APPENDIX TO THE REPORT OF THE MINISTER OF AGRICULTURE

# EXPERIMENTAL FARMS



## REPORTS

OF THE

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|---|---|
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| HORTICULTURIST | W. T. MACOUN |
| CHEMIST | F. T. SHUTT, M.A. |
| ENTOMOLOGIST AND BOTANIST | JAS. FLETCHER, LL.D. |
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| " " " INDIAN HEAD, N.W.T. | ANGUS MACKAY |
| " " " AGASSIZ, B.C. | THOS. A. SHARPE |

FOR

## 1904

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# APPENDIX

TO THE

# REPORT OF THE MINISTER OF AGRICULTURE

ON

# EXPERIMENTAL FARMS

OTTAWA, December 1, 1904.

SIR,—I beg to submit for your approval the eighteenth annual report of the work done, and in progress, at the several experimental farms.

In addition to my report, you will find appended reports from the following officers of the Central Experimental Farm : From the Agriculturist, Mr. J. H. Grisdale; from the Horticulturist, Mr. W. T. Macoun ; from the Chemist, Mr. Frank T. Shutt ; from the Entomologist and Botanist, Dr. James Fletcher; from the Experimentalist, Dr. C. E. Saunders, and from the Poultry Manager, Mr. A. G. Gilbert.

From the Branch Experimental Farms there are reports from Mr. R. Robertson, Superintendent, and from Mr. W. S. Blair, Horticulturist of the Experimental Farm for the Maritime Provinces, at Nappan, Nova Scotia; from Mr. S. A. Bedford, Superintendent of the Experimental Farm for Manitoba, at Brandon; from Mr. Angus Mackay, Superintendent of the Experimental Farm for the North-west Territories, at Indian Head, and from Mr. Thomas A. Sharpe, Superintendent of the Experimental Farm for British Columbia, at Agassiz.

In these reports there will be found the results of many important and carefully conducted experiments in agriculture, horticulture and arboriculture, the outcome of practical and scientific work in the fields, barns, dairy and poultry buildings; the orchards and plantations at the several experimental farms; also of scientific research in connection with the breeding of cereals and in determining their relative value, also of research work in the chemical laboratories bearing on many branches of agricultural and horticultural employment and of information gained from the careful study of the life histories and habits of injurious insects and the methods by which noxious weeds are propagated and spread, together with the most practical and economical measures for their destruction. In the report of the Entomologist and Botanist will also be found particulars of the experiments and observations which have been made during the past year in connection with the Apiary.

The large and constantly increasing demand by the farmers of the Dominion for the publications issued from the experimental farms, the rapidly extending correspondence and the readiness shown by farmers everywhere to co-operate with the work of the farms in the testing of new and promising varieties of cereals furnish gratifying evidence of the desire for information and improvement among this class of the community, also of the high esteem in which the work of the farms is held. It is hoped that the facts brought together in the present issue will be found of much practical value to the Canadian farmer and fruit-grower, and that they may assist in advancing agriculture and horticulture in this country.

I have the honour to be, sir,
Your obedient servant,
WM. SAUNDERS,
*Director of Experimental Farms.*

To the Honourable
The Minister of Agriculture,
Ottawa.

# ANNUAL REPORT

OF THE

# EXPERIMENTAL FARMS

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## REPORT OF THE DIRECTOR, WM. SAUNDERS, LL.D., F.R.S.C., F.L.S.

The general results of farm work throughout the Dominion, although not so uniformly favourable as in some other years, have on the whole been fairly satisfactory. The lengthened drought which prevailed in the Maritime Provinces during June and the greater part of July, reduced the hay crop considerably, leaving it from 20 to 30 per cent below the average. The grain, also, in most districts for the same reason gave lighter crops than usual, while pastures were seriously injured. In Quebec and Ontario the general conditions have been more favourable. The season, however, was cooler than usual, and although the rainfall in most places was sufficient, the crops did not make rapid growth. Owing to the severe winter, the fall wheat in Western Ontario was much injured, and nearly one-fourth of the crop was ploughed up. The average yield of that harvested was considerably below the average of past years. Spring wheat gave a yield about equal to the average, while barley and oats gave excellent crops, considerably above the average returns. In hay, also, the crop was well above the average.

In Manitoba the spring opened late; otherwise the season was favourable. Farmers have, however, suffered from an unusual invasion of rust, which reduced the crops of wheat and oats in some districts, but this was not sufficiently general to materially affect the total crop, and the high price paid for wheat this year, together with the increased area under crop will probably more than make up for any loss from rust. In the Territories seeding was also late, with favourable weather until the middle of June, when a period of drought set in which continued until the middle of July. Then timely rains saved the grain from injury, but the straw was considerably shorter than usual. The wheat crop in the Territories will probably average higher than in Manitoba, and the largely increased area there, together with the high prices realized, should materially assist in placing Territorial farmers in a very prosperous condition. The acreage now prepared for grain next season is much larger than in 1903, both in Manitoba and the Territories, and the prospects for the future are bright.

In the coast climate of British Columbia the rainfall in May, June and part of July was less than usual, but crops did not materially suffer. In the interior districts, where the rainfall is always light, the shortage this season reduced the grain yield in many localities below the average of past years.

In carrying on the work of the Experimental Farms from year to year, persistent efforts are made to assist farmers with information in regard to the maintenance of the fertility of their land, its proper treatment, and in the selection of highly productive seed of best quality; also to aid them generally in their endeavours to overcome difficulties which present themselves from time to time in the carrying on of farm work. These efforts have been much appreciated. The mass of new facts bearing on agriculture contained in this eighteenth annual report gives evidence of the skill and assiduity of the officers composing the staff of the Experimental Farms, and of their untiring efforts to benefit the cause of agriculture. At all these institutions visiting farmers are always welcome, and those who have an opportunity of personally inspecting the work in progress, after seeing its extent and its practical character, usually leave with a higher regard for the farms than they had before. Those who are unable to visit any of the farms can obtain, for the asking, the annual reports, in which the experiences gained at all the Experimental Farms are given, the perusal of which will give the reader, wherever he may be located, much information of practical value. Bulletins also are issued from time to time on special subjects, and are supplied free in the same manner as the reports.

## THE BREEDING OF CROSS-BRED APPLES FOR THE CANADIAN NORTH-WEST.

As soon as the branch experimental farms were established in the Canadian North-west experiments were begun on a rather extensive scale with both large and small fruits, with the object of finding out what sorts could be successfully grown there. Hardy varieties of the apple received special attention on account of the general usefulness of this fruit, and of its importance as a healthful article of diet. During the first eight or ten years more than two hundred of the hardiest sorts of cultivated apples obtainable in northern Europe and other northern countries were thoroughly tested, both at Brandon and Indian Head. These were planted in considerable numbers, often from twenty to fifty trees of a kind, in shelter of different degrees and without shelter, but none of these have yet produced a single apple. Experiments are still being continued with such new varieties as are announced from time to time as specially hardy, and thus far with similar negative results.

In 1887, the year during which work on the Experimental Farms was begun, seed was obtained from the Imperial Botanic Gardens at St. Petersburg, Russia, of a small wild Siberian crab-apple known as the 'Berried Crab,' *Pyrus baccata.* This wild crab is said to grow in great abundance near the shores of the Baikal Sea, and in other parts of Northern Siberia. Young trees were raised from this seed, and some of them were sent to Brandon, Man., and some to Indian Head, N.W.T., and at both places they were found to be entirely hardy. During a trial of fourteen or fifteen years the 'Berried Crab,' has never been injured by winter, and the trees have started from the terminal buds on the branches every season. These trees have fruited abundantly for many years, but the fruit is small—not much larger than a cherry—astringent and acid, and sometimes bitter. It does, however, make excellent jelly, hence this fruit in its unimproved form is found useful. It is also highly ornamental when covered with blossom in the spring, or with its fruit in the autumn. The trees are rather dwarf in habit, low branched and strongly built, with the fruit very firmly attached to the tree. From their build and general character they are well adapted to resist the winds to which trees are exposed on the North-west plains.

### BEGINNING OF THE WORK OF CROSS-BREEDING.

After four or five years' experience had thoroughly established the character of this tree for extreme hardiness, efforts were made to improve the size and quality of the fruit by cross-fertilizing the flowers of *Pyrus baccata* with pollen from many of the hardiest and best sorts of apples grown in Ontario. This work was begun in 1894, and has since been continued along several different lines. The seeds obtained from the first crosses were sown in the autumn of that year and germinated the following spring producing in all about 160 thrifty young trees. These were planted in the spring of 1896. Many of them grew very rapidly, and soon made shapely specimens. The young trees resulting from subsequent experiments have been planted from year to year in orchards at Ottawa, Brandon and Indian Head. In 1899 thirty-six of the cross-bred apples first produced and grown at Ottawa fruited, and five of them were of such size and quality as to justify their being propagated for more general test. The fact that so many of these fruited on the fourth year from the sowing of the seed indicates a very early bearing habit. Since then about two hundred more of these cross-bred apples have borne fruit, and the number of varieties worthy of extended cultivation has been considerably increased. Root grafts of some of the more promising sorts were early made, and these have been tested some three or four years at each of the North-western Experimental Farms, and have shown no indications of tenderness, even when planted in exposed situations. The cross-bred sorts grafted on the roots of *Pyrus baccata* have produced trees which so far as they have been tried seem to be quite as hardy as the wild form of *baccata,* and there is every reason to expect that they will prove generally hardy throughout the North-west country.

### EXPERIMENTS WITH 'PYRUS PRUNIFOLIA.'

In 1896 a series of crosses was begun on another sort of wild crab known as *Pyrus prunifolia.* This is regarded by some authorities as a distinct species; by others it is believed to be a hybrid between *P. malus,* the wild crab of Europe, and *P. baccata.* Seeds of this form were also obtained from the Royal Botanic Gardens of St. Petersburgh, Russia. The fruit of *P. prunifolia* is usually larger than that of *baccata,* and will average nearly double the size. Its hardiness in the North-west has also been established by a test covering a number of years on both of the Experimental Farms, at Brandon and Indian Head. The first crosses with this species were made in 1896, and since then many new sorts have been originated.

### APPLES FROM WHICH POLLEN WAS USED.

In the first crosses made on *Pyrus baccata* in 1894, pollen was used from the Tetofsky, Duchess and Wealthy apples, but since then pollen has been obtained from many other varieties of apples and used on *P. baccata, P. prunifolia,* or both, including Anis, Beautiful Arcade, Broad Green, Excelsior, Fameuse, Golden Russet, Haas, Herren, Krimskoe, McIntosh Red, McMahon White, Osimoe, Pewaukee, Red Astrachan, Ribston Pippin, Scott's Winter, Simbirsk No. 9, Swayzie Pomme Gris, Talman's Sweet, Winter St. Lawrence and Yellow Transparent. The number and variety of the crosses have thus been very much increased.

About 800 of these cross-bred varieties have been produced, and between 200 and 300 have fruited. While a large number have produced fruit of inferior quality, there have been obtained up to the present time 20 varieties in all, which from their superior size and quality may be regarded as useful for domestic purposes, and deserving of more extended trial.

### VARIETIES PRODUCED.

On plate I there are shown figures of *Pyrus baccata* (No. 1), and eight of the new cross-bred sorts of natural size, all produced from this species. The relative increase in the size of the cross-bred sorts is manifest to the eye. On weighing good average samples we find that the larger of these cross-bred apples are from 12 to 14 times heavier than *P. baccata.*

2. Alberta. *Pyrus baccata* with Haas.—Tree a strong grower and an abundant bearer. Fruit size 1·6 inches across, 1·4 inches deep, round somewhat flattened and slightly ribbed. Calyx persistent. Stem about half an inch long. Colour greenish yellow with a bright red cheek. Flesh nearly white, juicy, slightly astringent (astrin-

gency scarcely perceptible when fruit is ripe). Quality fair to good. Season last week in September to middle of October.

3. Silvia. *P. baccata* with Yellow Transparent.— Tree a strong grower and fair bearer. Fruit, size 1·4 inches across, 1·5 inches deep, form somewhat pointed and ribbed. Calyx persistent. Stem ¼ to ½ inch long. Colour pale yellow. Flesh of pleasant flavour, subacid, no astringency. Quality good. Ripe August 9 or 10, the earliest to ripen of all the cross-bred apples yet fruited.

4. Tony. *P. baccata* with McMahon White. Tree a strong grower and a heavy bearer. Fruit, size 1·6 inches across and 1·4 inches deep. Form round, somewhat flattened. Calyx persistent. Stem about ·8 of an inch long. Colour greenish yellow, streaked and splashed with bright red, and with many yellowish dots. Flesh yellowish white, juicy, sprightly, subacid, slightly astringent, with a pleasant flavour. Quality good. Season late September and October. A group of specimens of this variety is shown on plate II.

5. Columbia. *P. baccata* with Broad Green.—Tree a very strong grower and a fair bearer. Fruit, size 1·8 inches across and 1·6 inches deep, somewhat conical, distinctly ribbed. Calyx protruding and persistent. Stem of medium length. Colour red with stripes and dots of a deeper shade. Flesh yellowish, lightly streaked with red, juicy, subacid with a pleasant flavour, slightly astringent. Season late September and October.

6. Elsa. *P. baccata* with Yellow Transparent.—Tree a strong grower and good bearer. Fruit, size 1·4 inches across and 1·3 inches deep; nearly round, slightly ribbed. Calyx persistent on a slightly raised eminence, ribbed. Stem about an inch long, slender, but strong. Colour bright yellow. Flesh fine grained, tender, juicy, rather acid, but of pleasant flavour. Quality good. Season latter part of August.

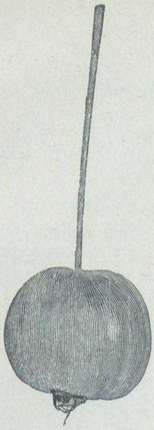
7. Prince. *P. baccata* with Tetofsky.—Tree a strong grower and very productive. Fruit, size 1·6 inches across and 1·3 inches deep, nearly round. Calyx drops in many of the specimens. Stem 1 to 1½ inches in length. Colour bright red (of a deeper shade on the side exposed to the sun), with a few paler dots and streaks. Flesh nearly white, juicy, subacid, somewhat astringent (astringency lessens as the fruit ripens). Of a pleasant flavour. Ripe early in Setpember.

8. Jewel. *P. baccata* with Yellow Transparent.—Tree a strong grower and a good bearer. Fruit, size, 1·4 inches across and 1·3 inches deep, nearly round, slightly elongated. Calyx persistent, stem about 1¼ inches long. Colour yellowish, with a pale red cheek. Flesh moderately firm, crisp, juicy, of good flavour, subacid with very little astringency. Quality good. Season, last week in August and early in September.

9. Robin. *P. baccata* with Simbirsk No. 9.—Tree a good grower and a medium bearer. Fruit, size, 1·5 inches across and 1·4 inches deep; nearly round, strongly ribbed. Calyx large, persistent and projecting. Stem about 1 inch long. Colour, yellow and red. Flesh very firm, juicy, subacid with a slight astringency and a pleasant flavour. Quality good, one of the best. Season, latter part of August and September.

10. Charles. *P. baccata* with Tetofsky.—Tree a very upright and strong grower, with large leathery leaves, and a medium bearer. Fruit, size, 1·6 inches across and 1·5 inches deep; nearly round, slightly ribbed. Calyx persistent. Stem rather long. Colour a uniform yellow. Flesh yellowish, solid, crisp, juicy, with a pleasant flavour, mildly acid and slightly astringent. Season, early in September.

11. Novelty. *P. baccata* with Wealthy.—Tree a vigorous grower with good foliage and fairly productive. Fruit, size, 1·6 inches across and 1·3 inches deep; nearly round, somewhat flattened at each end. Calyx persistent. Stem long and slender. Colour



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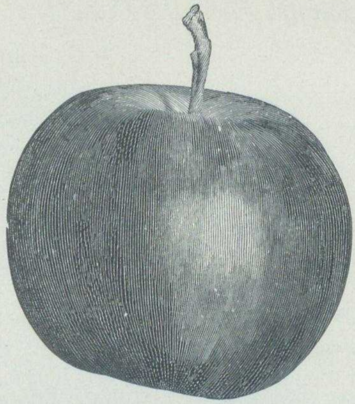

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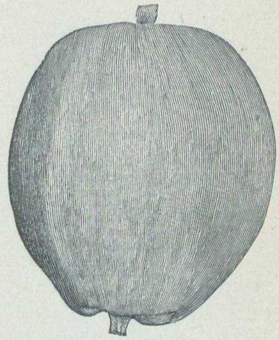

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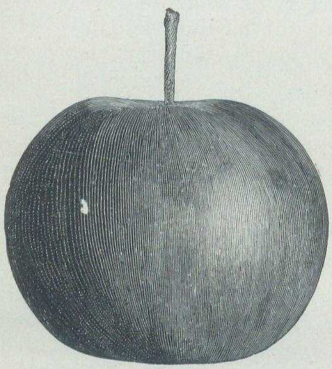

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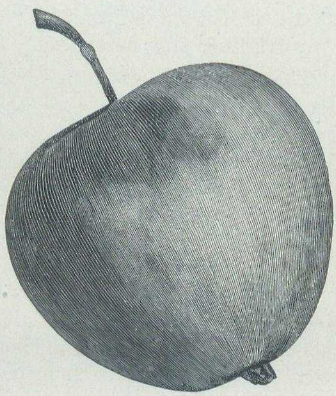

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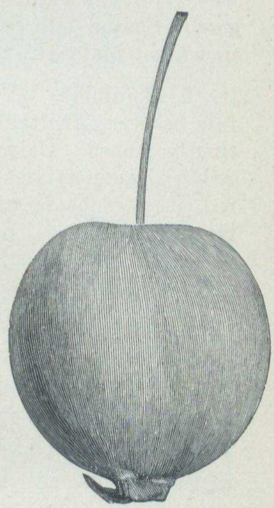

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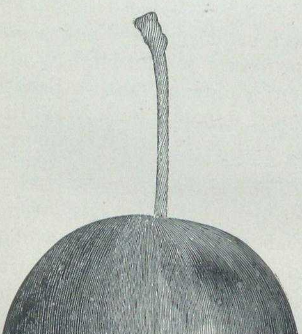

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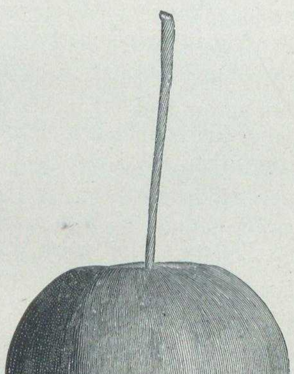

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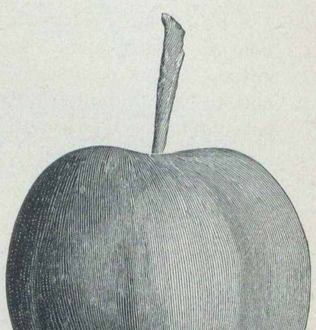

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1.—Pyrus Baccata.
2.—Alberta.
3.—Silvia.

4.—Tony.
5.—Columbia.
6.—Elsa.

7.—Prince.
8.—Jewel.
9.—Robin.

deep red. Flesh a pale yellowish pink, firm, crisp, juicy, subacid and of fair quality. Season, middle to end of September.

12. Progress. *P. baccata* with Wealthy.—Tree a vigorous grower, fairly upright in habit and productive. Fruit, size, 1·4 inches across and 1·2 inches deep; nearly round, somewhat flattened at each end. Calyx persistent. Stem long and slender. Colour, red with some yellow and a dark red cheek. Flesh very firm, crisp, sub-acid, juicy, very slightly astringent and of fair flavour. Season, middle of September.

13. Aurora. *P. baccata* with Tetofsky.—Tree a fair grower and productive. Fruit, size, 1·5 inches across and 1·2 inches deep; nearly round, somewhat ribbed. Calyx persistent. Stem long. Colour, bright red almost all over. Very handsome. Flesh crisp, juicy, acid and of fair flavour. Astringency very slight. Ripe September 6 to 12.

14. Dawn. *P. prunifolia* with Simbirsk No. 9.—Tree a good grower and fairly productive. Fruit, size, 1·8 inches across and 1·6 inches deep. Calyx persistent. Stem about half an inch long. Colour, red, of a deeper shade on the sunny side. Flesh firm, white, juicy, distinctly sub-acid, with a pleasant flavour. Quality good. Ripe September 20 to 30.

15. Magnus. *P. prunifolia* with Simbirsk No. 9.—Tree a strong grower and a fair bearer. Fruit, size, 1·8 inches across and 1·7 inches deep; nearly round. Calyx persistent. Stem about half an inch long. Colour, orange and scarlet. Flesh firm, rather juicy but not crisp, subacid. Flavour aromatic, very slight astringent. Quality very good. One of the largest and best yet fruited of the cross-bred apples. Ripe September 20 to 30.

16. Manitou. *P. baccata* with McMahon White.—Tree a fair grower and productive. Fruit, size, 1·5 inches across and 1·2 inches deep; nearly round, distinctly ribbed. Calyx persistent, prominent, ribbed. Stem 1 to 1¼ inches long. Colour yellow, almost covered with bright red, becoming deep red where exposed to the sun. Flesh nearly white, juicy, sprightly, subacid, with a pleasant flavour. Quality fair. Ripe, end of September.

17. Pioneer. *P. baccata* with Tetofsky.—Tree a strong grower and a good bearer. Fruit, size, 1·5 inches across and 1·3 inches deep; nearly round, slightly ribbed. Calyx persistent. Stem rather long. Colour, yellow with a pink cheek. Flesh white, fine-grained, firm, crisp, subacid, slightly astringent, moderately juicy, with a pleasant flavour. Season latter part of September and October.

18. Golden. *P. prunifolia* with Golden Russet.—Tree a fair grower, and quite productive. Fruit, size 1·5 inches across, 1·2 inches deep, round, somewhat flattened at the ends. Calyx persistent, in a shallow basin. Stem ½ inch long, rather stout. Colour bright yellow. Flesh fairly juicy, rather sweet, very slightly astringent. Quality good. Season last week in August and September.

19. Bow. *P. baccata* with Pewaukee.—Tree a fairly strong grower and productive. Fruit, size 1·5 inches across and 1·2 inches deep. Calyx persistent. Stem rather long. Colour bright yellow, with a faint tinge of red. Flesh yellowish white, crisp, juicy, mildly subacid, not astringent, of good flavour. Season late in September.

20. Kent. *P. baccata* with McIntosh Red.—Tree a good grower and productive. Fruit 1·5 inches across and 1·3 inches deep, nearly round and ribbed about the calyx. Calyx persistent, and slightly projecting stem ¾ to 1 inch long. Colour deep red, with an orange shade deeper in tint on the sunny side. Flesh yellowish white, juicy, crisp, mildly subacid, slightly astringent and of fairly good flavour. Season end of September to December. A group of specimens of this variety is shown on plate II.

### SUITABLE STOCKS FOR GRAFTING.

To ensure hardiness in a fruit tree not only must the part exposed to the air be capable of enduring the cold weather of winter, but the root on which the variety is grafted must be equally hardy, otherwise the tree will often perish at the root while the wood above ground is plump and free from injury. Fortunately we have in this instance in the roots of the wild form of *Pyrus baccata* a safe basis on which to work, and all of the young trees of the cross-bred apples which have been sent out for test from the Central Experimental Farm have been grafted or budded on this species. Some partial failures have occurred in grafting on this stock which have interfered with rapid distribution, and experience has shown that budding is to be preferred as a method of propagation in this instance. Having at the outset only one small tree to work with the number of grafts available must necessarily be limited, while probably three times the number of buds may be got from the same amount of wood. Not only does budding form a better union with the stock, but it also admits of the trees being multiplied more rapidly.

### METHODS OF DISTRIBUTION OF THESE CROSS-BRED FRUITS FOR FURTHER TEST.

Supplies of all these different sorts are sent first to the Experimental Farms at Brandon and Indian Head, where orchards of considerable size are being established. These fruits are also being tested at many different points in Manitoba and the North-west Territories, and at a few places in northern Ontario. To determine their hardiness on the North-west plains it is essential that they be tried in many localities from the eastern boundaries of the plains, where the altitude is comparatively low, to the foothills of the Rocky Mountains, where the elevation above sea-level is much greater. The question of altitude has a most important bearing on the hardiness of fruit trees.

For several years a list has been in course of preparation, on which have been entered from time to time the names of settlers who take a special interest in the growing of trees and shrubs. From this list a number of names were chosen, distributed over a wide area, seldom taking more than one or two in each district. In this way about 200 locations were selected, the extreme points of variation in elevation ranging from 740 to 4,200 feet. Having corresponded with these parties and received assurance that any young trees sent them would be carefully looked after, the first distribution was made in 1902, when four one-year old trees (one tree each of four different sorts) were sent to each person. In the spring of 1903 a second package was sent to the same individuals containing two additional varieties of cross-bred apples, so that at each of these points six of these young trees have been received. Reports have come in from all those whe have received the trees, and in almost every instance they are reported as entirely hardy, having stood the winters to which they have been exposed without injury, and as a rule made rapid growth. It is scarcely probable that any of these young trees will fruit in 1905, but in the following year it is likely that many of them will bear apples, when the interest in this work will be very much increased.

### OTHER LINES OF WORK UNDERTAKEN.

Another line of work in producing new apples was begun two years ago in crossing *Pyrus malus,* the wild apple of Europe, with some of our best apples. This fruit is about an inch in diameter to start with and of fair quality. A hardy form of this tree has been secured, which has stood several winters at Brandon and Indian Head without injury; and with this during the past two seasons a number of crosses have been made.

Many of the best of the crosses produced on *P. baccata* and *P. prunifolia* have been recrossed, thus introducing a second quota of the blood of the larger apple., with the hope of obtaining fruits of larger size. How far this can be carried without inducing tenderness can only be determined by experiment. The first one-year old trees produced by this method were planted in the orchard at Ottawa in the spring of 1904.

A very large number of young trees has been raised within the past five years from seed saved from the best of the named cross-bred sorts, and this work is being rapidly extended. Many hundreds of these seedlings have been planted, chiefly in orchards on the western Experimental Farms. Some of these have already fruited, and among them several new sorts of promise have appeared. In raising trees from the seeds of these cross-breds, a large proportion of them will probably sport towards the female parent, *P. baccata*, and produce fruit of an inferior quality, while a small proportion will be likely to inherit more fully the qualities of the male, which would result in larger and better fruit. What proportion will show improvement in this direction can only be determined by growing them, but if only one good variety in a considerable number be had, the inferior ones can all be grafted with the good variety, and time thus saved in building up an orchard.

Many seedlings have also been raised of the Martha, Snyder and other crabs, and several of the seedlings of Martha grown at the Experimental Farm at Brandon have borne fruit of good size and quality, and have thus far been quite hardy.

Of these seedlings, Maggie and No. 309 are among the most promising, and these are being propagated for more extended trial. Including the products from all these different methods of working there are now more than 700 different sorts growing on the Experimental Farm at Ottawa, about 1,200 on the farm at Brandon, and about 650 at Indian Head. There are also the 1,200 trees which have been referred to as growing at 200 different localities in the North-west country.

Grafts of a number of these new seedlings have been sent to some of the leading nurseries in Canada and the opportunity thus afforded of growing stock to meet such demand for these fruits as may arise.

The lines of work in progress may be thus summarized :—

1. The producing of a large number of hybrids by crossing *P. baccata* and *P. prunifolia* with a large number of the best sorts of cultivated apples.

2. The carrying on of similar work with a hardy strain of *Pyrus malus*, the wild crab of Europe.

3. The growing of a large number of trees from seed obtained from the best of the named cross-bred sorts.

4. The producing of a series of second crosses by which the best of the first produced cross-breds will receive another portion of the blood of the larger fruits.

5. The careful testing of every new seedling, or cross-bred fruit, from any and every source, where, associated with acceptable size and quality, there is promise of hardiness.

By persevering along the lines indicated there is little doubt that within a very few years a number of varieties of apples will be available, possessing that hardiness, size and quality which will commend them to the settlers in all those portions of the northern country where ordinary apples under average conditions cannot be grown. The success thus far achieved is most encouraging, and doubtless greater triumphs in the future will reward persistent effort.

## CO-OPERATIVE EXPERIMENTS BY CANADIAN FARMERS.

The assistance rendered to Canadian farmers by the distribution of samples of seed of high quality for the improvement of crops has been continued, and the work highly appreciated. Farmers everywhere have gladly undertaken to co-operate with the Experimental Farms in the endeavour to ascertain the relative merits in earliness, productiveness and quality of the different varieties under trial, when grown under the different climatic conditions which prevail in the several provinces and territories of the Dominion. During 1904 more than 37,000 farmers joined in these co-operative tests. A large number of reports have been received in which many have expressed their gratitude for the efforts made in their behalf, and their appreciation of the great value of this work. The samples of wheat and barley sent to each applicant have weighed five pounds each, and those of oats four pounds, sufficient in each case to sow one-twentieth of an acre. The samples of Indian corn, pease and potatoes have weighed three pounds each.

The samples sent from the Central Experimental Farm during the early months of 1904 have been distributed as follows :—

DISTRIBUTION BY PROVINCES.

| Name of Grain. | Prince Edward Island. | Nova Scotia. | New Brunswick. | Quebec. | Ontario. | Manitoba. | North-west Territories. | British Columbia. |
|---|---|---|---|---|---|---|---|---|
| Oats | 603 | 1,350 | 1,319 | 3,316 | 2,212 | 891 | 1,395 | 135 |
| Barley | 136 | 514 | 297 | 1,201 | 893 | 334 | 540 | 66 |
| Wheat | 395 | 795 | 908 | 1,711 | 790 | 977 | 1,658 | 82 |
| Pease | 23 | 121 | 140 | 328 | 94 | 54 | 67 | 19 |
| Indian corn | 46 | 189 | 175 | 831 | 687 | 47 | 158 | 26 |
| Potatoes | 116 | 620 | 748 | 1,574 | 2,155 | 760 | 1,124 | 202 |
| Total | 1,319 | 3,589 | 3,587 | 8,961 | 6,831 | 3,063 | 4,942 | 530 |

Total number of samples distributed, 32,822.

Number of applicants supplied, 32,756.

Total number of packages of each sort distributed :—

| | |
|---|---|
| Oats | 11,221 |
| Barley | 3,981 |
| Wheat | 7,316 |
| Pease | 846 |
| Indian corn | 2,159 |
| Potatoes | 7,299 |
| Total | 32,822 |

The following list shows the number of packages which have been sent out of the different varieties :—

| Name of Variety. | Number of Packages. |
|---|---|
| OATS. | |
| Banner | 2,765 |
| Improved Ligowo | 1,976 |
| Tartar King | 1,828 |
| Waverley | 1,328 |
| Wide Awake | 807 |
| Goldfinder | 759 |
| Abundance | 679 |
| Thousand Dollar | 504 |
| Black Beauty | 333 |
| American Beauty | 242 |
| Total | 11,221 |
| BARLEY (Six-rowed). | |
| Mensury | 1,228 |
| Odessa | 686 |
| Mansfield | 218 |
| Claude | 171 |
| Rennie's Improved | 162 |
| Royal | 44 |
| (Two-rowed). | |
| Sidney | 533 |
| Canadian Thorpe | 333 |
| Standwell | 333 |
| Invincible | 273 |
| Total | 3,981 |
| WHEAT. | |
| Red Fife | 1,765 |
| Preston | 1,602 |
| Percy | 811 |
| Stanley | 777 |
| Laurel | 668 |
| White Fife | 575 |
| Huron | 471 |
| White Russian | 280 |
| Wellman's Fife | 197 |
| White Connell | 167 |
| Common Emmer | 3 |
| Total | 7,316 |

| Name of Variety. | Number of Packages. |
|---|---|
| PEASE. | |
| Canadian Beauty | 516 |
| Prussian Blue | 195 |
| Arthur | 52 |
| Miscellaneous | 83 |
| Total | 846 |
| INDIAN CORN. | |
| Angel of Midnight | 653 |
| Selected Leaming | 508 |
| Early Mastodon | 423 |
| Compton's Early | 222 |
| Longfellow | 207 |
| Superior Fodder | 90 |
| Eureka | 56 |
| Total | 2,159 |
| POTATOES. | |
| Carman No 1 | 887 |
| American Wonder | 723 |
| Rural Blush | 606 |
| Early White Prize | 583 |
| Everett | 548 |
| Rochester Rose | 535 |
| Reeve's Rose | 449 |
| Early Andes | 418 |
| Canadian Beauty | 434 |
| Early Sunrise | 399 |
| Early Ohio | 394 |
| Late Puritan | 334 |
| Uncle Sam | 264 |
| Wonder of the World | 236 |
| Beauty of Hebron | 192 |
| Thorburn | 106 |
| Miscellaneous | 161 |
| Total | 7,299 |

## DISTRIBUTION OF SAMPLES FROM THE BRANCH EXPERIMENTAL FARMS.

Samples were also distributed from the Branch Experimental Farms, as follows:—

**Experimental Farm, Nappan, N.S.**

| | No. of Sample Bags. |
|---|---|
| Spring wheat | 72 |
| Oats | 198 |
| Barley | 65 |
| Pease | 51 |
| Buckwheat | 25 |
| Potatoes | 331 |
| Total | 742 |

**Experimental Farm, Brandon, Man.**

| | No. of Sample Bags |
|---|---|
| Spring wheat | 134 |
| Oats | 166 |
| Barley | 60 |
| Pease | 49 |
| Potatoes | 128 |
| Total | 537 |

Experimental Farm, Indian Head, N.W.T.

| | No. of Sample Bags. |
|---|---|
| Spring wheat | 420 |
| Oats | 542 |
| Barley | 367 |
| Pease | 176 |
| Flax, Rye and Emmer | 153 |
| Potatoes | 818 |
| Total | 2,476 |

Experimental Farm, Agassiz, B.C.

| | No. of Sample Bags. |
|---|---|
| Spring wheat | 86 |
| Oats | 153 |
| Barley | 74 |
| Pease | 120 |
| Potatoes | 164 |
| Total | 597 |

By adding the number of samples distributed by the branch farms to those sent out by the central farm, we have a total of 37,174. It is gratifying to find among the farmers of Canada so large a number of volunteers ready to co-operate in this experimental work.

For ten years the volume of this work has been large, and the average number of experimenters to whom samples have been sent has been 36,406 each year.

In distributing this large quantity of seed grain great care is taken to have it clean and as far as possible true to name. Most of it is grown at the Experimental Farms at Indian Head and Brandon, where the crops average larger yields than they do at Ottawa. It is believed that better results can be got from samples of oats from a crop which has given 100 bushels per acre than from one giving 50 or 60 bushels. There is much individuality stamped on every variety, and it is doubtless an advantage to have seed grain from productive strains.

To provide the large quantity of seed required for this distribution, arrangements are made for growing it the previous year. While maturing in the fields most of the grain from which the samples for distribution are to be supplied is gone carefully over, and any plants found of other varieties pulled up. After the grain is threshed it is put through suitable cleaning machinery, and then thoroughly examined, and if any foreign admixture which the separators will not remove is found the grain is hand picked before it is sent out. There is no doubt that the high quality and productiveness of the cereals grown throughout the Dominion has been favourably influenced and very largely so by the placing of these comparatively small quantities of cereals of high quality in the hands of so many good men. From the samples received hundreds of farmers have within three seasons produced sufficient seed for their own sowing and a considerable surplus to sell to their neighbours.

## CORRESPONDENCE.

The correspondence carried on during 1904 between the farmers of Canada and the officers of the Experimental Farms has been very large.

### CENTRAL EXPERIMENTAL FARM.

The following is a summary of the letters received and sent out at the Central Experimental Farm from December 1, 1903, to November 30, 1904; also the number of reports, bulletins and circulars forwarded by mail during the same period:—

| | Letters received. | Letters sent. |
|---|---|---|
| Director | 43,791 | 18,539 |
| Agriculturist | 2,067 | 2,967 |
| Horticulturist | 1,479 | 1,417 |
| Chemist | 1,284 | 1,251 |
| Entomologist and Botanist | 3,231 | 2,909 |
| Experimentalist | 349 | 281 |
| Poultry Manager | 2,298 | 2,006 |
| Accountant | 867 | 873 |
| | 55,366 | 30,243 |

A large number of the letters received by the Director are applications for samples of grain or for the publications of the farms, a considerable proportion of which are answered by sending the correspondents the material asked for, accompanied by circular letters. This explains why the number of letters received so much exceeds the number sent out.

| | |
|---|---|
| Circular letters, including circulars sent with samples of seed grain | 33,825 |
| Reports and bulletins mailed | 345,853 |

BRANCH EXPERIMENTAL FARMS.

The correspondence with the superintendents of the branch experimental farms is also large, as shown by the following figures:—

| | Letters received. | Letters sent. |
|---|---|---|
| Experimental Farm, Nappan, N.S. | 2,030 | 1,790 |
| " " Brandon, Man. | 5,300 | 3,528 |
| " " Indian Head, N.W.T. | 5,849 | 5,871 |
| " " Agassiz, B.C. | 2,942 | 2,772 |

Much additional information has also been sent out from the branch farms in printed circulars. By adding the correspondence conducted at the branch farms to that of the central farm, it will be seen that 71,487 letters in all were received, and 44,204 sent out during the year.

## TESTS OF THE VITALITY OF SEED GRAIN AND OTHER SEEDS.

The number of samples of seeds tested during the season of 1903-4 to find the proportion which would germinate, and to determine the percentage of plants of strong and weak growth, was 2,285.

This useful work has been carried on at the Central Experimental Farm every year since its establishment in 1887. The total number of samples tested since that time is 31,736. Farmers are invited to send in every year any samples which may be of doubtful vitality through injury before harvest or in harvesting or storing, so that their germinating power may be determined and their usefulness for seed puposes ascertained. The appliances available for these tests are all that could be desired, affording facilities for testing every sample in the soil, and also in germinators where the grain is placed between folds of linen or other fabric and kept constantly moist. In our experience there is no test so reliable as the soil, and it has often occurred when testing samples of low vitality in a germinator that the proportion of seeds which will start to grow between the moist folds of fabric in the apparatus will be larger than can be got from the same seed put into the soil. The information which is of practical use to the farmer is the proportion of seed which will grow in his fields when sown there. If the vitality of a sample is so weak that a large proportion of the young plants are unable to force their way through the soil, such seed, however high the percentage of germination shown in the germinator, is of less value for sowing.

During the past season 820 samples of oats have been tested, a large number of which were sent in from Northern Alberta, where the oat crop of 1903 was considerably injured by frost. In all cases where the germinating power was low, farmers were advised to dispose of such grain for feed and to buy oats of higher vitality for sowing. Many instances have come to our knowledge where such information supplied has saved farmers from much loss.

Any farmer may avail himself of the help which this branch of the work can give him; about an ounce of seed is all that is needed to allow of its germinating power being determined. No charge is made for testing samples, and they may be sent to the Central Experimental Farm by mail free of postage and can usually be reported on in about a fortnight.

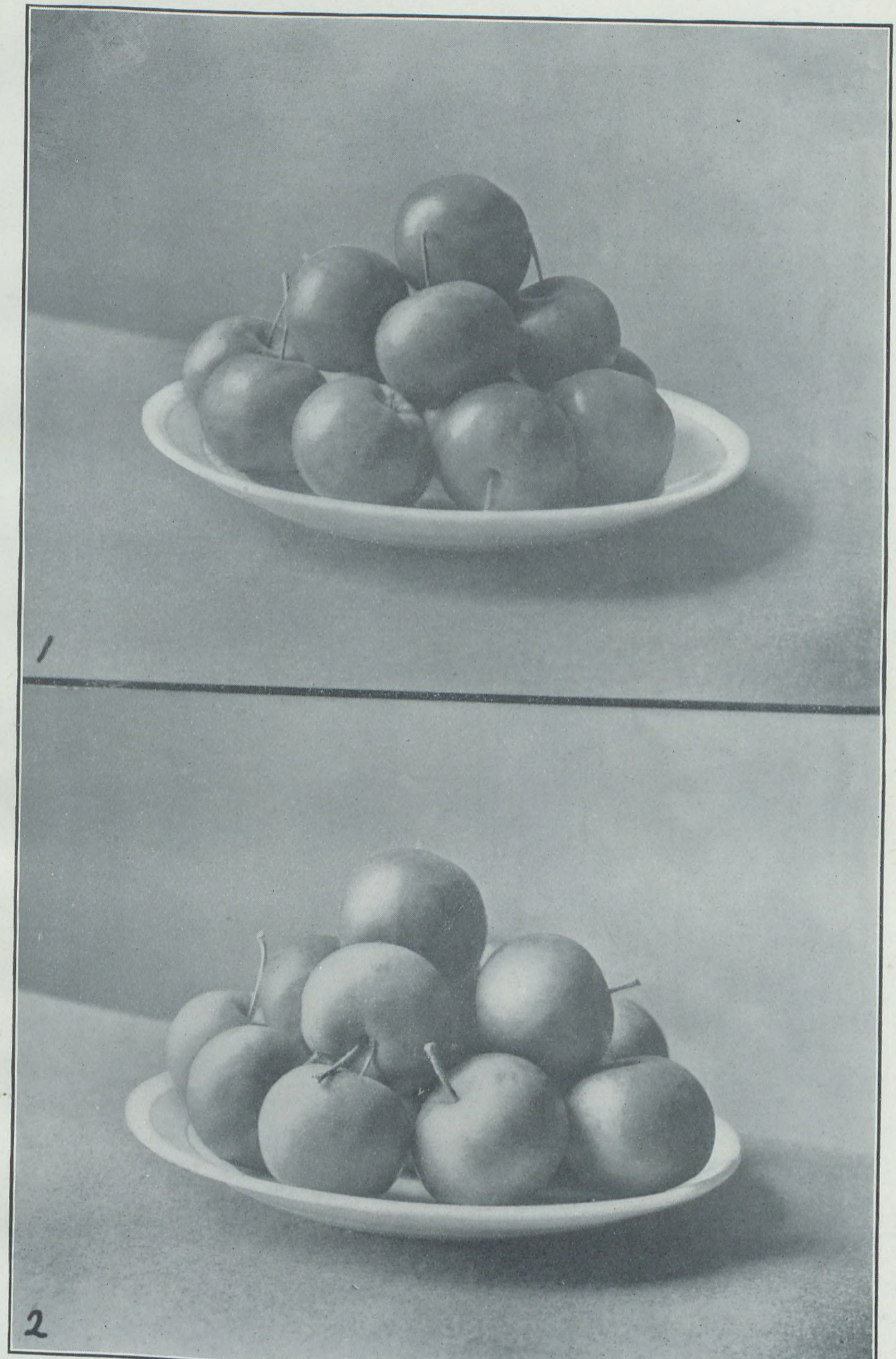
RESULTS of Tests of Seeds for Vitality, 1903-4:—

| Kind of Seed. | Number of Tests. | Highest Per-centage. | Lowest Per-centage. | Percent-age of Strong Growth. | Percent-age of Weak Growth. | Average Vitality. |
|---|---|---|---|---|---|---|
| Wheat | 679 | 100·0 | 17·0 | 81·6 | 4·6 | 86·2 |
| Barley | 269 | 100·0 | 22·0 | 83·2 | 6·9 | 90·1 |
| Oats | 820 | 100·0 | 1·0 | 60·3 | 10·0 | *70·3 |
| Rye | 2 | 94·0 | 88·0 | 89·0 | 2·0 | 91·0 |
| Pease | 164 | 100·0 | 6·0 | ........ | ........ | 64·6 |
| Grass | 117 | 100·0 | 7·0 | ........ | ........ | 74·5 |
| Clover | 186 | 100·0 | 17·0 | ........ | ........ | 76·3 |
| Corn | 13 | 94·0 | 20·0 | ........ | ........ | 62·1 |
| Radish | 5 | 72·0 | 17·0 | ........ | ........ | 40·0 |
| Sugar Beet | 3 | 82·0 | 74·0 | ........ | ........ | 78·0 |
| Cabbage | 3 | 75·0 | 57·0 | ........ | ........ | 66·0 |
| Tobacco | 2 | 54·0 | 47·0 | ........ | ........ | 50·5 |
| Ash Seed | 2 | 14·0 | 10·0 | ........ | ........ | 12·0 |
| Maple Seed | 2 | 20·0 | 16·0 | ........ | ........ | 18·0 |
| Rape | 1 | 99·0 | 99·0 | ........ | ........ | 99·0 |
| Miscellaneous vegetable seeds | 17 | 100·0 | 10·0 | ........ | ........ | 49·8 |
| **Total** number of samples tested, highest and lowest percentage | 2,285 | 100·0 | 1·0 | ........ | ........ | ........ |

TABLE showing Results of Grain Tests for each Province:—

| Kind of Grain. | Number of Tests. | Highest Per-centage. | Lowest Per-centage. | Per-centage of Strong Growth. | Per-centage of Weak Growth. | Average Vitality. |
|---|---|---|---|---|---|---|
| **ONTARIO.** | | | | | | |
| Wheat | 222 | 100·0 | 23·0 | 74·8 | 5·5 | 80·4 |
| Barley | 113 | 100·0 | 39·0 | 81·6 | 7·2 | 88·8 |
| Oats | 127 | 100·0 | 1·0 | 87·1 | 5·1 | 92·2 |
| **QUEBEC.** | | | | | | |
| Wheat | 45 | 100·0 | 53·0 | 88·4 | 3·3 | 91·7 |
| Barley | 17 | 100·0 | 58·0 | 87·5 | 7·5 | 95·0 |
| Oats | 21 | 100·0 | 47·0 | 83·5 | 5·9 | 89·5 |
| **MANITOBA.** | | | | | | |
| Wheat | 155 | 100·0 | 38·0 | 86·3 | 4·0 | 90·3 |
| Barley | 33 | 100·0 | 22·0 | 86·1 | 4·5 | 90·6 |
| Oats | 159 | 100·0 | 6·0 | 74·7 | 8·3 | 83·1 |
| **NORTH-WEST TERRITORIES.** | | | | | | |
| Wheat | 170 | 100·0 | 23·0 | 80·2 | 5·2 | 85·4 |
| Barley | 76 | 100·0 | 26·0 | 83·2 | 5·7 | 88·9 |
| Oats | 481 | 100·0 | 3·0 | 45·6 | 12·3 | *58·0 |

* This low average percentage in oats is due to the number of samples injured by unfavourable weather received from Northern Alberta. These samples ranged in vitality from 3 per cent and upwards. In other localities in the north-west the percentage of vitality ranged from 75 to 100 per cent.




1.—Alberta. 2.—Tony.

NOVA SCOTIA.

| | | | | | | |
|---|---|---|---|---|---|---|
| Wheat | 30 | 100·0 | 60·0 | 87·4 | 2·4 | 89·9 |
| Barley | 10 | 100·0 | 86·0 | 83·1 | 11·9 | 95·0 |
| Oats | 9 | 98·0 | 67·0 | 81·1 | 5·7 | 86·7 |

NEW BRUNSWICK.

| | | | | | | |
|---|---|---|---|---|---|---|
| Wheat | 31 | 100·0 | 17·0 | 89·0 | 2·9 | 91·9 |
| Barley | 10 | 99·0 | 86·0 | 84·5 | 12·1 | 96·6 |
| Oats | 10 | 99·0 | 89·0 | 87·9 | 6·8 | 94·7 |

PRINCE EDWARD ISLAND.

| | | | | | | |
|---|---|---|---|---|---|---|
| Wheat | 20 | 100·0 | 86·0 | 92·6 | 2·7 | 95·3 |
| Barley | 8 | 100·0 | 83·0 | 86·3 | 7·6 | 94·0 |
| Oats | 10 | 100·0 | 91·0 | 92·1 | 4·3 | 96·4 |

BRITISH COLUMBIA.

| | | | | | | |
|---|---|---|---|---|---|---|
| Wheat | 6 | 100·0 | 79·0 | 92·3 | 1·5 | 93·8 |
| Barley | 2 | 87·0 | 86·0 | 70·6 | 16·0 | 86·5 |
| Oats | 3 | 89·0 | 78·0 | 77·0 | 7·3 | 84·3 |

(Signed) WILLIAM T. ELLIS.

## METEOROLOGICAL OBSERVATIONS.

TABLE of Meteorological Observations taken at the Central Experimental Farm, Ottawa, 1904; maximum, minimum and mean temperature for each month, with date of occurrence, also rainfall, snowfall and total precipitation.

| Month. | Maximum. | Minimum. | Range. | Mean. | Highest. | Date. | Lowest. | Date. | Rainfall. | Snowfall. | Total Precipitation. | Number of Days Precipitation. | Heaviest in 24 hours. | Date. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | ° | ° | ° | ° | | ° | | | | | | | |
| January | 13·90 | —4·91 | 18·82 | 4·50 | 30·5 | 31st | —30·2 | 5th | 0·00 | 40·75 | 4·06 | 12 | 0·80 | 16th. |
| February | 15·23 | —5·66 | 20·89 | 4·78 | 38·0 | 22nd | —28·0 | 2nd | 0·39 | 24·00 | 2·79 | 13 | 0·55 | 23rd. |
| March | 32·49 | 14·66 | 17·83 | 23·57 | 42·8 | 23rd | —12·0 | 5th | 2·09 | 13·75 | 3·46 | 16 | 0·83 | 26th. |
| April | 47·15 | 30·01 | 17·14 | 38·58 | 66·0 | 24th | 6·2 | 2nd | 3·36 | 6·00 | 3·96 | 13 | 1·00 | 9th. |
| May | 71·31 | 46·82 | 24·49 | 59·06 | 85·0 | 9th | 35·2 | 12th | 3·49 | ..... | 3·49 | 10 | 0·88 | 15th. |
| June | 75·98 | 53·82 | 22·16 | 64·90 | 87·5 | 25th | 46·0 | 23rd | 2·80 | ..... | 2·80 | 14 | 0·49 | 15th. |
| July | 78·86 | 56·34 | 22·51 | 67·59 | 95·0 | 19th | 44·5 | 30th | 3·31 | ..... | 3·31 | 16 | 1·14 | 31st. |
| August | 75·98 | 52·52 | 23·45 | 64·24 | 83·5 | 5th | 42·8 | 30th | 2·80 | ..... | 2·80 | 13 | 1·68 | 20th. |
| September | 64·95 | 45·34 | 19·60 | 55·14 | 80·0 | 11th | 27·5 | 22nd | 5·50 | ..... | 5·50 | 15 | 1·58 | 24th. |
| October | 53·31 | 34·76 | 18·55 | 44·03 | 70·1 | 10th | 19·0 | 31st | 1·80 | ..... | 1·80 | 10 | 0·72 | 21st. |
| November | 36·27 | 22·10 | 14·17 | 29·18 | 52·0 | 3rd | 0·0 | 29th | 0·41 | 4·75 | 0·88 | 10 | 0·22 | 27th. |
| December | 16·72 | —1·03 | 17·76 | 7·85 | 35·7 | 31st | —20·6 | 25th | T | 19·50 | 1·94 | 15 | 0·50 | 19th. |

Rain or snow fell on 157 days during the 12 months.
Heaviest rainfall in 24 hours, 1·68 inches, on August 20th.
Heaviest snowfall in 24 hours, 8·00 inches, on January 16th.
The highest temperature during the 12 months, was 95·0° on July 19th.
The lowest temperature during the 12 months, was—30·2° on January 5th.
During the growing season rain fell on 13 days in April, 10 days in May, 14 days in June, 16 days in July, 13 days in August, and 15 days in September.
May, October and November, show the lowest number of days with precipitation, viz., 10 days in each month.
Total precipitation during the 12 months, 36·79 inches, as compared with 34·92 inches during 1903.

RAINFALL, Snowfall, and total Precipitation from 1890 to 1904, also the average annual amount that has fallen.

| Year. | Rainfall. | Snowfall. | Total Precipitation |
|---|---|---|---|
| | In inches. | In inches. | In inches. |
| 1890 | 24·73 | 64·85 | 31·22 |
| 1891 | 30·19 | 73·50 | 37·54 |
| 1892 | 23·78 | 105·00 | 34·28 |
| 1893 | 31·79 | 72·50 | 39·04 |
| 1894 | 23·05 | 71·50 | 30·20 |
| 1895 | 27·01 | 87·50 | 35·76 |
| 1896 | 21·53 | 99·75 | 31·50 |
| 1897 | 24·18 | 89·00 | 33·08 |
| 1898 | 24·75 | 112·25 | 35·97 |
| 1899 | 33·86 | 77·25 | 41·63 |
| 1900 | 29·48 | 108·00 | 40·27 |
| 1901 | 29·21 | 97·25 | 38·91 |
| 1902 | 25·94 | 101·75 | 36·10 |
| 1903 | 26·43 | 85·00 | 34·92 |
| 1904 | 25·95 | 108·75 | 36·79 |
| Total for 15 years | 401·88 | 1,353·85 | 537·21 |
| Yearly average for 15 years | 26·79 | 90·25 | 35·81 |

RECORD of Sunshine taken at the Central Experimental Farm, Ottawa, for the Year 1904.

| Months. | Number of days with Sunshine. | Number of days without Sunshine. | Total hours Sunshine. | Average Sunshine per day. |
|---|---|---|---|---|
| January | 14 | 17 | 65·1 | 2·10 |
| February | 19 | 10 | 97·0 | 3·34 |
| March | 24 | 7 | 129·4 | 4·17 |
| April | 21 | 9 | 129·4 | 4·31 |
| May | 28 | 3 | 233·8 | 7·54 |
| June | 27 | 3 | 236·4 | 7·88 |
| July | 29 | 2 | 224·0 | 7·22 |
| August | 28 | 3 | 252·2 | 8·13 |
| September | 25 | 5 | 145·3 | 4·84 |
| October | 24 | 7 | 107·2 | 3·45 |
| November | 22 | 8 | 99·0 | 3·30 |
| December | 19 | 12 | 70·6 | 2·27 |
| Total | .......... | .......... | 1,789·4 | .......... |

(Sgd.) WILLIAM T. ELLIS,
*Observer.*

## SPECIAL EXPERIMENTS WITH FERTILIZERS.

In the annual report of the experimental farms for 1893, details were given on pages 8 to 24 of the results of a series of tests which had then been carried on for some years with the object of gaining information regarding the effects which follow the application of certain fertilizers and combinations of fertilizers on the more important farm crops. The particulars there given covered the results of six years' experience with crops of wheat and Indian corn, and five years' experience with crops of oats, barley, turnips and mangels. The results of similar tests conducted for three years with carrots and one year with sugar beets were also given.

These experiments have been continued, and a summary of the results obtained has been given each year, taking the average yield of crops from the beginning, adding the results for the current year, and then giving the average yield for the full time. These tests were undertaken on virgin soil, on a piece of land which was cleared for the purpose. For particulars regarding the clearing and preparing of the land for crop in 1887-88 and its subsequent treatment, the reader is referred to the earlier issues of this report.

### OBJECT IN VIEW IN CONDUCTING THESE EXPERIMENTS.

In establishing and conducting this series of experiments, the object in view has been to gain information as to the effects produced by certain fertilizers and combinations of fertilizers on particular crops. They were never intended to serve as model test plots such as farmers could copy with advantage in their general practice. On the contrary, to gain the information desired, it has been found necessary to use some fertilizers in unusual quantities, and in other instances to more or less exhaust the soil by a succession of crops of the same sort, practices which in ordinary farming would be extravagant or detrimental. From this long conducted series of tests much useful information has been gained, which appeals to the mind with greater force as experience accumulates from year to year.

### VALUABLE INFORMATION GAINED.

These trials have shown that barn-yard manure can be most economically used in the fresh or unrotted condition; that fresh manure is equal, ton for ton, in crop-producing power to rotted manure, which, other experiments have shown, loses during the process of rotting about 60 per cent of its weight. In view of the vast importance of making the best possible use of barn-yard manure, it is difficult to estimate the value of this one item of information.

When these experiments were planned, the opinion was very generally held that untreated mineral phosphate, if very finely ground, was a valuable fertilizer, which gradually gave up its phosphoric acid for the promotion of plant growth. Ten years' experience has shown that mineral phosphate, untreated, is of no value as a fertilizer.

The use of sulphate of iron, which at the time these tests were begun, was highly recommended, as a means of producing increased crops, has also been proven to be of very little value for this purpose.

Common salt, which has long had a reputation with many farmers for its value as a fertilizer for barley, while others disbelieved in its efficacy, has been shown to be a most valuable agent for producing an increased crop of that grain, while it is of much less use when applied to crops of spring wheat or oats. Land plaster or gypsum has also proven to be of some value as a fertilizer for barley, while of very little service for wheat or oats. Some light has also been thrown on the relative usefulness of single and combined fertilizers.

CHANGES MADE IN THE EXPERIMENTS.

After ten years' experience had demonstrated that finely-ground, untreated mineral phosphate was of no value as a fertilizer, its use was discontinued in 1898. Prior to this it had been used in each set of plots in Nos. 4, 5, 6, 7 and 8, in all the different series of plots, excepting roots. In 1898 and 1899, similar weights of the Thomas' phosphate were used in place of the mineral phosphate, excepting in plot 6 in each series. In this plot the Thomas' phosphate was used in 1898 only.

After constant cropping for ten or eleven years, it was found that the soil on those plots to which no barn-yard manure had been applied was much depleted of humus, and hence its power of holding moisture had been lessened ,and the conditions for plant growth, apart from the question of plant food, had on this account become less favourable. In 1899 the experiments were modified and an effort made to restore some proportion of the humus and at the same time gain further information as to the value of clover as a collector of plant food. In the spring of that year ten pounds of red clover seed per acre was sown with the grain on all the plots of wheat, barley and oats. The young clover plants made rapid growth, and by the middle of October there was a thick mat of foliage varying in height and density on the different plots, which was ploughed under.

In 1900, 1901, 1902, 1903 and 1904, clover was again sown on all the grain plots, and was ploughed under in October. In 1900 and 1901 a good growth of clover was obtained, but in 1902 a severe frost in the spring destroyed a large proportion of the young plants, so that the crop available for ploughing under in the autumn was very light. In 1903 and 1904 the crop of clover ploughed under in the autumn was fairly good.

APPLICATION OF FERTILIZERS DISCONTINUED.

Another direction in which information was sought was in reference to the length of time which a liberal application of barn-yard manure would continue to affect subsequent crops, and in 1899 on plots 1, 2 and 6 the barn-yard manure, which had been used for ten or eleven years in succession, was discontinued. The phosphate fertilizer was also omitted on plot 6 in each series.

In 1900 all the fertilizers on all the plots were discontinued, and since then the same crops have been grown on all these plots from year to year without fertilizers, sowing clover with the grain each season. In this way some information has been gained as to the value of clover as a collector of plant food, and also as to the unexhausted values of the different fertilizers which have been used on these plots since the experiments were begun.

SPECIAL TREATMENT OF PLOTS OF INDIAN CORN AND ROOTS.

As it was not practicable to sow clover with the Indian corn and root crops, the sowing of these latter crops was discontinued in the spring of 1900 and clover sown in their place in the proportion of 12 pounds per acre. The clover on these plots made strong growth, so strong as to necessitate twice cutting during the season, the cut clover being left on the ground in each case to decay and add to the fertility of the soil. The clover was left over for further growth in the spring of 1901, and ploughed under for the roots about May 10, and for corn about the middle of that month. Then roots and Indian corn were again sown. In 1902 crops of Indian corn and roots were grown on these plots, but in 1903 the land was again devoted to clover.

## WHEAT PLOTS.

The seed sown on each of these plots from the beginning has been in the proportion of 1½ bushels per acre, excepting in 1894; and the varieties used were as follows:—

In 1888 to 1891, White Russian, and in 1892-3, Campbell's White Chaff. In 1894, the Rio Grande wheat was used, when, owing to lack of germinating power in the seed, a larger quantity was required. From 1895 to 1904 inclusive, Red Fife wheat was used in the usual quantity of 1½ bushels per acre. In 1904 the Red Fife was sown May 6, and was ripe August 18.

## TABLE I.

### EXPERIMENTS WITH FERTILIZERS ON PLOTS OF WHEAT.

| No. of Plot. | Fertilizers applied each year from 1888 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the autumn. | Average Yield for Sixteen Years. | | | 17th Season, 1904. Variety, Red Fife. | | | Average Yield for Seventeen Years. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Yield of Grain. | | Yield of Straw. | Yield of Grain. | | Yield of Straw. | Yield of Grain. | | Yield of Straw. |
| | | Per acre. | | Per acre | Per acre. | | Per acre | Per acre. | | Per acre |
| | | Bush. | lbs. | Lbs. | Bush. | lbs. | Lbs. | Bush. | lbs. | Lbs. |
| 1 | Barn-yard manure (mixed horse and cow manure) well rotted, 12 tons per acre in 1888; 15 tons per acre each year after to 1898 inclusive. No manure has been applied since then.... .. . ... ...... | 22 | $23\frac{12}{16}$ | 4,022 | 26 | 20 | 2,750 | 22 | $37\frac{10}{17}$ | 3,947 |
| 2 | Barn-yard manure (mixed horse and cow manure) fresh, 12 tons per acre in 1888; 15 tons per acre each year after to 1898 inclusive. No manure has been applied since then.......... ............... | 22 | $38\frac{11}{16}$ | 4,053 | 26 | 10 | 2,880 | 22 | $50\frac{8}{17}$ | 3,985 |
| 3 | Unmanured from the beginning......... . | 11 | $37\frac{8}{16}$ | 1,978 | 13 | 10 | 1,290 | 11 | $42\frac{16}{17}$ | 1,937 |
| 4 | Mineral phosphate, untreated, finely ground, 500 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 a similar weight of the Thomas' phosphate was used. No fertilizers have been applied since then . . .................. .... | 12 | $4\frac{1}{16}$ | 2,107 | 17 | 40 | 1,250 | 12 | $23\frac{14}{17}$ | 2,056 |
| 5 | Mineral phosphate, untreated, finely ground, 500 lbs. nitrate of soda, 200 lbs. per acre used each year from 1888 to 1897 inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then...................... | 12 | $58\frac{7}{16}$ | 2,773 | 19 | .. | 1,190 | 13 | $19\frac{12}{17}$ | 2,680 |
| 6 | Barn-yard manure, partly rotted and actively fermenting, six tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897 inclusive. In 1898, 500 lbs. of Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then................................ | 19 | $22\frac{6}{16}$ | 3,317 | 21 | 10 | 2,510 | 19 | $28\frac{12}{17}$ | 3,270 |
| 7 | Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then..................... | 13 | $38\frac{3}{16}$ | 2,607 | 17 | 40 | 2,310 | 13 | $52\frac{7}{17}$ | 2,590 |

TABLE I.—EXPERIMENTS WITH FERTILIZERS ON PLOTS OF WHEAT—*Concluded.*

| No. of Plot. | Fertilizers applied each year from 1888 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the autumn. | Average Yield for Sixteen Years. | | | 17th Season, 1904. Variety, Red Fife. | | | Average Yield for Seventeen Years. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Yield of Grain. | | Yield of Straw. | Yield of Grain. | | Yield of Straw. | Yield of Grain. | | Yield of Straw. |
| | | Per acre. | | Per acre | Per acre. | | Per acre | Per acre. | | Per acre |
| | | Bush. | lbs. | Lbs. | Bush. | lbs. | Lbs. | Bush. | lbs. | Lbs. |
| 8 | Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then.......... | 11 | $34\frac{2}{16}$ | 2,218 | 16 | 40 | 2,390 | 11 | 50 | 2,226 |
| 9 | Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then.... .... .................. .... | 12 | $22\frac{11}{16}$ | 1,986 | 15 | 20 | 2,250 | 12 | $33\frac{2}{17}$ | 2,002 |
| 10 | Mineral superphosphate, No. 1, 350l bs.; nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then.. | 13 | $27\frac{4}{16}$ | 2,953 | 13 | 40 | 2,640 | 13 | 28 | 2,935 |
| 11 | Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897 inclusive. No fertilizers have been applied since then.......... | 14 | $24\frac{11}{16}$ | 2,900 | 14 | 10 | 2,270 | 14 | $23\frac{14}{17}$ | 2,863 |
| 12 | Unmanured from the beginning.......... | 10 | $31\frac{14}{16}$ | 1,943 | 13 | 10 | 1,400 | 10 | $41\frac{3}{17}$ | 1,911 |
| 13 | Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then.. | 12 | $42\frac{1}{16}$ | 2,103 | 14 | 20 | 1,770 | 12 | $47\frac{14}{17}$ | 2,083 |
| 14 | Bone, finely ground, 500 lbs.; wood ashes unleached, 1,500 lbs. per acre; used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then.. | 15 | $26\frac{14}{16}$ | 2,681 | 17 | .. | 1,840 | 15 | $32\frac{8}{17}$ | 2,632 |
| 15 | Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then.. | 14 | 15 | 2,496 | 16 | .. | 2,100 | 14 | $21\frac{3}{17}$ | 2,472 |
| 16 | Muriate of potash, 150 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then.. | 15 | $43\frac{15}{16}$ | 2,282 | 14 | 30 | 2,280 | 15 | $39\frac{12}{17}$ | 2,282 |
| 17 | Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then.. | 13 | $1\frac{11}{16}$ | 2,432 | 13 | 40 | 3,170 | 13 | $3\frac{12}{17}$ | 2,475 |
| 18 | Sulphate of iron, 60 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then.. | 12 | $50\frac{15}{16}$ | 2,019 | 13 | 30 | 2,030 | 12 | $53\frac{4}{17}$ | 2,020 |
| 19 | Common salt (Sodium chloride), 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then........ ....... .......... | 13 | $47\frac{7}{16}$ | 1,667 | 15 | 40 | 1,470 | 13 | $54\frac{1}{17}$ | 1,655 |
| 20 | Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then............... | 12 | $53\frac{15}{16}$ | 1,989 | 12 | 50 | 1,600 | 12 | $53\frac{14}{17}$ | 1,966 |
| 21 | Mineral superphosphate, No. 2, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been used since then ... ........................ | 13 | $16\frac{8}{16}$ | 1,984 | 12 | 30 | 1,580 | 13 | $13\frac{13}{17}$ | 1,960 |

## BARLEY PLOTS.

The quantity of seed sown per acre on the barley plots was 2 bushels in 1889 to 1891, $1\frac{1}{2}$ bushels in 1892 and 1893, and 2 bushels from 1894 to 1904, inclusive. Two-rowed barley was used for seed throughout until 1902, when Mensury, a six-rowed sort, was tried. The varieties used were as follows: 1889 to 1891, Saale; 1892, Goldthorpe; 1893, Duck-bill; and in 1894 to 1901, Canadian Thorpe, a selected form of the Duck-bill. Since 1902 Mensury has been sown. In 1904 it was sown May 6, and was harvested on July 30.

### TABLE II.

### EXPERIMENTS WITH FERTILIZERS ON PLOTS OF BARLEY.

| No. of Plot. | Fertilizers applied each year from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the autumn. | Average Yield for Fifteen Years. | | | 16th Season, 1904. Variety, Mensury. | | | Average Yield for Sixteen Years. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Yield of Grain. | | Yield of Straw. | Yield of Grain. | | Yield of Straw. | Yield of Grain. | | Yield of Straw. |
| | | Per acre. | | Per acre | Per acre. | | Per acre | Per acre. | | Per acre |
| | | Bush. | lbs. | Lbs. | Bush. | lbs. | Lbs. | Bush. | lbs. | Lbs. |
| 1 | Barn-yard manure, well rotted, 15 tons per acre each year to 1898, inclusive. No manure has been applied since then...... | 35 | $25\frac{1}{15}$ | 3,060 | 42 | 4 | 2,860 | 35 | $45\frac{3}{16}$ | 3,047 |
| 2 | Barn-yard manure, fresh, 15 tons per acre each year to 1898, inclusive. No manure has been applied since then............ | 35 | $14\frac{14}{15}$ | 3,234 | 41 | 2 | 2,660 | 35 | $32\frac{2}{16}$ | 3,198 |
| 3 | Unmanured from the beginning.......... | 14 | $28\frac{13}{15}$ | 1,537 | 16 | 42 | 1,430 | 14 | $35\frac{11}{16}$ | 1,530 |
| 4 | Mineral phosphate, untreated, finely ground, 500 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899 a similar weight of the Thomas' phosphate was used. No fertilizers have been applied since then.......................... | 15 | $44\frac{8}{15}$ | 1,510 | 17 | 44 | 1,660 | 16 | $2\frac{8}{16}$ | 1,519 |
| 5 | Mineral phosphate, untreated, finely ground, 500 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then............. | 21 | $10\frac{3}{15}$ | 2,219 | 22 | 14 | 1,800 | 21 | $13\frac{6}{16}$ | 2,193 |
| 6 | Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897, inclusive. In 1898 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then.......................... | 28 | $26\frac{2}{15}$ | 2,396 | 37 | 4 | 2,720 | 29 | $3\frac{13}{16}$ | 2,416 |
| 7 | Mineral phosphate, untreated, finely ground, 500 lbs. nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then .................... | 26 | $12\frac{11}{15}$ | 2,377 | 35 | 10 | 2,760 | 26 | $39\frac{11}{16}$ | 2,401 |

TABLE II.—EXPERIMENTS WITH FERTILIZERS ON PLOTS OF BARLEY—*Concluded.*

| No. of Plot. | Fertilizers applied each year from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the autumn. | Average Yield for Fifteen Years. | | | 16th Season, 1904. Variety, Mensury. | | | Average Yield for Sixteen Years. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Yield of Grain. | | Yield of Straw. | Yield of Grain. | | Yield of Straw. | Yield of Grain. | | Yield of Straw. |
| | | Per acre. | | Per acre | Per acre. | | Per acre | Per acre. | | Per acre |
| | | Bush. | lbs. | Lbs. | Bush. | lbs. | Lbs. | Bush. | lbs. | Lbs. |
| 8 | Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then.. ...... | 21 | 37 | 1,835 | 35 | 30 | 2,070 | 22 | $30\frac{9}{16}$ | 1,850 |
| 9 | Mineral superphosphate, No. 1, 500 lbs. per acre used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then .................... | 21 | $26\frac{5}{15}$ | 1,729 | 28 | 46 | 1,280 | 22 | $0\frac{9}{16}$ | 1,701 |
| 10 | Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then................................ | 28 | 4 | 2,359 | 25 | 40 | 1,770 | 27 | $45\frac{4}{16}$ | 2,322 |
| 11 | Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then.. | 27 | $1\frac{5}{15}$ | 2,481 | 32 | 14 | 2,170 | 27 | $17\frac{2}{16}$ | 2,462 |
| 12 | Unmanured from the beginning......... .. | 14 | $12\frac{5}{15}$ | 1,228 | 17 | 24 | 1,420 | 14 | $22\frac{1}{16}$ | 1,240 |
| 13 | Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then.. | 15 | 15 | 1,421 | 21 | 22 | 1,560 | 15 | $33\frac{7}{16}$ | 1,430 |
| 14 | Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then.. | 24 | $1\frac{5}{15}$ | 2,089 | 27 | 34 | 2,630 | 24 | $12\frac{6}{16}$ | 2,123 |
| 15 | Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then.. | 22 | $7\frac{10}{15}$ | 2,270 | 19 | 8 | 1,530 | 21 | $46\frac{11}{16}$ | 2,224 |
| 16 | Muriate of potash, 150 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then. | 22 | $40\frac{10}{15}$ | 1,859 | 23 | 36 | 1,430 | 22 | $43\frac{11}{16}$ | 1,832 |
| 17 | Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then.. | 19 | $16\frac{7}{15}$ | 1,933 | 19 | 38 | 1,450 | 19 | $17\frac{13}{16}$ | 1,903 |
| 18 | Sulphate of iron, 60 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then.. | 18 | $44\frac{10}{15}$ | 1,656 | 20 | .. | 1,290 | 18 | $47\frac{14}{16}$ | 1,633 |
| 19 | Common salt (Sodium chloride) 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then.......... .. ......... ... | 27 | 19 | 1,892 | 23 | 26 | 1,510 | 27 | $7\frac{7}{16}$ | 1,868 |
| 20 | Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then...... .... | 20 | 24 | 1,591 | 22 | 34 | 1,780 | 20 | $30\frac{10}{16}$ | 1,603 |
| 21 | Mineral superphosphate, No. 2, 500 lbs. per acre, used each year from 1889 to 1899, inclusive. No fertilizers have been applied since then.... ... .............. | 21 | $9\frac{9}{15}$ | 1,770 | 24 | 18 | 1,580 | 21 | $19\frac{2}{16}$ | 1,758 |

## OAT PLOTS.

The quantity of seed sown per acre on the oat plots was 2 bushels in 1889 and 1890; 1½ bushels in 1891 to 1893, and 2 bushels from 1894 to 1904, inclusive. The varieties used were as follows: In 1889, Early English; in 1890 to 1893, Prize Cluster; and from 1894 to 1904, inclusive, the Banner. In 1904 Banner was sown April 22 and the plots were harvested August 17.

TABLE III.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF OATS.

| No. of Plot. | Fertilizers applied each year from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the autumn. | Average Yield for Fifteen Years. Yield of Grain. Per acre. | | Average Yield for Fifteen Years. Yield of Straw. Per acre | 16th Season, 1904. Variety, Banner. Yield of Grain. Per acre. | | 16th Season, 1904. Variety, Banner. Yield of Straw. Per acre | Average Yield for Sixteen Years. Yield of Grain. Per acre. | | Average Yield for Sixteen Years. Yield of Straw. Per acre |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Bush. | lbs. | Lbs. | Bush. | lbs, | Lbs. | Bush. | lbs. | Lbs. |
| 1 | Barn-yard manure, well rotted, 15 tons per acre each year to 1898, inclusive. No manure has been applied since then....... | 51 | 11$\frac{9}{15}$ | 3,226 | 57 | 12 | 3,040 | 51 | 24$\frac{7}{16}$ | 3,214 |
| 2 | Barn-yard manure, fresh, 15 tons per acre each year to 1898, inclusive. No manure has been applied since then.......... .. | 55 | 17$\frac{5}{15}$ | 3,368 | 58 | 18 | 3,110 | 55 | 23$\frac{13}{16}$ | 3,352 |
| 3 | Unmanured from the beginning..... .... | 34 | 11$\frac{10}{15}$ | 1,715 | 42 | 12 | 2,660 | 34 | 28$\frac{1}{16}$ | 1,774 |
| 4 | Mineral phosphate, untreated, finely ground, 500 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 a similar weight of the Thomas' phosphate was used. No. fertilizers have been applied since then ..................... | 34 | 26$\frac{14}{15}$ | 1,844 | 51 | 6 | 26 10 | 35 | 27$\frac{10}{16}$ | 1,892 |
| 5 | Mineral phosphate, untreated, finely ground, 500 lbs. nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then...... .... | 48 | 25$\frac{1}{15}$ | 2,661 | 58 | 28 | 2,450 | 49 | 12$\frac{12}{16}$ | 2,648 |
| 6 | Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897, inclusive. In 1898 500 lbs. of Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then.. | 48 | 5$\frac{5}{15}$ | 2,738 | 60 | 30 | 2,850 | 48 | 32$\frac{6}{16}$ | 2,745 |
| 7 | Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then.... ............ ... | 49 | 4$\frac{3}{15}$ | 3,143 | 53 | 18 | 2,800 | 49 | 13$\frac{14}{16}$ | 3,121 |
| 8 | Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then.. ......... | 43 | 22$\frac{5}{15}$ | 2,498 | 58 | 18 | 2,900 | 44 | 19$\frac{15}{16}$ | 2,523 |
| 9 | Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been used since then.. .... ...... .......... .... | 38 | 5$\frac{10}{15}$ | 1,976 | 50 | 10 | 2,340 | 38 | 31$\frac{7}{16}$ | 1,999 |

## EXPERIMENTS WITH FERTILIZERS ON PLOTS OF OATS—*Continued.*

| No. of Plot. | Fertilizers applied each year, from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the autumn. | Average Yield for Fifteen Years. | | | 16th Season, 1904. Variety, Banner. | | | Average Yield for Sixteen Years. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Yield of Grain. | | Yield of Straw. | Yield of Grain. | | Yield of Straw. | Yield of Grain. | | Yield of Straw. |
| | | Per acre. | | Per acre | Per acre. | | Per acre | Per acre. | | Per acre |
| | | Bush. | lbs. | Lbs. | Bush. | lbs. | Lbs. | Bush. | lbs. | Lbs. |
| 10 | Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then.................. | 46 | 32 | 2,680 | 54 | 24 | 2,130 | 47 | $14\frac{5}{16}$ | 2,645 |
| 11 | Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897, inclusive. No fertilizers have been applied since then...... | 39 | ..$\frac{2}{15}$ | 2,427 | 37 | 32 | 2,650 | 38 | $31\frac{14}{16}$ | 2,441 |
| 12 | Unmanured from the beginning .......... | 23 | $28\frac{5}{15}$ | 1,426 | 25 | .. | 1,540 | 23 | $30\frac{13}{16}$ | 1,433 |
| 13 | Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then.. | 34 | $28\frac{5}{15}$ | 2,023 | 46 | 26 | 1,730 | 35 | $19\frac{11}{16}$ | 2,005 |
| 14 | Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then.. | 41 | $18\frac{12}{15}$ | 2,297 | 50 | 20 | 2,350 | 41 | $3\frac{14}{16}$ | 2,300 |
| 15 | Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then.. | 47 | 6 | 2,746 | 43 | 28 | 2,480 | 46 | $32\frac{14}{16}$ | 2,729 |
| 16 | Muriate of potash, 150 lbs. per acre, used each year from 1898 to 1899 inclusive. No fertilizers have been applied since then.. | 39 | $5\frac{10}{15}$ | 2,218 | 54 | 24 | 2,210 | 40 | $4\frac{11}{16}$ | 2,217 |
| 17 | Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then.. | 45 | $13\frac{5}{15}$ | 2,794 | 54 | 4 | 2,340 | 45 | $32\frac{1}{16}$ | 2,766 |
| 18 | Sulphate of iron, 60 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then.. | 39 | —$\frac{11}{15}$ | 1,985 | 47 | 32 | 2,630 | 39 | $13\frac{11}{16}$ | 2,025 |
| 19 | Common salt (Sodium chloride), 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then................................ | 38 | 15 | 1,929 | 53 | 28 | 2,690 | 39 | $13\frac{11}{16}$ | 1,976 |
| 20 | Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then............ | 34 | 32 | 1,966 | 46 | 26 | 2,610 | 35 | $23\frac{2}{16}$ | 2,060 |
| 21 | Mineral superphosphate, No. 2, 500 lbs per acre, used each year from 1889 to 1899, inclusive. No fertilizers have been applied since then. | 35 | 17 | 1,859 | 51 | 26 | 2,580 | 36 | $17\frac{9}{16}$ | 1,904 |

The one-tenth acre plots of wheat, barley and oats had by the end of 1903 become infested with several troublesome perennial weeds, hence it was thought best to sow only one-half of each plot with grain in 1904, devoting the other half to a hoed crop to clean it. On this account no clover was sown on any of the cereal plots in 1904, and one-half of the wheat plots was sown with mangels, one-half of the barley plots with potatoes, and one-half of the oat plots with carrots, computing the yields of grain from a one-twentieth acre plot in each case.

## INDIAN CORN PLOTS.

The experiments with the plots of Indian corn have been conducted with the object of obtaining the largest weight of well matured green fodder for the silo, and to have the corn so far advanced when cut, that the ears shall be as far as is practicable in the late milk or glazed condition. Each plot has been divided from the outset into two equal parts, on one of which—known as No. 1—one of the stronger growing and somewhat later ripening sorts has been tried, and on the other, marked No. 2, one of the earlier maturing varieties. During the first four years one of the Dent varieties was tested under No. 1. The Mammoth Southern Sweet was tried in 1888 to 1890. In 1891 the Red Cob Ensilage was used, and in 1892 to 1902 the Rural Thoroughbred White Flint was tested. On the other half of the plot (No. 2) the Canada Yellow Flint was used in 1888 to 1890, the Thoroughbred White Flint in 1891, Pearce's Prolific in 1892 to 1894, and the Mammoth Eight-Rowed Flint in 1895 to 1902. For the first four years the No. 1 series was planted in drills 3 feet apart, using about 24 pounds of seed to the acre and thinning the plants, when up, to 6 or 8 inches, and the No. 2 in hills 3 feet apart each way with 4 or 5 kernels in a hill. During the past seven years both sorts have been grown in hills.

In 1900 no crop of Indian corn was grown on these plots, but clover was sown in its place on May 5 in the proportion of 12 pounds per acre. This made a strong growth, was cut twice during the season and left on the ground to decay, so that when ploughed under, the land might get the full benefit of the clover crop. The clover was allowed to remain growing until May 20, 1901. It was then ploughed under about 6 inches deep, and harrowed well before the corn was planted. Clover was sown again in 1903, and ploughed under in May, 1904. The corn was planted in 1904, on June 6, and cut for ensilage September 26.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF INDIAN CORN, CUT GREEN FOR ENSILAGE.

| No. of Plot. | Fertilizers applied each year from 1888 to 1898 or 1899. No fertilizers used since. Clover sown in 1900 in place of the corn and ploughed under in May, 1901, before the corn was planted. In 1903 clover was again sown and ploughed under in May, 1904. | Average Yield for Fourteen Years. Plot No. 1—weight of green fodder. Per acre. Tons. | lbs. | Average Yield for Fourteen Years. Plot No. 2—weight of green fodder. Per acre. Tons | lbs | 15th Season, 1904. Plot No. 1—Selected Leaming, weight of green fodder. Per acre. Tons | lbs. | 15th Season, 1904. Plot No. 2—Angel of Midnight, weight of green fodder. Per acre. Tons | lbs | Average Yield for Fifteen Years. Plot No. 1—weight of green fodder. Per acre. Tons | lbs. | Average Yield for Fifteen Years. Plot No. 2—weight of green fodder. Per acre. Tons | lbs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Barn-yard manure (mixed horse and cow manure) well rotted, 12 tons per acre, each year from 1888 to 1898 inclusive. No manure has been applied since then.. | 16 | 757 | 13 | 167 | 16 | 1,460 | 14 | 640 | 16 | 804 | 13 | 332 |
| 2 | Barn-yard manure (mixed horse and cow manure) fresh, 12 tons per acre each year from 1888 to 1898 inclusive. No manure has been applied since then............ | 16 | 627 | 11 | 941 | 16 | 130 | 13 | 240 | 16 | 594 | 11 | 1,161 |
| 3 | Unmanured from the beginning.......... | 7 | 28 | 5 | 209 | 9 | 1,600 | 9 | 1,470 | 7 | 399 | 5 | 826 |
| 4 | Mineral phosphate, untreated, finely ground, 800 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 a similar weight of the Thomas' phosphate was used. No fertilizers have been applied since then..................... | 7 | 1,749 | 4 | 1,844 | 13 | 540 | 13 | 40 | 8 | 463 | 5 | 924 |

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF INDIAN CORN—*Continued.*

| No. of Plot. | Fertilizers applied each year, from 1888 to 1898 or 1899. No fertilizers used since. Clover sown in 1900 in place of the corn and ploughed under in May, 1901, before the corn was planted. In 1903 clover was again sown and ploughed under in May, 1904. | Average Yield for Fourteen Years. | | | | 15th Season, 1904. | | | | Average Yield for Fifteen Years. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ⅟₁₀ Plot No. 1—weight of green fodder. | | ⅟₁₀ Plot No. 2—weight of green fodder. | | ⅟₁₀ Plot No. 1—Selected Leaming, weight of green fodder. | | ⅟₁₀ Plot No. 2—Angel of Midnight, weight of green fodder. | | ⅟₁₀ Plot No. 1—weight of green fodder. | | ⅟₁₀ Plot No. 2—weight of green fodder. | |
| | | Per acre. | | Per acre | | Per acre. | | Per acre | | Per acre. | | Per acre | |
| | | Tons. | lbs. | Tons. | lbs | Tons. | lbs. | Tons. | lbs | Tons. | lbs. | Ton | lbs |
| 5 | Mineral phosphate, untreated, finely ground, 800 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899, 800 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then.................. | 11 | 703 | 8 | 1,874 | 15 | 1,820 | 14 | 440 | 11 | 1,311 | 9 | 578 |
| 6 | Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897 inclusive. In 1898 500 lbs. of Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then.. | 16 | 493 | 11 | 1,861 | 16 | 190 | 15 | 260 | 16 | 473 | 12 | 288 |
| 7 | Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then........................ | 15 | 499 | 11 | 355 | 14 | 1,750 | 13 | 930 | 15 | 449 | 11 | 660 |
| 8 | Mineral phosphate, untreated, finely ground, 500 lbs., wood ashes, unleached, 1,500 lbs., per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then........... | 12 | 150 | 9 | 637 | 15 | 360 | 14 | 460 | 12 | 564 | 9 | 1,292 |
| 9 | Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then.............................. | 11 | 483 | 8 | 1,315 | 13 | 600 | 11 | 350 | 11 | 757 | 8 | 1,651 |
| 10 | Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then.. | 13 | 1,105 | 10 | 1,034 | 13 | 430 | 12 | 40 | 13 | 1,060 | 10 | 1,234 |
| 11 | Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then.. | 16 | 526 | 12 | 613 | 16 | 620 | 15 | 520 | 16 | 532 | 12 | 1,007 |
| 12 | Unmanured from the beginning......... | 10 | 1,970 | 8 | 1,979 | 12 | 160 | 11 | 1,430 | 11 | 116 | 9 | 342 |
| 13 | Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then.. | 12 | 371 | 9 | 784 | 13 | 880 | 12 | 1,110 | 12 | 538 | 9 | 1,206 |
| 14 | Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then.. | 12 | 1,690 | 9 | 1,755 | 14 | 1,150 | 13 | 580 | 12 | 1,921 | 10 | 210 |
| 15 | Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then.. | 12 | 1,317 | 9 | 1,406 | 11 | 50 | 10 | 530 | 12 | 1,099 | 9 | 1,481 |
| 16 | Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then.. | 13 | 317 | 10 | 178 | 12 | 740 | 11 | 1,320 | 13 | 212 | 10 | 254 |

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF INDIAN CORN—*Concluded.*

| No. of Plot. | Fertilizers applied each year from 1888 to 1898 or 1899, No fertilizers used since. Clover sown in 1900 in place of the corn and ploughed under in May, 1901, before the corn was planted. In 1903 clover was again sown and ploughed under in May, 1904. | Average Yield for Fourteen Years. | | | | 15th Season, 1904. | | | | Average Yield for Fifteen Years. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Plot No. 1—½ weight of green fodder. | | Plot No. 2—½ weight of green fodder. | | Plot No. 1—½ Selected Leaming, weight of green fodder. | | Plot No. 2—½ Angel of Midnight, weight of green fodder. | | Plot No. 1—½ weight of green fodder. | | Plot No. 2—½ weight of green fodder. | |
| | | Per acre. | | Per acre | | Per acre. | | Per acre | | Per acre. | | Per acre | |
| | | Tons. | lbs. | Tons | lbs | Tons. | lbs. | Tons | lbs | Tons. | lbs. | Tons | lbs |
| 17 | Mineral superphosphate, No. 1, 600 lbs.; muriate of potash 200 lbs.; sulphate of ammonia, 150 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then.. | 13 | 1,069 | 9 | 1,927 | 14 | 270 | 12 | 1,610 | 13 | 1,149 | 10 | 306 |
| 18 | Muriate of potash, 300 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then.. | 9 | 1,836 | 7 | 211 | 13 | 120 | 12 | 1,440 | 10 | 255 | 7 | 960 |
| 19 | Double sulphate of potash and magnesia, 300 lbs. per acre in 1889 and '90; (muriate of potash 200 lbs., substituted, each year since); dried blood, 300 lbs.; mineral superphosphate, No. 1. 500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then.. | 12 | 569 | 8 | 1,689 | 13 | 1,510 | 13 | 810 | 12 | 765 | 9 | 297 |
| 20 | Wood ashes, unleached, 1.900 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then. | 10 | 1,739 | 8 | 356 | 14 | 1,510 | 13 | 1,800 | 11 | 257 | 8 | 1,119 |
| 21 | Bone, finely ground, 500 lbs.; sulphate of ammonia, 200 lbs.; muriate of potash, 200 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then........... | 12 | 1,347 | 7 | 1,207 | 12 | 1,950 | 12 | 70 | 12 | 1,387 | 7 | 1,797 |

## PLOTS OF MANGELS AND TURNIPS.

In conducting these experiments, the roots only have been taken from the land, the tops have always been cut off and left on the ground to be ploughed under, so that the plant food they have taken from the soil may be returned to it. One-half of each one-tenth acre plot in the series has been devoted to the growth of mangels, and the other half to turnips, and these crops have been alternated from year to year. The preparation of the land has been the same for both these roots. Until 1900 it was ploughed in the autumn after the crop was gathered, gang-ploughed deeply in the spring after the barn-yard manure had been spread on plots 1, 2 and 6, and after gang-ploughing, the other fertilizers were spread by scattering them evenly over the surface, after which it was all harrowed with the smoothing harrow, then made in ridges 2 feet apart, rolled and sown.

In 1889, the variety of mangel used was the Mammoth Long Red. In 1890, three varieties were sown on each plot. In 1891, each plot again had three varieties, and from 1892 to 1902 one variety only was used, namely, the Mammoth Long Red. About 4 pounds of seed were sown per acre each year.

Two varieties of turnips were sown on the half plots devoted to these roots in 1889, and in 1890, a single variety, Carter's Elephant Swede. In 1891, six varieties were sown. In 1892, the Improved Purple Top Swede only was sown, in 1893 and 1894, the Prize Purple Top Swede, in 1895, the Imperial Swede, and from 1896 to 1902, the Prize Purple Top Swede. The land used for the turnips, which are usually sown later than the mangels, was prepared in the same manner as for the mangels. It was then allowed to stand until the day before sowing, when it was gang-ploughed shallow or cultivated to kill weeds and loosen the soil, ridged, rolled and sown. About 3 pounds of seed were sown per acre.

In 1900 and 1903, no crops of mangels and turnips were grown, but clover was sown in their place in May in the proportion of 12 pounds per acre. This made a strong growth and was cut twice each year during the season, and left on the ground to decay, so that when ploughed under, the land might get the full benefit of the clover crop. The clover was allowed to remain growing until near the middle of May, by which time it had made a very heavy growth. It was then ploughed under about 6 inches deep and harrowed well, then made up into ridges 2 feet apart. These were rolled with a hand roller, which flattened the ridges considerably and made a firm, even seed bed. The crops of clover and roots are alternated in this way, for the purpose of supplying humus and also of gaining information as to the fertilizing effect of green clover ploughed under on land to be used for growing roots.

In 1904, the mangels were sown on May 12, and pulled on October 14; the turnips were sown May 12, and pulled October 14. The yield per acre has been calculated in each case from the weight of roots gathered from two rows, each 66 feet long.

## EXPERIMENTS WITH FERTILIZERS ON PLOTS OF MANGELS AND TURNIPS.

| No. of Plot. | Fertilizers applied each year from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1900 in place of the roots and ploughed under in May, 1901, before the roots were sown. In 1903 clover was again sown and ploughed under in May, 1904. | Average Yield for Thirteen Years. Mangels, Weight of Roots. Per Acre. Tons. | lbs. | Average Yield for Thirteen Years. Turnips, Weight of Roots. Per Acre. Tons. | lbs. | 14th Season, 1904. Varieties. West Half Plot. Mangels, Mammoth Long Red: Weight of Roots. Per Acre. Tons. | lbs. | 14th Season, 1904. Varieties. East Half Plot. Turnips, Purple Top Swede: Weight of Roots. Per Acre. Tons. | lbs. | Average Yield for Fourteen Years. Mangels, Weight of Roots. Per Acre. Tons. | lbs. | Average Yield for Fourteen Years. Turnips, Weight of Roots. Per Acre. Tons. | lbs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Barn-yard manure (mixed horse and cow manure) well rotted, 20 tons per acre each year from 1889 to 1898 inclusive. No manure has been applied since then.......... | 22 | 1,267 | 15 | 1,327 | 12 | 1,830 | 23 | 1,400 | 21 | 1,879 | 16 | 475 |
| 2 | Barn-yard manure (mixed horse and cow manure) fresh, 20 tons per acre each year from 1889 to 1898 inclusive. No manure has been applied since then.... .......... | 21 | 792 | 15 | 1,522 | 12 | 1,200 | 23 | 200 | 20 | 1,535 | 16 | 570 |
| 3 | Unmanured from the beginning..... | 9 | 122 | 7 | 864 | 8 | 1,230 | 13 | 140 | 9 | 58 | 7 | 1,669 |
| 4 | Mineral phosphate, untreated, finely ground, 1,000 lbs. per acre, used each year from 1889 to 1897, inclusive. In 1898 and 1899 a similar weight of the Thomas' phosphate was used. No fertilizers have been applied since then............... | 8 | 1,577 | 7 | 1,908 | 9 | 1,840 | 17 | 1,490 | 8 | 1,739 | 8 | 1,307 |
| 5 | Mineral phosphate, untreated, finely ground, 1,000 lbs., nitrate of soda, 250 lbs. wood ashes, unleached, 1,000 lbs. per acre, used each year from 1889 to 1897 inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then. | 14 | 1,403 | 9 | 1,948 | 11 | 1,250 | 18 | 70 | 14 | 963 | 10 | 1,099 |
| 6 | Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 1,000 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1889 to 1897 inclusive. In 1898 1,000 lbs. of Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then.. | 18 | 53 | 12 | 1,949 | 12 | 1,760 | 18 | 1,230 | 17 | 1,318 | 13 | 755 |
| 7 | Mineral phosphate, untreated, finely ground, 1,000 lbs.; sulphate of potash, 200 lbs. in 1889 and 1890 (substituted by muriate of potash, 250 lbs. in 1891 and subsequent years); nitrate of soda, 200 lbs. per acre, used each year from 1889 to 1897 inclusive. In 1898 and 1899 1,000 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then ......... | 11 | 1,252 | 9 | 1,030 | 10 | 1,950 | 14 | 340 | 11 | 1,162 | 9 | 1,695 |
| 8 | Mineral superphosphate, No. 1, 500 lbs.; sulphate of potash, 200 lbs. in 1889 and 1890 (substituted by muriate of potash, 250 lbs. in 1891 and subsequent years); nitrate of soda, 200 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then ........................... | 14 | 159 | 11 | 1,618 | 10 | 1,590 | 14 | 820 | 13 | 1,690 | 11 | 1,990 |

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF MANGELS AND TURNIPS—*Concluded.*

| No. of Plot. | Fertilizers applied each year from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1900 in place of the roots and ploughed under in May, 1901, before the roots were sown. In 1903 clover was again sown and ploughed under in May, 1904. | Average Yield for Thirteen Years. | | | | 14th Season, 1904, Varieties. | | | | Average Yield for Fourteen Years. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mangels, Weight of Roots. | | Turnips, Weight of Roots. | | West Half Plot. Mangels, Mammoth Long Red: Weight of Roots. | | East Half Plot. Turnips, PurpleTop Swede: Weight of Roots. | | Mangels, Weight of Roots. | | Turnips, Weight of Roots. | |
| | | Per Acre. | | Per Acre. | | Per Acre. | | Per Acre. | | Per Acre. | | Per Acre. | |
| | | Tons. | lbs. | Tons. | lbs. | Tons. | lbs. | Tons. | lbs. | Tons. | lbs. | Tons. | lbs. |
| 9 | Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then.. | 9 | 1,306 | 9 | 339 | 10 | 1,240 | 18 | 1,410 | 9 | 1,444 | 9 | 1,701 |
| 10 | Nitrate of soda, 300 lbs. per acre, used each year from 1889 to 1899, inclusive. No fertilizers have been applied since then............... | 14 | 823 | 9 | 918 | 10 | 1,420 | 14 | 990 | 14 | 294 | 9 | 1,637 |
| 11 | Sulphate of ammonia, 300 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then. ..... .... | 12 | 743 | 10 | 1,795 | 10 | 1,750 | 13 | 880 | 12 | 529 | 11 | 158 |
| 12 | Unmanured from the beginning..... | 7 | 894 | 7 | 645 | 7 | 1,910 | 12 | 1,320 | 7 | 966 | 7 | 1,407 |
| 13 | Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,000 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then..... ..... | 12 | 842 | 8 | 1,891 | 9 | 50 | 14 | 220 | 12 | 356 | 9 | 628 |
| 14 | Wood ashes, unleached, 2,000 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then.......... | 11 | 76 | 8 | 317 | 12 | 740 | 16 | 1,200 | 11 | 266 | 8 | 1,523 |
| 15 | Common salt (Sodium chloride), 400 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then.. | 9 | 1,422 | 7 | 825 | 12 | 910 | 16 | 530 | 9 | 1,814 | 8 | 896 |
| 16 | Mineral superphosphate, No. 1, 500 lbs.; nitrate of soda, 200 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then.......... | 13 | 160 | 10 | 1,896 | 10 | 1,140 | 17 | 1,070 | 12 | 1,801 | 11 | 837 |
| 17 | Mineral superphosphate, No. 1, 350 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then.. | 13 | 1,179 | 10 | 694 | 10 | 970 | 21 | 1,200 | 13 | 735 | 11 | 301 |
| 18 | Mineral superphosphate, No. 1, 500 lbs.; muriate of potash, 200 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then.......... | 12 | 1,988 | 11 | 285 | 11 | 820 | 19 | 810 | 12 | 1,762 | 11 | 1,465 |
| 19 | Double sulphate of potash and magnesia, 300 lbs. per acre in 1889 and 1890 (muriate of potash, 200 lbs., substituted each year since); dried blood, 250 lbs.; mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then........ ....... | 14 | 820 | 12 | 503 | 11 | 1,750 | 18 | 990 | 14 | 458 | 12 | 1,395 |
| 20 | Wood ashes, unleached, 1,500 lbs.; common salt (Sodium chloride), 300 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then.. | 15 | 324 | 10 | 1,562 | 12 | 690 | 20 | 30 | 14 | 1,922 | 11 | 881 |
| 21 | Mineral superphosphate, No. 2, 500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then.. | 15 | 48 | 11 | 309 | 12 | 1,530 | 19 | 1,610 | 14 | 1,725 | 11 | 1,544 |

The results had in 1904 in crops from the plots under these experiments show still further the benefits arising from the ploughing under of clover.

## EFFECTS OF FERTILIZERS ON OATS, CLOVER AND BROME GRASS.

In continuation of the report made last year on the 'Effects of Fertilizers on Wheat, Oats, Clover and Brome Grass,' the following tables are submitted. A part of the wheat plots were unfortunately so injured as to make the comparisons in that series of no value, hence no reference is made to the wheat plots. Fertilizers were applied in the proportions stated to the different series of plots in 1900, 1902 and 1904.

### RESULTS OF THE APPLICATION OF FERTILIZERS TO OATS.

Sown, May 9; Ripe, August 10, 1904.

| No. of Plot. | TABLE I. Name of variety, Improved Ligowo. | Yield of Grain per Acre. | | Yield of Straw per Acre. |
|---|---|---|---|---|
| | | Bush. | Lbs. | Lbs. |
| 1 | Superphosphate, 400 lbs. per acre | 70 | 20 | 3,160 |
| 2 | Thomas' phosphate, 400 lbs. per acre | 70 | 20 | 4,240 |
| 3 | Thomas' phosphate, 800 lbs. per acre | 82 | 12 | 2,920 |
| 4 | Check | 56 | 16 | 2,480 |
| 5 | Thomas' phosphate, 400 lbs., kainit, 200 lbs. per acre | 52 | 32 | 1,960 |
| 6 | Superphosphate, 400 lbs., kainit, 200 lbs. per acre | 51 | 26 | 3,200 |
| 7 | Check | 60 | — | 1,960 |
| 8 | Thomas' phosphate, 400 lbs., kainit, 200 lbs., nitrate soda, 100 lbs. p. acre | 81 | 26 | 4,180 |
| 9 | Superphosphate, 400 lbs., kainit, 200 lbs., nitrate soda, 100 lbs. per acre | 83 | 18 | 4,360 |
| 10 | Barnyard manure, mixed horse and cow, fresh, 12 tons per acre | 61 | 6 | 3,960 |
| 11 | Barnyard manure, mixed horse and cow, well rotted, 12 tons per acre | 80 | — | 4,320 |
| 12 | Check | 76 | 16 | 4,040 |
| 13 | Fresh slacked lime, 1,000 lbs. per acre | 71 | 26 | 4,600 |
| 14 | Nitrate soda, 100 lbs. per acre | 80 | — | 5,120 |
| 15 | Check | 62 | 12 | 3,920 |
| 16 | Nitrate soda, 200 lbs. per acre | 70 | 20 | 5,600 |

### RESULTS OF THE APPLICATION OF FERTILIZERS TO CLOVER.

First cutting, June 23; second, August 29, 1904.

| No. of Plot. | TABLE II. Fertilizers used. | YIELD PER ACRE. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1st Cutting. | | | | 2nd Cutting. | | | |
| | | Green. | | Cured. | | Green. | | Cured. | |
| | | Tons. | Lbs. | Tons. | Lbs. | Tons. | Lbs. | Tons. | Lbs. |
| 1 | Superphosphate, 400 lbs. per acre | 8 | 1,200 | 2 | 600 | 3 | 480 | 1 | 1,120 |
| 2 | Thomas' phosphate, 400 lbs. per acre | 9 | 920 | 3 | 80 | 3 | — | 1 | 1,200 |
| 3 | Thomas' phosphate, 800 lbs. per acre | 7 | 1,640 | 2 | 360 | 2 | 1,680 | 1 | 960 |
| 4 | Check | 7 | 80 | 2 | 260 | 3 | 360 | 1 | 1,220 |
| 5 | Thomas' phosphate, 400 lbs., kainit, 200 lbs. per acre | 8 | 1,040 | 2 | 960 | 3 | 1,680 | 1 | 1,600 |
| 6 | Superphosphate, 400 lbs., kainit, 200 lbs. per acre | 9 | 840 | 2 | 1,280 | 2 | 1,360 | 1 | 920 |
| 7 | Check | 8 | 1,440 | 2 | 800 | 2 | 1,280 | 1 | 880 |
| 8 | Thomas' phosphate, 400 lbs., kainit, 200 lbs., nitrate soda, 100 lbs. per acre | 8 | 1,320 | 2 | 720 | 2 | 1,200 | 1 | 400 |
| 9 | Superphosphate, 400 lbs., kainit, 200 lbs., nitrate soda, 100 lbs. per acre | 8 | 1,560 | 1 | 1,920 | 2 | 480 | 1 | 120 |
| 10 | Barnyard manure, mixed horse and cow, fresh, 12 tons per acre | 6 | 160 | 1 | 1,120 | 3 | 880 | 1 | 720 |
| 11 | Barnyard manure, mixed horse and cow, well rotted, 12 tons per acre | 7 | 120 | 1 | 1,960 | 2 | 1,280 | 1 | 400 |
| 12 | Check | 7 | 920 | 1 | 1,520 | 3 | 720 | 1 | 920 |
| 13 | Fresh slacked lime, 1,000 lbs. per acre | 6 | 400 | 1 | 1,360 | 2 | 400 | 1 | — |
| 14 | Nitrate soda, 100 lbs. per acre | 6 | 720 | 1 | 1,760 | 2 | 800 | 1 | — |
| 15 | Check | 5 | 1,240 | 1 | 1,080 | 3 | 400 | 1 | 1,520 |
| 16 | Nitrate soda, 200 lbs. per acre | 7 | 480 | 1 | 1,560 | 4 | 400 | 1 | 1,040 |

RESULTS OF THE APPLICATION OF FERTILIZERS TO AWNLESS BROME GRASS.

Crop Cut June 27, 1904.

| No. of Plot. | TABLE III. Fertilizers used. | Height of Brome Grass | Yield per Acre. Green. | | Cured. | |
|---|---|---|---|---|---|---|
| | | Inches. | Tons. | Lbs. | Tons. | Lbs. |
| 1 | Superphosphate, 400 lbs. per acre | 44—48 | 9 | 320 | 4 | 1,040 |
| 2 | Thomas' phosphate, 400 lbs. per acre | 44—48 | 7 | 480 | 4 | — |
| 3 | Thomas' phosphate, 800 lbs. per acre | 44—48 | 7 | 1,400 | 3 | — |
| 4 | Check | 44—48 | 5 | 800 | 2 | 440 |
| 5 | Thomas' phosphate, 400 lbs.; kainit, 200 lbs. per acre | 45—50 | 5 | 1,600 | 2 | 800 |
| 6 | Superphosphate, 400 lbs.; kainit, 200 lbs. per acre | 45—50 | 7 | — | 2 | 1,800 |
| 7 | Check | 44—48 | 5 | 1,760 | 2 | 1,480 |
| 8 | Thomas' phosphate, 400 lbs.; kainit, 200 lbs.; nitrate soda, 100 lbs. per acre | 45—50 | 4 | 240 | 2 | 1,800 |
| 9 | Superphosphate, 400 lbs.; kainit, 200 lbs.; nitrate soda, 100 lbs. per acre | 45—50 | 9 | 80 | 3 | 1,920 |
| 10 | Barn-yard manure, mixed horse and cow, fresh, 12 tons per acre | 45—50 | 7 | 560 | 3 | 560 |
| 11 | Barn-yard manure, mixed horse and cow, well rotted, 12 tons per acre | 45—50 | 6 | — | 2 | 840 |
| 12 | Check | 44—48 | 5 | 880 | 2 | 560 |
| 13 | Fresh slacked lime, 1,000 lbs. per acre | 44—48 | 3 | 1,800 | 1 | 1,760 |
| 14 | Nitrate soda, 100 lbs. per acre | 45—50 | 7 | 40 | 3 | 240 |
| 15 | Check | 45—50 | 8 | 160 | 3 | 1,040 |
| 16 | Nitrate soda, 200 lbs. per acre | 45—50 | 7 | 640 | 3 | 320 |

## INCREASED CROPS FROM THE PLOUGHING UNDER OF CLOVER.

Further experiments have been conducted during 1904 to show the benefit arising from the ploughing under of clover to add humus and fertility to the soil. In all these experiments there has been a marked increase in the crop the first year following the ploughing under of clover, a considerable increase the second year, and some increase on the third year after clover.

| Plot. | GROUP 1. | 1904. Banner Oats. Yield of Grain. Per acre. | | Yield of Straw. Per acre. | Corn Selected Leaming. Yield per acre. | | Potatoes. Everett. Yield per acre. | |
|---|---|---|---|---|---|---|---|---|
| | | Bush. | Lbs. | Lbs. | Tons. | Lbs. | Bush. | Lbs. |
| 1 | Crop in 1904 after clover in 1903 | 68 | 8 | 4,080 | 29 | 1,600 | 402 | -- |
| 2 | Crop in 1904 on plot where no clover was grown in 1903 | 43 | 18 | 2,080 | 26 | 400 | 362 | 20 |
| | Gain from use of clover | 24 | 24 | 2,000 | 3 | 1,200 | 39 | 40 |

## Group 2.

In each of the divisions of this group there were also three plots. In the upper three in each table, the crops were sown after clover, grown in 1901, and ploughed under in the autumn of that year; the lower three show the crops where no clover was grown. In divisions 3, 6 and 9 the effect is also shown, on the crops of 1903 and 1904, of allowing the clover sown in 1901 to grow for two seasons and ploughing it under in the autumn of 1902.

| Division 1. | 1902. Banner Oats. Yield of Oats. — Per acre. | | 1902. Banner Oats. Weight of Straw. — Per acre. | 1903. Turnips. Yield per acre. | | 1904. Potatoes. Yield per acre. | |
|---|---|---|---|---|---|---|---|
| | Bush. | Lbs. | Lbs. | Tons. | Lbs. | Bush. | Lbs. |
| 1 Crops in 1902-3-4, after clover in 1901 | 72 | 20 | 4,720 | 25 | — | 390 | — |
| 2 Crops in 1902-3-4, on plot where no clover was grown in 1901 | 58 | 28 | 3,120 | 20 | 1,920 | 376 | 20 |
| Gain from use of clover | 13 | 26 | 1,600 | 4 | 80 | 13 | 40 |

| Division 2. | 1902. Potatoes, Everett. Yield Per Acre. | | 1903. Carrots. Yield Per Acre. | | 1904. Potatoes, Everett. Yield Per Acre. | |
|---|---|---|---|---|---|---|
| | Bush. | Lbs. | Tons. | Lbs. | Bush. | Lbs. |
| 3 Crops in 1902-3-4, after clover in 1901 | 392 | 40 | 20 | 1,400 | 378 | 40 |
| 4 Crops in 1902-3-4, on plot where no clover was grown in 1901 | 358 | — | 18 | 280 | 346 | 20 |
| Gain from use of clover | 34 | 40 | 2 | 1,120 | 32 | 20 |

| Division 3. | 1902. Corn Selected Leaming. Yield Per Acre. | | 1903. Potatoes, Everett. Yield Per Acre. | | 1904. Mensury Barley. Yield of Barley. — Per Acre. | | 1904. Mensury Barley. Weight of Straw. — Per Acre. |
|---|---|---|---|---|---|---|---|
| | Tons. | Lbs. | Bush. | Lbs. | Bush. | Lbs. | Lbs. |
| 5 Crops in 1902-3-4, after clover in 1901 | 20 | 800 | 202 | — | 45 | — | 3,840 |
| 6 Crops in 1902-3-4, on plot where no clover was grown in 1901 | 15 | — | 154 | 40 | 38 | 16 | 3,750 |
| Gain from the use of clover | 5 | 800 | 47 | 20 | 6 | 32 | 90 |
| 7 Crops in 1903-4, on plot where clover was allowed to grow two seasons | .... | .... | 200 | 40 | 35 | — | 3,720 |
| 8 Crops in 1903-4, on plot where no clover was grown in 1901 | .... | .... | 134 | 40 | 32 | 24 | 2,210 |
| Gain from the use of clover | .... | .... | 66 | 00 | 2 | 24 | 1,510 |

GROUP 2—*Continued.*

| Division 4. | 1902. Banner Oats. Yield of Oats — Per Acre. | | 1902. Banner Oats. Weight of Straw — Per Acre. | 1903. Mangels. Yield Per Acre. | | 1904. Turnips. Yield Per Acre. | |
|---|---|---|---|---|---|---|---|
| | Bush. | Lbs. | Lbs. | Tons. | Lbs. | Tons. | Lbs. |
| 9 Crops in 1902-3-4, after clover in 1901 ........ | 70 | 20 | 4,960 | 30 | 1,000 | 24 | 40 |
| 10 Crops in 1902-3-4, on plot where no clover was grown in 1901 .................... ......... | 61 | 6 | 2,720 | 27 | 320 | 19 | 1,160 |
| Gain from the use of clover ...... ..... | 9 | 14 | 2,240 | 3 | 680 | 4 | 880 |

| Division 5. | 1902. Potatoes, Everett. Yield Per Acre. | | 1903. Sugar Beets. Yield Per Acre. | | 1904. Turnips. Yield Per Acre. | |
|---|---|---|---|---|---|---|
| | Bush. | Lbs. | Tons. | Lbs. | Tons. | Lbs |
| 11 Crops in 1902-3-4, after clover in 1901........ ................. | 386 | 20 | 20 | 680 | 27 | 360 |
| 12 Crops in 1902-3-4, on plot where no clover was grown in 1901... | 346 | 40 | 16 | 1,040 | 25 | 640 |
| Gain from use of clover.......... .. . ......... .... | 39 | 40 | 3 | 1,640 | 1 | 1,720 |

| Division 6. | 1902. Corn Selected Leaming. Yield Per Acre. | | 1903. Corn Selected Leaming. Yield Per Acre. | | 1904. Banner Oats. Yield of Oats — Per Acre. | | 1904. Banner Oats. Weight of Straw — Per Acre. |
|---|---|---|---|---|---|---|---|
| | Tons. | Lbs. | Tons. | Lbs. | Bush. | Lbs. | Lbs. |
| 13 Crops in 1902-3-4, after clover in 1901........ | 23 | 1,200 | 18 | 1,440 | 61 | 6 | 3,600 |
| 14 Crops in 1902-3-4, on plot where no clover was grown in 1901........ ..................... | 17 | 720 | 14 | 1,200 | 54 | 4 | 2,880 |
| Gain from use of clover.......... .... | 6 | 480 | 4 | 220 | 7 | 2 | 720 |
| 15 Crops in 1903-4, on plot where clover was allowed to grow two seasons........................ | .......... | | 15 | 1,600 | 56 | 16 | 2,680 |
| 16 Crops in 1903-4, on plot where no clover was sown in 1901....... ............................ | .......... | | 7 | ...... | 45 | 30 | 2,440 |
| Gain from use of clover ........ ....... | .... ...... | | 8 | 1,600 | 10 | 20 | 240 |

| Division 7. | 1902. Banner Oats. Yield of Oats — Per Acre. | | 1902. Banner Oats. Weight of Straw — Per Acre. | 1903. Preston Wheat. Yield of Wheat — Per Acre. | | 1903. Preston Wheat. Weight of Straw — Per Acre. | 1904. Mangels. Yield Per Acre. | |
|---|---|---|---|---|---|---|---|---|
| | Bush. | Lbs. | Lbs. | Bush. | Lbs. | Lbs. | Tons. | Lbs. |
| 17 Crops in 1902-3-4, after clover in 1901 | 72 | 32 | 5,280 | 16 | .. | 1,760 | 21 | 1,080 |
| 18 Crops in 1902-3-4, on plots where no clover was grown in 1901.... ......... | 63 | 18 | 3,280 | 14 | 40 | 1,400 | 21 | 80 |
| Gain from the use of clover.... | 9 | 14 | 2,000 | 1 | 20 | 360 | .. | 1,000 |

GROUP 2.—*Concluded.*

| Division 8. | 1902. Potatoes, Everett. Yield Per Acre. | | 1903. Mensury Barley. Yield of Barley. — Per Acre. | | 1903. Mensury Barley. Weight of Straw. — Per Acre. | 1904. Mangels. Yield Per Acre. | |
|---|---|---|---|---|---|---|---|
| | Bush. | Lbs. | Bush. | Lbs. | Lbs. | Tons. | Lbs. |
| 19 Crops in 1902-3-4, after clover in 1901 | 396 | .. | 51 | 32 | 2,640 | 26 | 1,520 |
| 20 Crops in 1902-3-4, on plot where no clover was grown in 1901 | 353 | 20 | 50 | ..... | 2,520 | 26 | 440 |
| Gain from the use of clover | 42 | 40 | 1 | 32 | 120 | .. | 1,080 |

| Division 9. | 1902. Corn, Selected Leaming. Yield Per Acre. | | 1903. Banner Oats. Yield of Oats. — Per Acre. | | 1903. Banner Oats. Weight of Straw. — Per Acre. | 1904. Corn, Selected Leaming. Yield Per Acre. | |
|---|---|---|---|---|---|---|---|
| | Tons. | Lbs. | Bush. | Lbs. | Lbs. | Tons. | Lbs. |
| 21 Crops in 1902-3-4, after clover in 1901 | 22 | 1,600 | 82 | 12 | 3,920 | 24 | 1,200 |
| 22 Crops in 1902-3-4, on plot where no clover was grown in 1901 | 16 | 800 | 76 | 16 | 3,240 | 22 | .. |
| Gain from the use of clover | 6 | 800 | 5 | 30 | 680 | 2 | 1,200 |
| 23 Crops in 1903-4, on plot where clover was allowed to grow two seasons | ........ | .. | 87 | 2 | 4,880 | 25 | 800 |
| 24 Crops in 1903-4, on plot where no clover was grown in 1901 | ........... | | 74 | 4 | 4,080 | 24 | 1,200 |
| Gain from the use of clover | .......... | | 12 | 32 | 800 | .. | 1,600 |

INFLUENCE of Previous Crops on Yield of Grain and Weight of Straw of Banner Oats, grown in 1904.

| Banner Oats. | 1904. Banner Oats. Yield of Oats. — Per Acre. | | 1904. Banner Oats. Weight of Straw. — Per Acre. |
|---|---|---|---|
| | Bush. | Lbs. | Lbs. |
| 1 Crop in 1904, after horse beans, rows 21 inches apart in 1903 | 61 | 6 | 3,280 |
| 2 Crop in 1904, after horse beans, rows 28 inches apart in 1903 | 80 | .. | 4,720 |
| 3 Crop in 1904, after pease, crop harvested in 1903 | 83 | 18 | 5,160 |
| 4 Crop in 1904, on plot where crop of oats was harvested in 1903 | 84 | 24 | 5,280 |
| 5 Crop in 1904, after pease, crop ploughed under twice in 1903 | 88 | 8 | 6,280 |
| 6 Crop in 1904, after soja beans, rows 21 inches apart in 1903 | 52 | 32 | 2,400 |
| 7 Crop in 1904, after soja beans, rows 28 inches apart in 1903 | 72 | 32 | 3,600 |
| 8 Crop in 1904, after crop of sand vetch harvested in 1903 | 78 | 28 | 5,080 |
| 9 Crop in 1904, on plot where crop of oats was harvested in 1903 | 83 | 18 | 5,200 |
| 10 Crop in 1904, after sand vetch ploughed under twice in 1903 | 89 | 14 | 5,480 |
| 11 Crop in 1904, after alsike clover in 1903 | 45 | 10 | 2,140 |
| 12 Crop in 1904, on plot where no clover was grown in 1903 | 28 | 8 | 1,120 |
| 13 Crop in 1904, after buckwheat crop harvested in 1903 | 30 | 20 | 1,640 |
| 14 Crop in 1904, on plot where crop of oats was harvested in 1903 | 71 | 26 | 3,640 |
| 15 Crop in 1904, after buckwheat, ploughed under twice in 1903 | 67 | 2 | 4,120 |
| 16 Crop in 1904, after Alfafa clover in 1903 | 44 | 24 | 2,440 |
| 17 Crop in 1904 on plot where no clover was grown in 1903 | 35 | 10 | 1,680 |
| 18 Crop in 1904, after flax in 1903 | 27 | 2 | 1,440 |
| 19 Crop in 1904, on plot where no flax was grown in 1903 | 49 | 14 | 2,160 |
| 20 Crop in 1904, after hairy vetch in 1903 | 70 | 20 | 3,840 |

## BULLETINS ISSUED DURING 1904.

Four bulletins have been issued during the year.

No. 44, on the 'Results obtained in 1903 from trial plots of grain, fodder, corn, field roots and potatoes,' issued jointly by the Director and the Experimentalist. In this bulletin there are presented the results of a large number of experiments which were conducted at all the experimental farms during the season of 1903, with oats, barley, spring wheat, pease, Indian corn, turnips, mangels, carrots, sugar beets and potatoes, in plots of uniform size and the crops grown under uniform conditions. Both earliness and productiveness are recorded. The average results are also given of the tests for a series of years of those varieties which have proved most profitable.

No. 45, on Emmer and Spelt, prepared by Dr. C. E. Saunders, Experimentalist, in which are given a number of descriptions of varieties of these two sorts of grain; the results are also submitted of many experiments which have been conducted with these cereals at the experimental farms.

Much interest has been awakened of late among farmers in some parts of this country in the growing of emmer and spelt, and in the bulletin referred to many facts are brought together, regarding the proportion of hull to kernel and the relative usefulness and cropping power of emmer and spelt in comparison with other cereals. There are also given in this bulletin the results of some analyses made by the Chemical Division of the kernels and hulls of emmer and spelt, showing the relative nutritive value of these cereals.

No. 46, on 'Alfalfa or Lucern, its culture, use and value.' This bulletin consists of three parts: Part 1 was prepared by Mr. J. H. Grisdale, Agriculturist of the Central Experimental Farm; Part 2, by Mr. Frank T. Shutt, Chemist of the Experimental Farms, and Part 3 by Dr. James Fletcher, Entomologist and Botanist of the Experimental Farms.

In reference to this plant, the economy of growing it for the feeding of stock and for ploughing under to enrich the soil, its deep rooting habit which gives it the power of drawing moisture and plant food from depths not reached by other plants, and the large quantities of palatable and nutritious fodder which it produces, are all discussed in this bulletin, also its adaptability to many of the climatic conditions found in the Dominion.

No. 47, 'Trees and Shrubs tested in Manitoba and the North-west Territories,' prepared by the Director. In this bulletin are given the results of a very large number of trials of trees and shrubs which have been planted at the Experimental Farms at Brandon, Manitoba, and at Indian Head, in the North-west Territories, during the past sixteen years to ascertain what species and varieties are hardy enough to endure the winter in those parts of the Dominion. In this bulletin is presented in a convenient and condensed form all the facts ascertained for the instruction and encouragement of those who desire to adorn their homes with these objects of beauty. The love of trees and shrubs is almost universal and nowhere is it more strongly felt than on the North-west plains where trees and shrubs are scarce. Hitherto considerable sums of money have been spent annually by settlers in the purchase of trees and shrubs from the east, most of which have been too tender to endure the climate. The information given in this bulletin will, it is hoped, greatly lessen this injudicious expenditure. This bulletin will also be useful to residents of eastern Canada, since any of the species found hardy enough to endure the climate of the North-west, may be planted with assurance of success in any of the eastern parts of this country.

# VISITS TO THE BRANCH EXPERIMENTAL FARMS.

## THE EXPERIMENTAL FARM AT BRANDON, MAN.

On August 5, I left Ottawa for the annual tour of inspection of the branch experimental farms and arrived in Brandon on August 7. Several days were spent on this farm at that time and two days more on the return journey, September 15-16. The crops on the higher lands on the farm were in good condition, but a heavy flooding of the Assiniboine river had seriously injured those on the lower lands. Rust prevailed on some of the plots of cereals to a limited degree, nevertheless many of the crops were very heavy.

In the uniform trial plots, the best varieties of spring wheat gave from 30 to 36 bushels per acre, six-rowed barley, 54 to 66 bushels, and two-rowed from 55 to 63 bushels per acre. Oats gave extraordinary returns, ranging from 112 to 134 bushels per acre, pease also gave extra heavy crops, from 60 to 85 bushels per acre. Roots also did well, and potatoes gave an immense crop, from 500 to 650 bushels per acre.

The fields gave evidence of good and careful cultivation. The stock, implements and buildings were also found in good condition.

The orchards of cross-bred apples and seedling crabs have made strong growth and some new and promising varieties were fruiting for the first time.

The pasture fields looked well, and the crop of hay was very fair. The forest and ornamental trees, also the shrubs and flowers had made good growth and presented an attractive appearance.

## THE EXPERIMENTAL FARM AT INDIAN HEAD, N.W.T.

This farm was visited on August 10-12 and September 13-14. The wheat was an excellent crop. The best sorts on the trial plots gave from 45 to 50 bushels per acre, while the larger fields averaged about 40 bushels, the grain weighing from 61 to 63 lbs. per bushel. The wheat crop throughout this district was good and in many instances from 35 to 40 bushels per acre was harvested. The experiments carried on at Indian Head with early ripening varieties of grain command much attention from farmers. The Preston, Stanley and Huron, cross-bred sorts produced at the Central Experimental Farm were ripe and cut this year about a week before the Red Fife was ready to harvest.

The crop of oats was very heavy, ranging from 90 to 120 bushels per acre, while the best yielding sorts of barley gave from 60 to 67 bushels. There was very little rust on any of the cereals in the North-west. Pease yielded unusually well, from 60 to 68 bushels per acre, and the most prolific sorts of potatoes from 350 to 435 bushels.

*Bromus inermis.*—Brome grass is now a well established and important crop, and with the western rye grass *Agropyrum tenerum* furnishes the greater part of the hay fed to horses and cattle on the Experimental Farm. Indian corn has been successfully grown, giving from 10 to 20 tons of green fodder per acre. Field roots have also done well, excepting carrots, the crop of which has been light.

Many of the Siberian crabs and cross-bred apples fruited well; trees and shrubs also, planted for shelter and ornament, made luxuriant growth, while annual and perennial flowers provided a wealth of bloom.

Stock of all sorts looked well, giving evidence of attention and care. The buildings were in good condition and the implements well cared for.

## THE EXPERIMENTAL FARM AT AGASSIZ, B.C.

The farm at Agassiz was visited from August 25 to 30. Both fruit and forest trees were found to be suffering from the drought which had prevailed for some weeks previous. The leaves were turning yellow. Extensive fires were consuming the forests in many districts and much valuable timber was destroyed. The air in many localities was so filled with smoke as to veil the beauties of the landscape.

The hay crop had been an excellent one and the clover exceptionally heavy. The yield of grain also was fairly good. Oats have given as high as 67 bushels per acre, barley 63 bushels, and spring wheat 33 bushels per acre. Indian corn had made good growth but was rather uneven, due chiefly to faulty germination of the seed. Roots and potatoes promised well.

The fruit orchards were not in a very satisfactory condition. Many of the young apple trees have been greatly injured by canker which has spread rapidly and proved very destructive, making it necessary to root up many of the trees. Pears were a very light crop and some of the trees were withering from the drought. Plums were a fair crop and the rot was not very prevalent this season, so that most of the fruit was gathered in good condition.

Blackberries were fruiting well and raspberries had given a fair crop. Currants and gooseberries had also borne fairly well. The nut trees and mulberries were well laden with fruit.

The cattle and sheep were in good condition, and notwithstanding the long period of dry weather the pastures were looking fairly well. Pigs were thriving, but the litters had been smaller than usual. The fowls had made good progress and there was a large number of chickens.

## VISIT TO VICTORIA.

While in Victoria, several orchards were seen and the crops seemed to be fully up to the average. One of these, owned by Mr. R. M. Pamler, deserves special notice. In has been established as a commercial orchard and comprises twenty acres in all. The trees have all been planted about eighteen feet apart with the intention of allowing them to bear until they begin to crowd each other and then gradually thin them out. In this orchard there are planted about 3,000 trees. The apples number about 2,000 and consist chiefly of Wealthy, Blenheim Orange, Duchess, Boskoop, Cox's Orange Pippin and Lord Suffield. Of pears there are about 200, chiefly Bartlett, Louise Bonne and Beurre Bosc. The cherries, of which there are about 800, are largely Olivet, Belle Magnifique and English Morello.

This method of growing fruit on the Island is said to have been very satisfactory and to have given good returns.

## VISIT TO VERNON AND PENTICTON.

While at Vernon a visit was paid to the Coldstream ranch where the large orchards planted by Lord Aberdeen are now bearing abundantly. These orchards are in splendid condition and remarkably clean and well cultivated. The trees are thrifty with well formed heads, and the fruit is regularly thinned, so that none of the trees are allowed to overbear. Nearly all the fruit produced is of first quality.

The journey on Lake Okanagan from Okanagan Landing to Penticton was very enjoyable, and at the various landing places there was evidence of much progress, and settlement is going on rapidly. Kelowna, which is about half way down the lake, has now become a town of good size, and in the surrounding country, orchards can be seen in every direction. On the return journey, the steamer took on shipments of fruit, &c., for the east. At Summerland, 700 boxes of tomatoes, apples and plums were received, and at Peachland and Kelowna additional shipments were made. There is a rapidly growing business in fruits and vegetables throughout this region.

## THE EXPERIMENTAL FARM AT NAPPAN, N.S.

The annual visit was paid to this farm in October, when all the crops were found to be harvested, excepting field roots. Owing to the unusually dry weather in the summer all the grain and fodder crops were light. Hay was 20 to 25 per cent below the average, while oats, wheat and barley had also given considerably less than an average yield ; the quality of the grain, however, was good. Indian corn was not a heavy crop and had been cut by a severe frost which had lessened its weight. The crop of turnips was heavy, giving from 30 to 40 tons per acre.

The stock was in good condition, the steers under feeding tests were making satisfactory progress and the dairy cows milking fairly well.

The apple orchards have made good progress, and a large proportion of the trees have borne good crops. Pear trees have given very little fruit during 1904, some of the varieties look very healthy, while others have made but a short and feeble growth. Similar variation was noticeable among the plums and some of the European sorts had fruited fairly well, but the American plums seem to be of little value here.

Of cherries the Bigarreau varieties in the older and more exposed orchard have suffered much from winter killing of the wood, whereas in the younger orchard in the shelter of the woods they have mostly escaped injury. Many of the Morello's and Russian sorts have made good growth, but have had very little fruit this year, probably because of the killing of the blossom buds during the severe winter of 1903-04. Some seedlings of the Kentish cherry, which is found in many parts of Nova Scotia, have been planted and are making promising growth. A large proportion of the cherries raised by the farmers of Nova Scotia are from seedling trees of this character, which are very generally distributed, are very hardy and usually bear good crops.

## ACKNOWLEDGMENTS.

Grateful acknowledgments are due to those who have rendered me special service during the year. To the Director of the Arnold Arboretum, Jamaica Plains, Mass., for seeds of many different sorts of trees and shrubs, also for a fine collection of specimens of Crataegus and other rare trees for the Arboretum at Ottawa. To the United States Department of Agriculture, for many favours, including samples of cereals, seeds of fodder crops, &c., for test from foreign countries. To the Director of the Royal Gardens, Kew, England, for seeds of many sorts of trees, shrubs and plants. To Prof. John Macoun and Mr. J. M. Macoun, both of the Geological and Natural History Survey of Canada, for seeds of rare Canadian plants.

To the officers of the Central and Branch Experimental Farms my thanks are due for their earnest co-operation in carrying on the different divisions of the work. Grateful acknowledgments are also due to those members of the staff who have aided me in those branches of which I have had personal charge. To Mr. John Fixter, the farm foreman, who has taken charge of the special tests made with fertilizers on farm crops and aided me with practical suggestions. To Mr. George Fixter, to whom I am indebted for his careful supervision of the distribution of samples of seed grain. To Miss M. Hager, for valuable help in the taking of field notes and in the compilation of records in connection with work on the several experimental farms. To Mr. James Taggart, for the care and good judgment he has displayed as foreman of the ornamental grounds, and to Mr. Wm. T. Ellis, who has done careful work in testing the vitality of seeds, the management of the plants in the green-house and in propagating useful plants for outside decoration. Mr. Ellis has also rendered useful service in the taking of meteorological records.

I also take pleasure in bearing testimony to the faithful services of my secretary, Mr. Malcolm C. O'Hanly. The employees also of all the farms have my thanks for the interest they have taken in their work, and the care with which they have discharged their respective duties.

WM. SAUNDERS,
*Director of Experimental Farms.*

# REPORT OF THE AGRICULTURIST

(J. H. GRISDALE, B. AGR.)

DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith reports upon the horses, cattle, sheep, swine and farming operations under my supervision during the past year.

I have to report a fairly successful year in the different branches of my division and in this connection I wish to acknowledge my indebtedness for assistance and interested co-operation in their various positions of the farm foreman, Mr. John Fixter, of the herdsman, Mr. C. T. Brettell, and of the dairyman, Mr. J. Meilleur.

During the year I have attended a number of meetings in various parts of Canada, and have conducted a number of student judging contests, in addition to my regular work of supervising and directing the experimental feeding and farming operations at the Central Experimental Farm.

From December 1, 1903, to November 30, 1904, 2,067 letters were received and 2,967 despatched by the agricultural division.

I have the honour to be, sir,
Your obedient servant,
J. H. GRISDALE,
*Agriculturist.*

## LIVE STOCK.

The live stock now (December 1, 1904) occupying the different stables and pens under my charge include horses, cattle, sheep and swine.

### HORSES.

The horses are kept for labour exclusively, although some experimental feeding is usually under way to gain some information as to the most economical methods of feeding draught horses, as well as experiments to determine the comparative values of different foods as forage for the same.

The horses are usually 19 in number, made up of:—

Thirteen heavy draught horses of Clydesdales and Percheron blood.
Five heavy driving horses.
One light driver.

### CATTLE.

There are representatives of four breeds of cattle, viz.:—Shorthorn, Ayrshire, Guernsey and Canadian. There are besides, a number of grade cattle and steers. These cattle are kept for breeding and feeding operations, mostly of an experimental character. Pure bred breeding animals are usually on sale, however, and a considerable number are sold in the course of the year.

*Pure Bred Breeding Cattle.*

The pure bred cattle in the barns at present are as follows:—
Shorthorns, including 3 bulls and 13 females.
Ayrshires, including 2 bulls and 15 females.
Guernseys, including 4 bulls and 8 females.
Canadians, including 1 bull and 7 females.

*Grade Cattle.*

At present the grades number 17 head, made up of 3 Shorthorn grades, 5 Ayrshire grades, 7 Guernsey grades and 2 Canadian grades.

*Steers.*

Sixty-three steers are under feed at present. They are of different ages and breeding and the number is made up of:—

| | |
|---|---|
| 15 three-year-olds. | 16 yearlings. |
| 20 two-year-olds. | 12 calves. |

SHEEP.

Sheep are not kept in large numbers, only 43 being now in the pens. Two breeds are kept, namely : Shropshires and Leicesters.

There are 25 Shropshires, as follows :—1 aged ram, 3 spring ram lambs, 14 aged ewes and 7 ewe lambs.

The Leicesters number 13, made up as follows :—1 aged ram, 2 ram lambs, 7 aged ewes and 4 ewe lambs.

There are besides two grades and three wethers.

SWINE

One hundred swine of all classes are now in the pens being fed experimentally or being kept for breeding purposes. The breeds kept are Berkshires, Tamworths and Yorkshires.

The Yorkshires are 37 in number, including:

| | |
|---|---|
| 2 stock boars. | 6 young sows. |
| 4 young boars. | 15 sucklings. |
| 10 breeding sows. | |

The Berkshires are 7 in number, including :

| | |
|---|---|
| 1 stock boar. | 2 young sows. |
| 4 breeding sows. | |

The Tamworths are 5 in number, including:

| | |
|---|---|
| 3 breeding sows. | 1 young boar. |
| 1 young sow. | |

## HORSES.

There are 19 horses in the stables. These horses are expected to do the work in the various departments during the year. The work on the '200 acre farm' is but a part of their duties. They work in addition for the horticultural and experimental departments, as well as upon the lawns and in the arboretum. In addition a large amount of hauling in connection with the different departments, as well as road making and messenger service, takes up much of their time.

HORSE LABOUR.

During the year from December 1, 1903, to November 30, 1904, the work done by the 19 horses kept in the stables here was equivalent to 5,260 days work, distributed as follows:—Live stock, hauling feed, marketing stock, &c., 109 3-10 days ; farm work (200 acre farm), 722 8-10 days ; draining and care of roads, including removing snow and breaking roads in winter, 92 days ; manure on 200 acre farm, 261 6-10 days ; cleaning land, gathering stones, &c., 84 5-10 days; arboretum, 169 5-10 days; horticultural division, 611 5-10 days; lawns, &c., 160 5-10 days; experimental division, 586 days ; bulletins and reports to and from farm office, 100 days ; poultry, 8 1-10 days ; mail, including milk delivery, 171 7-10 days ; omnibus service, including 3 horses for omnibus, 2 horses for general driving and 1 horse for supervision of work, 2,122 days; work about greenhouse, outbuildings, sidewalks, exhibitions, &c., 60 5-10 days.

In estimating the cost of farming operations further on in this report, $2.50 per day is charged for team and driver. To feed and care for the horses, cost 37 cents per horse per working day, and the driver received \$1.41⅔ per day. It is evident therefore that the team and driver cost \$2.16 per day, leaving a margin of 32 cents, or 16 cents per horse per day for wear and tear.

### FEEDING HEAVY HORSES.

Several experiments in feeding heavy horses have been conducted during the year.

Not infrequently oats are high-priced when bran is cheap. During the past year chopped oats have usually sold for from \$24 to \$26 per ton on the Ottawa markets. Bran has been as low as \$15 per ton.

To the man with many horses to feed, economy in the meal part of the ration is a most important consideration. For that reason one of the experiments was conducted for the purpose of finding out if bran could be used to any considerable extent as a substitute for oats.

The horses, 12 in number, were divided into 6 groups of 2 each; the roughage ration in each case being oat hay.

Group 1 received a meal mixture of equal parts of oats and bran; group 2, 1 part bran to 2 parts oats; group 3, 2 parts bran to 1 part oats; group 4, pure oats; group 5, oil meal 1 part, oats 10 parts; and group 6, bran 2 parts, oil meal 1 part, and oats 10 parts. The oats were ground in every case, and the ground oats or other meal and ground oats were mixed with the cut hay and the whole mass dampened.

The meal was fed in three nearly equal portions morning, noon and night, while only about one-fifth of the hay was fed in the morning, as much at noon, and the balance or three-fifths at night.

To illustrate, one of the horses in group 1 received his rations as follows:—

Morning, hay, 3 lbs.; meal mixture, 6 lbs.

Noon, hay, 3 lbs.; meal mixture, 6 lbs.

Evening, hay, 8 lbs.; meal mixture, 5 lbs.

The meal mixture and cut oat hay being mixed together and slightly dampened in each case.

#### BRAN FEEDING EXPERIMENT—OAT HAY.

| Group. | Average weight Sept. 25. | Meal Ration, kind. | Hay (all fed on oat hay). | Amt. Meal Mixture fed in 40 days to 1 horse. | Amt. Oat Hay fed in 40 days. | Daily Meal Ration. | Daily Hay Ration. | Average weight Nov. 4. | Loss — or Gain + | Value of Food consumed in 1 day. | Value of Food consumed in 40 days. | Cost of Food for 1 year if such a meal ration were fed. | Cost of Food for 1 year if pure oats were fed. | Saving in 1 year by feeding such grain ration rather than pure oats. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Lbs. | Cts. | \$ cts. | \$ cts. | \$ cts. | \$ cts. |
| 1 | 1,488 | Bran... 1<br>Oats.... 1 | Oat hay. | 680 | 580 | 17 | 14½ | 1,495 | 7+ | 22 | 8 80 | 80 30 | 89 06 | 8 76 |
| 2 | 1,604 | Bran... 1<br>Oats.... 2 | " .. | 800 | 760 | 20 | 19 | 1,601 | 3— | 27·98 | 11 19 | 102 12 | 111 83 | 9 71 |
| 3 | 1,685 | Bran... 2<br>Oats.... 1 | " .. | 800 | 700 | 20 | 17½ | 1,649 | 36— | 24·77 | 8 91 | 90 41 | 109 94 | 19 53 |
| 4 | 1,669 | Oats...... | " .. | 800 | 760 | 20 | 19 | 1,663 | 6— | 30·65 | 12 26 | 111 87 | 111 87 | |
| 5 | 1,656 | Oil meal 1<br>Oats....10 | " .. | 680 | 740 | 17 | 18½ | 1,622 | 34— | 27·22 | 10 89 | 99 35 | 98 10 | 1.25 loss |
| 6 | 1,673 | Bran... 2<br>Oil meal 1<br>Oats....10 | " .. | 800 | 620 | 20 | 15½ | 1,624 | 49— | 28·61 | 11 44 | 104 46 | 107 38 | 2 92 |

Group 1, on bran and oats equal parts, seemed to like their ration and did very well on it during the 40 days, making a gain of 7 lbs. each in that time. This is a meal mixture that may safely be fed by any owner of heavy horses, as they are practically certain to do well on it. It is much better adapted for feeding with timothy hay than is a ration of pure oats. Where bran was valued at $16 per ton and ground oats at $24, there would be a saving of $8.76 in the cost of feeding a horse for one year as compared with feeding pure oats.

Group 2, on bran 1 part and oats 2 parts, did very well on their ration and seemed to relish it.

Group 3, on bran 2 parts and oats 1 part, seemed fond of the meal mixture, but did not like the oat hay and consequently lost somewhat in weight. When timothy hay was substituted for the oat hay, however, this group came up in weight and did as well as any of the others. This mixture may be recommended as a good meal ration for working horses and is certainly very economical in comparison with pure oats, since there would be a saving of $19.53 in the year by feeding such a ration instead of an equal weight of pure oats.

Group 4, on pure oats did very well. Their ration, however, while not any heavier than that of several other groups cost 30·65 cents for the day or 2 cents more than the next most expensive.

Group 5, on oil meal 1 part, and oats 10 parts, seemed to enjoy their food but succeeded in losing 34 lbs. each in weight. Oil meal is usually found to give very good results and even in this case seemed to help keep the horses in good health and spirits. The price was against it, however, as it was found to have raised the cost of the ration slightly above what it would have been had pure oats been fed.

Group 6, on bran 2 parts, oil meal 1 part, and oats 10 parts, would be considered by most horsemen as being an ideal ration. They liked the meal very much but did not care for the oat hay. As soon as put on timothy hay they started to recover in weight very rapidly. Even though bran constituted such a small portion of the ration it more than overcame the extra cost of the oil meal and there was a slight saving over what would have been the cost had pure oats been fed, viz.: $2.92 in one year.

All the horses were on general farm work. Sometimes one team would for a few days be put at harder work than the others but things were fairly equal.

The oat hay had been cut a little on the ripe side and was not very palatable. A glance at the following table will show how the groups were affected by the change to timothy hay.

BRAN FEEDING EXPERIMENT—TIMOTHY HAY.

| Group. | Average weight when starting oat hay, Sept. 25. | Average weight when finishing oat hay, Nov. 4. | Loss — or Gain + while on oat hay 40 days. | Average weight 10 days after being fed on timothy hay. | Average gain in 10 days after change from oat hay to timothy hay. | Meal Ration. |
|---|---|---|---|---|---|---|
| | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. | |
| 1 | 1,488 | 1,495 | 7+ | 1,507 | 12 | Bran 1, oats 1. |
| 2 | 1,604 | 1,601 | 3— | 1,628 | 27 | Bran 1, oats 2. |
| 3 | 1,685 | 1,649 | 36— | 1,668 | 17 | Bran 2, oats 1. |
| 4 | 1,669 | 1,663 | 6— | 1,674 | 11 | Oats. |
| 5 | 1,656 | 1,622 | 34— | 1,633 | 11 | Oil meal 1, oats 10. |
| 6 | 1,673 | 1,624 | 49— | 1,656 | 32 | Bran 2, oil meal 1, oats 10. |

FEEDING ROOTS AND ENSILAGE TO WORKING HORSES.

The effect of feeding roots or ensilage to working horses has been studied during the year and a few points noted.

The roots experimented with were turnips, mangels and carrots, in addition one lot received ensilage as a part of their ration. A check lot receiving no feed other than the regular ration of hay, oats and bran was under feed at the same time.

The following table shows the amount of each kind of succulent food fed and the results so far as the gains or losses in weight of the horses are concerned.

| Group. | Average weight Nov. 19. | Kind of roots fed 1 horse. | Amount fed in 14 days. | Average daily feed of roots. | Meal Ration, amt. fed in 1 day. | Hay (mixed), amt. fed in 1 day. | Average weight of horses Dec. 3. | Loss — or Gain + |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Lbs. |
| 1 | 1,490 | Carrots. | 152 | 10 | 17 | 13 | 1,460 | 30— |
| 2 | 1,625 | Mangels. | 92 | 6 | 18 | 15 | 1,610 | 15— |
| 3 | 1,657 | Turnips. | 152 | 10 | 18 | 15 | 1,657 | |
| 4 | 1,595 | Ensilage. | 152 | 10 | 18 | 15 | 1,590 | 5— |
| 5 | 1,625 | ... .......... | .......... | .......... | 18 | 15 | 1,642 | 17+ |

As a general conclusion it may be stated that when such amounts of roots, &c., as are indicated in the table are fed horses working every day, the effect is not likely to be very good. The roots, &c., are laxative in character, hence any heavy exercise when receiving such food induces an undue looseness which is both unpleasant and injurious. There seemed to be but little preference in this respect among the feeds mentioned, and the only horses not suffering from this affection during the period of the experiment were the ones getting no succulent food.

Turnips and carrots seemed the most palatable of the four, with ensilage almost as welcome to the horses and mangels not at all in favour.

It was observed that fed in smaller amounts per day or fed to idle horses no evil effects were noticeable. The roots or ensilage did not seem to replace any of the regular ration of meal and hay and the feeding of these feeds was an added expense rather than an economy.

Where fed to idle horses, however, or where fed to horses it was desired to put in better condition, a small amount of roots—5 to 8 pounds per day—has been found beneficial, as serving to prevent digestion troubles.

## DAIRY CATTLE.

The herd of dairy cattle during the year 1904 consisted of 28 females all told. They were:—

| | |
|---|---|
| Ayrshires. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | 6 |
| Guernseys. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | 5 |
| Canadians. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | 4 |
| Shorthorns. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | 3 |
| Shorthorn grades. . . . . . . . . . . . . . . . . . . . . . . . . . . . | 2 |
| Ayrshire grades. . . . . . . . . . . . . . . . . . . . . . . . . . . . . | 4 |
| Guernsey grades. . . . . . . . . . . . . . . . . . . . . . . . . . . . | 3 |
| Canadian grades. . . . . . . . . . . . . . . . . . . . . . . . . . . . | 1 |

### FEEDING THE DAIRY CATTLE.

One important consideration in feeding dairy cows is to make the ration not only as effective as possible as a milk-producing ration, but to make it as cheap as possible, and at the same time productive of good results. From the farmer's standpoint the most expensive part of the ration is the grain or meal part thereof. Our experience goes to show that with the use of clover hay and succulent food there is not the same, nor nearly the same need of a large proportion of meal in the ration as there is when either the one or the other of these most valuable milk-producing foods is lacking. When both are absent the amount of meal necessary to insure good returns from the cattle is so great as to render the profitable production of milk almost impossible in winter.

Both clover hay and succulent food are produced in abundance on the farm here and every advantage is taken of these, to the dairy farmer, invaluable feeds, to reduce the cost of producing milk.

Accordingly, the roughage ration fed to the cows consisted of ensilage, roots, (mangels and sugar-mangels), clover hay and some chaff.

The amount of roughage fed varies considerably, since the milch cows vary in weight from 800 lbs. to 1,600 lbs. The approximate roughage ration fed per 1,000 lbs. live weight is 35 lbs. ensilage, 20 lbs. mangels, 3 lbs. clover hay and a little chaff.

The meal mixture or grain ration consisted of different mixtures at different times and for different cows. Cows in heavy milk should receive a meal ration very rich in milk-forming material.

In feeding meal, even more than in feeding roughage, to dairy cows there is every opportunity for the careless or ignorant feeder to waste much valuable feed by feeding in too large quantities, or by feeding the wrong kind of meal or grain.

### SUMMER FEEDING.

The cows were pastured as usual during the greater part of the summer months. They occupied one field of the three year rotation marked 'E' on page 82, and referred to there, as being under pasture in 1904. This field was able to carry about fifty head of cattle for over a month and over thirty head for over two months. When the pasture began to get bare it was supplemented by soiling crops cut and fed in the stables. A somewhat heavier grain ration was fed this year than usual on account of the greater extent to which soiling was carried on. The meal ration in summer consisted of oats and bran about equal parts. It was fed in amounts varying with the milk yield of the cows being fed, save in the case of heifers with their first calves which usually received more than their records seemed to call for as it was desired to encourage them and to cultivate in them the habit of maintaining a heavy and uniform flow of milk during the whole lactation period.

### COST OF FEEDING.

In estimating the cost of feeding, the following prices were charged for feed stuffs, being the average local market rates for the same during the season of 1904, save in the case of ensilage and roots, which are charged for at the rate usually affixed in experimental feeding in all parts of America.

| | | |
|---|---|---|
| Pasture (per month) | $ 1 00 | per cow. |
| Bran | 16 00 | per ton. |
| Gluten meal and oil meal | 25 00 | " |
| Oats and barley | 21 00 | " |
| Clover hay | 7 00 | " |
| Chaff | 4 00 | " |
| Roots and ensilage | 2 00 | " |

In estimating the value of the product, 20 cents per pound is allowed for the butter and 15 cents per hundred pounds for the skim-milk and buttermilk. The butter is manufactured in the farm dairy and sells on the market at from 22 to 30 cents per pound, an average of about 24 cents per pound during the last year. This leaves about 4 cents per pound for cost of manufacture.

The following tables give in detail the particulars concerning each cow, herd statements for each of the pure-bred herds, and monthly statements for all the herds combined.

The monthly statements for the whole milking herd show the total yield of milk for each month, its butter-fat content, the amount of butter produced, the number of pounds of milk required for a pound of butter, and the average yield of milk per cow per diem. The highest average per cent of fat was recorded in October and the lowest in January.

### DAIRY CATTLE REPORTS.

During the year 28 different cows were milked for shorter or longer periods, as indicated on the first page of my report on dairy cattle, whereas in the subjoined 'herd reports' only 20 animals are reported upon.

In almost any dairy herd of any size some cows will be found that for some reason have given milk during only a very small part of any given year. Where a large number of cows are being considered, one or two such cases introduced in estimating the average does not materially affect the same, but where the herds to be compared are small the consideration of one or two such cases in one herd and no such cases in another makes an unjust difference in favour of the latter herd. To overcome this difficulty as far as possible, the records of three of the best cows in each herd, and of cows that had been in milk for the greater part of the year, have been taken, and the averages estimated from these records, rather than from the records of all cows of that particular breed that happened to calve during the year.

Report 1 is a summary of the more important points in connection with the year's work with the dairy herd.

Report 2 contains the individual records of all cows that gave milk during the year.

Reports 3, 4, 5, 6, 7, 8 and 9 give the herd records of the several pure-bred and grade herds under test.

## REPORT 1.

### GENERAL SUMMARY.

| — | November. | December. | January. | February. | March. | April. | May. | June. | July. | August. | September. | October. | Total. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. of cows giving milk for month.. | 26 | 26 | 24 | 20 | 24 | 25 | 25 | 28 | 28 | 26 | 25 | 25 | |
| Lbs. of milk in month... | 11,640 | 11,363 | 8,148 | 7,919 | 13,394 | 17,233 | 19,614 | 22,400 | 21,242 | 18,653 | 15,467 | 14,251 | 181,321 |
| Average for 1 day........ | 388 | 378·7 | 271·6 | 263·8 | 446·4 | 574·4 | 553·8 | 746·6 | 708 | 621·7 | 515·5 | 475 | 494·8 |
| Daily average per cow.... | 14·92 | 14·56 | 11·31 | 13·19 | 18·60 | 22 97 | 22·15 | 26·66 | 25·28 | 23·91 | 20·62 | 19 | 18·59 |
| Per cent fat.. | 4·67 | 4·84 | 4·79 | 4·48 | 4·20 | 4·26 | 4·28 | 4·27 | 4·13 | 4·04 | 4·20 | 4·57 | 4·41 |
| Lbs. butter-fat......... | 546·69 | 533·28 | 420·24 | 343·28 | 544·53 | 712·22 | 833·18 | 942·96 | 861·96 | 747·07 | 633·64 | 641·96 | 7761·01 |
| Lbs. butter... | 643·16 | 627·38 | 494·40 | 403·86 | 640·60 | 837·90 | 980·21 | 1109·36 | 1014·07 | 878·90 | 745·45 | 755·23 | 9130 60 |
| Lbs. milk for 1 lb. butter. | 18·09 | 18·11 | 16·48 | 19·60 | 20.90 | 20·50 | 20·01 | 20·19 | 20·94 | 21·22 | 20·74 | 18·86 | 19·85 |

# REPORT 2.

## INDIVIDUAL COW RECORDS.

| Name of Cows. | Age. | Date of dropping last calf. | Number of days in milk. | Daily average yield of milk. | Total milk for year. | Per cent of fat in milk. | Pounds butter produced in year. | Value of butter at 20 cts. per lb. | Value of skim milk at 15 cts. per 100 lbs. | Total value of product. | Amount meal eaten, valued at 1c. per lb. | Amount of roots and ensilage eaten, valued at $2 per ton. | Amount hay, valued at $7 per ton. | Months on pasture at $1 per month. | Total cost of feed for year. | Cost to produce 100 lbs. milk. | Cost to produce 1 lb. butter, skim-milk neglected. | Profit on 1 lb. butter, skim-milk neglected. | Profit on cow during year, labour neglected. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Days. | Lbs. | Lbs. | p. c. | Lbs. | $ cts. | $ cts. | $ cts. | Lbs. | Lbs. | Lbs. | Mos | $ cts. | Cts. | Cts. | Cts. | $ cts. |
| Queenie ... .....(G.G.) | 6 | Apr. 5, '04 | 324 | 19·2 | 6,250 | 6·12 | 450·30 | 90 06 | 8 70 | 98 76 | 1,596 | 11,210 | 941 | 5 | 36 97 | 59·28 | 8·2 | 11·8 | 61 79 |
| Fortune.......... (C.) | 8 | Nov. 27, '04 | 335 | 26 | 8,734 | 4·56 | 468·60 | 93 72 | 10 89 | 104 61 | 2,359 | 11,960 | 941 | 5 | 45 35 | 51·92 | 9·7 | 10·3 | 59 26 |
| Zamora.......... (C.) | 8 | May 24, '04 | 327 | 23·5 | 7,658 | 4·91 | 442·43 | 88 48 | 10 67 | 99 15 | 1,972 | 11,960 | 941 | 5 | 41 48 | 54·16 | 9·3 | 10·7 | 57 67 |
| Jessie A .......... (A.) | 10 | Feb. 15, '04 | 313 | 32·2 | 10,086 | 3·77 | 447·85 | 89 57 | 14 45 | 104 02 | 2,486 | 12,120 | 941 | 5 | 46 78 | 46·38 | 10·4 | 9·6 | 57 24 |
| Itchen Lady ..... (G.) | 7 | May 4, '04 | 294 | 26·6 | 7,782 | 4·50 | 412·39 | 82 47 | 11 05 | 93 52 | 1,906 | 11,815 | 941 | 5 | 40 67 | 52·26 | 9·8 | 10·2 | 52 85 |
| Exilée.......... (C.) | 9 | " 1, '04 | 334 | 25·8 | 8,628 | 4·10 | 416·90 | 83 38 | 12 31 | 95 69 | 2,214 | 11,960 | 941 | 5 | 43 90 | 51.21 | 10·5 | 9·5 | 51 79 |
| Countess ........(A.G.) | 6 | Apr. 2, '04 | 324 | 25·4 | 8,258 | 4 | 389·41 | 77 88 | 11 89 | 89 77 | 1,952 | 11,810 | 941 | 5 | 41 13 | 49·80 | 12·1 | 7·9 | 48 64 |
| Flossy Lyons..... (G.) | 4 | Feb. 25, '04 | 319 | 20 | 6,386 | 5·12 | 384·92 | 76 98 | 9 00 | 85 98 | 1,724 | 11,210 | 941 | 5 | 38 25 | 59·89 | 9·9 | 10·1 | 47 73 |
| Maggie.......... (A.) | 8 | Mar. 27, '04 | 300 | 28·6 | 8,595 | 3·76 | 381·03 | 76 20 | 12 02 | 88 22 | 1,965 | 11,810 | 941 | 5 | 41 22 | 47·09 | 10·9 | 9·1 | 47 00 |
| Bellflower ... ..(G.G.) | 6 | Apr. 15, '04 | 275 | 25·9 | 7,146 | 4·32 | 363·74 | 72 74 | 10 17 | 82 91 | 1,500 | 11,815 | 941 | 5 | 36 61 | 51·23 | 10·7 | 9·3 | 46 30 |
| Polly ............(G.C.) | 9 | Mar. 24, '04 | 343 | 22·3 | 7,665 | 4·30 | 388·56 | 77 71 | 10 91 | 88 62 | 2,201 | 11,660 | 941 | 5 | 43 46 | 56·71 | 11·1 | 9·9 | 45 15 |
| Denty ........... (A.) | 5 | Feb. 6, '04 | 284 | 27·1 | 7,672 | 4·06 | 367·28 | 73 45 | 10 95 | 84 40 | 1,834 | 11,965 | 941 | 5 | 40 10 | 52·27 | 10·9 | 9·1 | 44 30 |
| Alma............(G.G.) | 3 | " 28, '04 | 312 | 20·1 | 6,291 | 4·88 | 361·82 | 72 36 | 8 89 | 81 25 | 1,776 | 11,515 | 941 | 5 | 39 07 | 62·10 | 10·8 | 9·2 | 42 18 |
| Deanie ... ...... (G.) | 7 | Aug. 22, '04 | 366 | 17·7 | 6,501 | 4·90 | 374·98 | 74 99 | 9 18 | 84 17 | 2,168 | 11,815 | 941 | 5 | 43 29 | 66·59 | 11·6 | 8·4 | 40 88 |
| Ruby............ (G.) | 7 | Sept. 28, '04 | 321 | 18·9 | 6,084 | 5·07 | 363·14 | 72 62 | 8 58 | 81 20 | 1,982 | 11,515 | 941 | 5 | 41 13 | 67·60 | 11·4 | 8·6 | 40 07 |
| Marchioness...... (S.) | 10 | Mar. 10, '04 | 321 | 18·8 | 6,054 | 3·75 | 267·59 | 53 51 | 8 68 | 62 19 | 1,919 | 12,332 | 941 | 5 | 41 32 | 51·30 | 12 | 8 | 20 87 |
| Bloomer .......... (A.) | 5 | " 12, '04 | 326 | 22·4 | 7,311 | 3·93 | 338·10 | 67 62 | 9 75 | 77 37 | 1,775 | 11,810 | 941 | 5 | 39 36 | 57·51 | 11·6 | 8·4 | 38 01 |
| Alice............(G.A.) | 3 | " 20, '04 | 352 | 19·1 | 6,750 | 3·87 | 307·32 | 61 22 | 9 66 | 70 88 | 1,613 | 11,480 | 941 | 5 | 37 35 | 55·33 | 12·1 | 7·9 | 33 53 |
| Laura............(G.A.) | 8 | Feb. 9, '04 | 291 | 27·5 | 8,037 | 3·65 | 309·90 | 61 98 | 11 59 | 73 57 | 1,978 | 11,815 | 941 | 5 | 41 39 | 51·49 | 13·3 | 6·7 | 32 18 |
| Rosy............(G.S.) | 5 | Oct. 5, '03 | 366 | 20·7 | 7,604 | 3·65 | 327 | 65 40 | 10 91 | 76 31 | 2,253 | 11,815 | 941 | 5 | 44 14 | 58·05 | 13·5 | 6·5 | 32 17 |
| Janet............ (S.) | 3 | Nov. 14, '03 | 290 | 13·81 | 5,505 | 4·4 | 284·96 | 56 99 | 7 83 | 64 82 | 2,198 | 11,815 | 941 | 5 | 43 59 | 79·18 | 15·3 | 4·7 | 21 23 |
| Gurta ....... ... (A.) | 4 | " 6, '03 | 328 | 18·6 | 6,130 | 3·67 | 265·19 | 53 03 | 8 79 | 61 82 | 1,923 | 11,815 | 941 | 5 | 40 84 | 66·62 | 15·4 | 4·6 | 20 98 |
| Duchess........ ... (S.) | 3 | Dec. 13, '03 | 275 | 16·56 | 4,556 | 4·15 | 222·44 | 44 48 | 6 49 | 50 97 | 1,883 | 10,525 | 941 | 5 | 37 62 | 82·57 | 16·9 | 3·1 | 13 35 |
| Cherry .... .... (G.S.) | 4 | Sept. 14, '04 | 303 | 14·8 | 4,502 | 4·30 | 227·98 | 45 59 | 6 41 | 52 00 | 1,864 | 11,815 | 941 | 5 | 40 25 | 89· | 17·6 | 2·4 | 11 75 |
| Flecky .......... (A.) | 5 | Mar. 14, '04 | 314 | 15·1 | 4,759 | 3·78 | 212·06 | 42 41 | 6 82 | 49 23 | 1,861 | 11,660 | 941 | 5 | 40 13 | 84·32 | 18 9 | 1·1 | 9 10 |
| Clatford Spot .... (G.) | 10 | June 21, '04 | 308 | 14·09 | 4,342 | 4·27 | 218·55 | 43 71 | 6 18 | 49 89 | 2,346 | 12,125 | 941 | 5 | 45 38 | 1·04 | 20·8 | ..... | 4 51 |
| Alvina .........(G.A.) | 3 | May 22, '04 | 143 | 15·5 | 2,217 | 4·79 | 125·05 | 25 01 | 3 13 | 28 14 | 797 | 7,500 | 941 | 5 | 25 21 | 1·13 | 20·1 | ...... | 2 93 |
| Duchesse......... (C.) | 3 | July 21, '04 | 264 | 14·03 | 3,705 | 3·78 | 164·93 | 32 98 | 5 31 | 38 29 | 1,399 | 11,660 | 941 | 5 | 35 45 | 95·63 | 21·5 | ...... | 2 84 |
| Average ......... | ... | ..... ..... | 309 | ...... | 6,614$\frac{4}{7}$ | ...... | 331·58 | 66 30 | 9 32 | 75 63 | 1,908$\frac{5}{7}$ | 11,582$\frac{11}{28}$ | 929$\frac{4}{7}$ | 5 | 40 41 | ..... | ...... | ...... | 35 22 |

SHORTHORNS.

| Name of Cows. | Age. | Date of dropping last calf. | Number of days in milk. | Daily average yield of milk. | Total milk for year. | Per cent of fat in milk. | Pounds of butter produced in year. | Value of butter at 20 cents per lb. | Value of skim-milk at 15 cents per 100 lbs. | Total value of products. | Amount of meal eaten, valued at 1c. per lb. | Amount of roots and ensilage eaten, valued at $2 per ton. | Amount of hay, valued at $7 per ton. | Months on pasture at $1 per month. | Total cost of feed for year. | Cost to produce 100 lbs. of milk. | Cost to produce 1 lb. butter, skim-milk neglected. | Profit on 1 lb. butter, skim-milk neglected. | Profit on cows during year, labour neglected. | Sex of calf dropped during the year. | Value of calf, or price for which it sold. | Total returns from cow, milk and calf. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Days. | Lbs. | Lbs. | p. c. | Lbs. | $ cts. | $ cts. | $ cts. | Lbs. | Lbs. | Lbs. | Mos | $ cts. | Cts. | Cts. | Cts. | $ cts. | | $ cts. | $ cts. |
| Marchioness.. (S) | 10 | Mar. 10, '04 | 321 | 18·8 | 6,054 | 3·75 | 267·59 | 53 51 | 8 68 | 62 19 | 1,919 | 12,332 | 941 | 5 | 41 32 | 51·30 | 12·0 | 8·0 | 20 87 | Heifer. | v. 75 00 | 137 19 |
| Janet........... | 3 | Nov. 14, '03 | 290 | 13·81 | 5,505 | 4·4 | 284·96 | 56 99 | 7 83 | 64 82 | 2,198 | 11,815 | 941 | 5 | 43 59 | 79·18 | 15·3 | 4·7 | 21 23 | Bull... | s. 100 00 | 164 82 |
| Duchess......... | 3 | Dec. 13, '03 | 275 | 16·56 | 4,556 | 4·15 | 222·44 | 44 48 | 6 49 | 50 97 | 1,883 | 10,525 | 641 | 5 | 37 62 | 82·57 | 16·9 | 3·1 | 13 35 | " ... | v. 100 00 | 150 97 |
| Average..... | .. | .......... | 295 | 16·39 | 5,335 | 4·10 | 258·33 | 51 66 | 7 66 | 59 32 | 2,000 | 11,557 | 841 | 5 | 40 84 | 71·01 | 14·7 | 5·2 | 21 82 | | 91 66 | 150 99 |

AYRSHIRES.

| Name of Cows. | Age. | Date of dropping last calf. | Number of days in milk. | Daily average yield of milk. | Total milk for year. | Per cent of fat in milk. | Pounds of butter produced in year. | Value of butter at 20 cents per lb. | Value of skim-milk at 15 cents per 100 lbs. | Total value of products. | Amount of meal eaten, valued at 1c. per lb. | Amount of roots and ensilage eaten, valued at $2 per ton. | Amount of hay, valued at $7 per ton. | Months on pasture at $1 per month. | Total cost of feed for year. | Cost to produce 100 lbs. of milk. | Cost to produce 1 lb. butter, skim-milk neglected. | Profit on 1 lb. butter, skim-milk neglected. | Profit on cows during year, labour neglected. | Sex of calf dropped during the year. | Value of calf, or price for which it sold. | Total returns from cow, milk and calf. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jessie A.... .... | 10 | Feb. 15, '04 | 313 | 32·2 | 10,086 | 3 77 | 447·85 | 89 57 | 14 45 | 104 02 | 2,486 | 12,120 | 941 | 5 | 46 78 | 46·38 | 10·4 | 9·6 | 57 24 | Heifer. | v. 75 00 | 179 02 |
| Maggie.......... | 8 | Mar. 27, '04 | 300 | 28·6 | 8,595 | 3·76 | 381·03 | 76 20 | 12 02 | 88 22 | 1,965 | 11,810 | 941 | 5 | 41 22 | 47·09 | 10·9 | 9·1 | 47 00 | " .. | v. 50 00 | 138 22 |
| Denty........... | 5 | Feb. 6, '04 | 284 | 27·1 | 7,672 | 4·06 | 367·28 | 73 45 | 10 95 | 84 40 | 1,834 | 11,965 | 941 | 5 | 40 10 | 52·27 | 10·9 | 9·1 | 44 30 | 2 bulls. | s. 55 00 | 139 40 |
| Average..... | .. | .......... | 299 | 29·3 | 8,784 | 3·86 | 398·72 | 79 74 | 12 47 | 92 21 | 2,095 | 11,965 | 941 | 5 | 42 70 | 48·58 | 10·7 | 9·2 | 49·51 | | 60 00 | 152 55 |

GUERNSEYS.

| Name of Cows. | Age. | Date of dropping last calf. | Number of days in milk. | Daily average yield of milk. | Total milk for year. | Per cent of fat in milk. | Pounds of butter produced in year. | Value of butter at 20 cents per lb. | Value of skim-milk at 15 cents per 100 lbs. | Total value of products. | Amount of meal eaten, valued at 1c. per lb. | Amount of roots and ensilage eaten, valued at $2 per ton. | Amount of hay, valued at $7 per ton. | Months on pasture at $1 per month. | Total cost of feed for year. | Cost to produce 100 lbs. of milk. | Cost to produce 1 lb. butter, skim-milk neglected. | Profit on 1 lb. butter, skim-milk neglected. | Profit on cows during year, labour neglected. | Sex of calf dropped during the year. | Value of calf, or price for which it sold. | Total returns from cow, milk and calf. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Itchen Lady...... | 7 | May 4, '04 | 294 | 26·6 | 7,782 | 4·50 | 412·39 | 82 47 | 11 05 | 93 52 | 1,906 | 11,815 | 941 | 5 | 40 67 | 52 26 | 9·8 | 10·2 | 52 85 | Bull... | s. 30 00 | 123 52 |
| Flossy Lyons..... | 4 | Feb. 25, '04 | 319 | 20 | 6,386 | 5·12 | 384·92 | 76 98 | 9 00 | 85 98 | 1,724 | 11,210 | 941 | 5 | 38 25 | 59 89 | 9 9 | 10·1 | 47 73 | Heifer. | v. 35 00 | 120 98 |
| Deanie.......... | 7 | Aug. 27, '04 | 466 | 17·7 | 6,501 | 4·90 | 374·98 | 74 99 | 9 18 | 84 17 | 2,168 | 11,815 | 941 | 5 | 43 29 | 66 59 | 11·6 | 8·4 | 40 88 | Bull... | s. 25 00 | 109 17 |
| Average..... | .. | .......... | 359 | 21·4 | 6,889 | 4·84 | 390·76 | 78·14 | 9·74 | 87·89 | 1,932 | 11,613 | 941 | 5 | 40 73 | 59 58 | 10·4 | 9·5 | 47 15 | | 30 00 | 117 89 |

CANADIANS.

| Name of Cows. | Age. | Date of dropping last calf. | Number of days in milk. | Daily average yield of milk. | Total milk for year. | Per cent of fat in milk. | Pounds of butter produced in year. | Value of butter at 20 cents per lb. | Value of skim-milk at 15 cents per 100 lbs. | Total value of products. | Amount of meal eaten, valued at 1c. per lb. | Amount of roots and ensilage eaten, valued at $2 per ton. | Amount of hay, valued at $7 per ton. | Months on pasture at $1 per month. | Total cost of feed for year. | Cost to produce 100 lbs. of milk. | Cost to produce 1 lb. butter, skim-milk neglected. | Profit on 1 lb. butter, skim-milk neglected. | Profit on cows during year, labour neglected. | Sex of calf dropped during the year. | Value of calf, or price for which it sold. | Total returns from cow, milk and calf. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fortune d'Oka... | 8 | Nov. 27, '04 | 335 | 26 | 8,734 | 4·56 | 468·60 | 93 72 | 10 89 | 104 61 | 2,359 | 11,960 | 941 | 5 | 45 35 | 51 92 | 9·7 | 10·3 | 59 26 | Bull... | s. 30 00 | 123 72 |
| Zamora.......... | 8 | May 24, '04 | 327 | 23·5 | 7,658 | 4·91 | 442·43 | 88 48 | 10 67 | 99 75 | 1,972 | 11,960 | 941 | 5 | 41 48 | 54 16 | 9 3 | 10·7 | 57 67 | Heifer. | v. 50 00 | 138 48 |
| Exilée... ....... | 9 | " 1, '04 | 334 | 25·8 | 8,628 | 4·10 | 416·90 | 83 38 | 12 31 | 95 69 | 2,214 | 11,960 | 941 | 5 | 43 90 | 51 21 | 10·5 | 9·5 | 51 79 | Bull... | s. 25 00 | 108 38 |
| Average..... | .. | .......... | 332 | 25·1 | 8,340 | 4·52 | 442·64 | 88·52 | 11 29 | 99 81 | 2,181 | 11,960 | 941 | 5 | 43 57 | 52 43 | 9·8 | 10·1 | 56 24 | | 35 00 | 123 52 |

## SHORTHORN GRADES.

| Name of Cows. | Age. | Date of dropping last calf. | Number of days in milk. | Daily average yield of milk. | Total milk for year. | Per cent of fat in milk. | Pounds of butter produced in year. | Value of butter at 20c. per lb. | Value of skim-milk at 15c. per 100 lbs. | Total value of product. | Amount of meal eaten, valued at 1c. per lb. | Amount of roots and ensilage eaten, valued at $2 per ton. | Amount of hay, valued at $7 per ton. | Months in pasture at $1 per month. | Total cost of food for year. | Cost to produce 100 lbs. milk. | Cost to produce 1 lb. butter, skim-milk neglected. | Profit on 1 lb. butter, skim-milk neglected. | Profit on cow during year, labour neglected. | Sex of calf dropped during year. | Value of calf or price for which it sold. | Total returns from cow, milk and calf. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Days. | Lbs. | Lbs. | p. c. | Lbs. | $ cts. | $ cts. | $ cts. | Lbs. | Lbs. | Lbs. | Mos | $ cts. | $ cts. | Cts. | Cts. | $ cts. | | $ cts. | $ cts. |
| Rosy .......... | 5 | Oct. 5, '03 | 366 | 20·7 | 7 604 | 3·65 | 327 | 65 40 | 10 91 | 76 31 | 2,253 | 11,815 | 941 | 5 | 44 14 | 58 05 | 13·5 | 6·5 | 32 17 | Bull... | 5 00 | 81 31 |
| Cherry........... | 4 | Sept 14, '04 | 303 | 14·8 | 4,502 | 4·30 | 227·98 | 45 59 | 6 41 | 52 00 | 1,864 | 11,815 | 941 | 5 | 40 25 | 89 00 | 17·6 | 2·4 | 11 75 | " .. | 5 00 | 57 00 |
| Average...... | .. | .... ..... | 334 | 17·7 | 6,053 | 3·97 | 277·49 | 55 49 | 8 66 | 64 15 | 2,058 | 11,815 | 941 | 5 | 42 19 | 73 52 | 15·5 | 4·4 | 21 96 | | 5 00 | 69 15 |

## AYRSHIRE GRADES.

| Name of Cows. | Age. | Date of dropping last calf. | Number of days in milk. | Daily average yield of milk. | Total milk for year. | Per cent of fat in milk. | Pounds of butter produced in year. | Value of butter at 20c. per lb. | Value of skim-milk at 15c. per 100 lbs. | Total value of product. | Amount of meal eaten, valued at 1c. per lb. | Amount of roots and ensilage eaten, valued at $2 per ton. | Amount of hay, valued at $7 per ton. | Months in pasture at $1 per month. | Total cost of food for year. | Cost to produce 100 lbs. milk. | Cost to produce 1 lb. butter, skim-milk neglected. | Profit on 1 lb. butter, skim-milk neglected. | Profit on cow during year, labour neglected. | Sex of calf dropped during year. | Value of calf or price for which it sold. | Total returns from cow, milk and calf. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Countess ........ | 6 | Apl. 2, '04 | 324 | 25·4 | 8,258 | 4· | 389·41 | 77 88 | 11 89 | 89 77 | 1,952 | 11,810 | 941 | 5 | 41 13 | 49 80 | 12·1 | 7·9 | 48 64 | Heifer. | 5 00 | 94 77 |
| Alice ............ | 3 | Mar.20, '04 | 352 | 19·1 | 6,750 | 3·87 | 307·32 | 61 22 | 9 66 | 70 88 | 1,613 | 11,480 | 941 | 5 | 37 35 | 55 33 | 12·1 | 7·9 | 33 53 | Bull... | ........ | 70 88 |
| Laura ..... ..... | 8 | Feb. 9, '04 | 291 | 27·5 | 8,037 | 3·65 | 309·90 | 61 98 | 11 59 | 73 57 | 1,978 | 11,815 | 941 | 5 | 41 39 | 51 49 | 13·3 | 6·7 | 32 18 | " ... | ........ | 73 57 |
| Average...... | .. | ....... | 322 | 24 | 7,681 | 3·84 | 335·54 | 67 02 | 11 04 | 78 07 | 1,847 | 11,701 | 941 | 5 | 39 95 | 52 20 | 12·5 | 7·5 | 38 11 | .... . | 5 00 | 79 74 |

## GUERNSEY GRADES.

| Name of Cows. | Age. | Date of dropping last calf. | Number of days in milk. | Daily average yield of milk. | Total milk for year. | Per cent of fat in milk. | Pounds of butter produced in year. | Value of butter at 20c. per lb. | Value of skim-milk at 15c. per 100 lbs. | Total value of product. | Amount of meal eaten, valued at 1c. per lb. | Amount of roots and ensilage eaten, valued at $2 per ton. | Amount of hay, valued at $7 per ton. | Months in pasture at $1 per month. | Total cost of food for year. | Cost to produce 100 lbs. milk. | Cost to produce 1 lb. butter, skim-milk neglected. | Profit on 1 lb. butter, skim-milk neglected. | Profit on cow during year, labour neglected. | Sex of calf dropped during year. | Value of calf or price for which it sold. | Total returns from cow, milk and calf. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Queenie.......... | 6 | Apr. 5, '04 | 324 | 19·2 | 6,250 | 6.12 | 450·30 | 90·06 | 8·70 | 98·76 | 1,596 | 11,210 | 941 | 5 | 36·97 | 59·28 | 8·2 | 11·8 | 61·79 | Bull... | ........ | 98·76 |
| Bellflower........ | 6 | Apr. 15, '04 | 275 | 25·9 | 7,146 | 4·32 | 363·74 | 72·74 | 10·17 | 82·91 | 1,500 | 11,815 | 941 | 5 | 36·61 | 51·23 | 10·7 | 9·3 | 46·30 | " ... | ........ | 82·91 |
| Alma............ | 3 | Feb. 28, '04 | 312 | 20·1 | 6,291 | 4·88 | 361·82 | 72·36 | 8·89 | 81·25 | 1,776 | 11,515 | 941 | 5 | 39·07 | 62·10 | 10·8 | 9.2 | 42·18 | Heifer. | 2 00 | 83·25 |
| Average...... | .. | .......... | 303 | 21·7 | 6,562 | 5·10 | 391·95 | 78·38 | 9.25 | 87·64 | 1,624 | 11,546 | 941 | 5 | 37·35 | 57·53 | 9·9 | 10·1 | 50·02 | .... . | 2 00 | 88·30 |

DAILY RECORDS.

The effort to interest dairymen in the returns from their individual cows has been continued, and many farmers seem to be awakening to a knowledge of the fact that the improvement of the whole herd demands the study of the unit; that is, a close acquaintance with the expenditure upon the individual cow and the returns from the same.

This can be determined in no other way than by keeping an exact record of the daily milk yield and the daily food consumption.

Forms, similar to the following, for keeping a record of the milk yield are still supplied free on application.

DAIRY MILK RECORD.

Herd belonging to ..........................................
Post Office..........................................
Record for week ending..........................................

(This form supplied free by Live Stock Division, Central Experimental Farm, Ottawa, Ont).

COWS.

| Day. | Time. | | | | | | | | | | | | | | | | | Total for Day. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sunday | Morning | | | | | | | | | | | | | | | | | |
| | Evening | | | | | | | | | | | | | | | | | |
| Monday | Morning | | | | | | | | | | | | | | | | | |
| | Evening | | | | | | | | | | | | | | | | | |
| Tuesday | Morning | | | | | | | | | | | | | | | | | |
| | Evening | | | | | | | | | | | | | | | | | |
| Wednesday | Morning | | | | | | | | | | | | | | | | | |
| | Evening | | | | | | | | | | | | | | | | | |
| Thursday | Morning | | | | | | | | | | | | | | | | | |
| | Evening | | | | | | | | | | | | | | | | | |
| Friday | Morning | | | | | | | | | | | | | | | | | |
| | Evening | | | | | | | | | | | | | | | | | |
| Saturday | Morning | | | | | | | | | | | | | | | | | |
| | Evening | | | | | | | | | | | | | | | | | |
| Total | Week | | | | | | | | | | | | | | | | | |

(Reverse.)

CENTRAL EXPERIMENTAL FARM.

WM. SAUNDERS, *Director.* J. H. GRISDALE, *Live Stock and Agriculture.*

MILK RECORDS.

1. The profitable dairy cow must give over 5,000 pounds of milk each year. To know the value of a cow her total annual yield of milk must be known. The only way to know this is to keep a record of her daily milk yield.

2. The form on the other side of this sheet is intended to help progressive dairy farmers by supplying them with a simple and convenient sheet for the keeping of the milk records of their individual cows. A study of such records will soon indicate which cows should go to the butcher. We would be pleased to receive a summary of your record. If you have no summary forms write us.

3. Such records are being kept by hundreds of successful dairymen to-day. Many of these men attribute their success to the keeping of such records. Why not give the

thing a trial if you are a dairyman? It will increase your milk product. It will lighten your labour, since your interest will be increased in your work, and 'interest lightens labour.' It will show you the unprofitable cow the 'boarder.' You cannot get rid of her too quickly.

4. For weighing the mik a simple spring balance may be secured for from one to three dollars. If your local dealer cannot supply you, write the undersigned for particulars. A small platform scale is fairly convenient, but we find the spring balance preferable.

5. Many farmers keep records of the amount of food fed to individual cows. If you would like to do so, sample forms would be sent free on writing J. H. Grisdale, Agriculturist, Central Experimental Farm, Ottawa, Ont.

## EXPERIMENTS WITH DAIRY COWS.

In reporting upon the following experiments with dairy cows, a few introductory remarks are submitted, a careful reading of which will help in understanding the results.

A careful examination of the daily milk records of many cows shows that for from 2 to 3 months the milk flow increases or remains nearly uniform; for the next 3 or 4 months the decrease is at the rate of about 10 per cent, and then till the end of the lactation period the rate of decrease seems to vary very much, some cows decreasing very rapidly, and others very slowly indeed. It is, therefore, rather difficult to say what the normal rate of decrease in milk flow in a given group of cows really should be, even though the dates of calving were known. It would probably be safe, however, to say that 10 per cent per month was the regular rate of decrease, and taking that rate as the basis, some idea of the influence of the different feeds on the milk flow may be formed.

In estimating the values of rations, hay is charged at $7 per ton; ensilage, turnips, mangels and sugar mangels at $2; sugar beets at $3 per ton, and meal at $20 per ton.

The cows in the different experiments were in some cases dry, in other cases far advanced in the lactation period, and in other cases newly calved.

## ENSILAGE *VS.* MANGELS.

The cows in these groups were all fairly well advanced in lactation and the experiment was in every way satisfactory, no mishap or untoward circumstance arising. It will be observed that while the mangels were practically no better milk producers than the ensilage, the mangel ration cost 1·2 cents more per diem than the ensilage ration. The table is self-explanatory. The 'summaries' are the averages of the results of group 'C' on mangels and group 'D' on mangels, and the same when on ensilage.

ENSILAGE vs. MANGELS FOR MILK PRODUCTION.

| | | METHOD OF FEEDING. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1st period of 2 weeks. | | 2nd period of 2 weeks. | | 3rd period of 2 weeks. | | Summaries. | |
| | | Group C. | Group D. | Group C. | Group D. | Group C. | Group D. | | |
| | | Number in group, 4. | Number in group, 4. | Number in group, 4. | Number in group, 4. | Number in group, 4. | Number in group, 4. | Summary. | Summary. |
| | | Regular Ration. | Regular Ration. | Ensilage, Hay, Meal. | Mangels, Hay, Meal. | Mangels, Hay, Meal. | Ensilage, Hay, Meal. | Mangels, Hay, Meal. | Ensilage, Hay, Meal. |
| Average weight to start | Lbs. | | | 1,024 | 922 | 1,044 | 941 | 983 | 982 |
| Average weight at end of 2 weeks | " | | | 1,044 | 941 | 1,071 | 969 | 1,006 | 1,006 |
| Loss — or gain + | " | | | + 20 | + 19 | + 27 | + 28 | + 23 | + 24 |
| Meal fed group in 1 day | " | 32 | 31 | 30 | 30 | 28½ | 29 | 29¼ | 29½ |
| Hay fed group in 1 day | " | 12 | 12 | 20 | 20 | 20 | 20 | 20 | 20 |
| Ensilage and roots fed group in 1 day | " | 200 | 190 | | | | | | |
| Ensilage fed group in 1 day | " | | | 222 | | | 178 | 271 | 200 |
| Mangels fed group in 1 day | " | | | | 277 | 265 | | | |
| Meal fed in 2 weeks | " | 448 | 434 | 420 | 420 | 399 | 406 | 409 | 413 |
| Hay fed in 2 weeks | " | 168 | 168 | 280 | 280 | 280 | 280 | 280 | 280 |
| Ensilage and roots in 2 weeks | " | 2,800 | 2,660 | | | | | | |
| Mangels in 2 weeks | " | | | | 3,880 | 3,710 | | 3,795 | |
| Ensilage in 2 weeks | " | | | 3,105 | | | 2,495 | | 2,800 |
| Value of food fed group in 2 weeks | $ | 7 87 | 7 59 | 8 28 | 9 06 | 8 68 | 7 53 | 8 87 | 7 91 |
| Value of food fed 1 cow in 1 day | Cts. | 14 | 13·5 | 14·8 | 15·3 | 15·5 | 13·5 | 15·4 | 14·2 |
| Milk produced by group in 2 weeks | Lbs. | 1,204 | 1,162 | 1,015½ | 1,041½ | 972 | 991 | 1,007 | 1,003 |
| First day's milk from group | " | 87½ | 82 | 80 | 79 | 71½ | 72½ | 75 | 71 |
| Second day's milk from group | " | 85½ | 84½ | 82½ | 78½ | 72 | 73 | 75 | 73 |
| Average daily yield of group during 1st week | " | 87 | 85 | 75½ | 75½ | 70½ | 70¾ | 73 | 73 |
| Average daily yield of group during 2nd week | " | 84 | 82 | 70 | 73 | 69½ | 70¾ | 71 | 70½ |
| Average daily yield of group during 2 weeks | " | 86 | 83¾ | 72½ | 74¾ | 70 | 70¾ | 72 | 71½ |
| Next to last day's milk from group | " | 83 | 80 | 69 | 74 | 68 | 68 | 73 | 68½ |
| Last day's milk from group | " | 82 | 76½ | 73 | 74 | 68 | 70 | 73 | 71½ |
| Decrease in rate of daily milk yield in 2 weeks | " | 3 | 5 | 10 | 5 | 4 | 3 | 4½ | 6½ |
| Per cent decrease in rate of daily milk yield | p. c. | 3½ | 6 | 12½ | 6 | 5½ | 4 | 5½ | 8 |

The cows in group 'E' and 'F' seemed to like the dry forage fairly well, and the group ate about 25 per cent more dry matter when so fed, but the yield of milk fell off very rapidly.

The results seem to indicate quite strongly the advisability of every dairy farmer having some succulent feed to give to his milch cows in addition to the hay and meal.

DRY FORAGE vs. SUCCULENT FORAGE.

| — | | Method of Feeding. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1st period of 2 weeks. | | 2nd period of 2 weeks. | | 3rd period of 2 weeks. | | Summaries. | |
| | | Group E. | Group F. | Group E. | Group F. | Group E. | Group F. | Summary. | Summary. |
| | | Number in group, 4. | Number in group, 4. | Number in group, 4. | Number in group, 4. | Number in group, 4. | Number in group, 4. | | |
| | | Roots and Ensilage, Meal, Hay. | Roots and Ensilage, Hay, Meal. | Dry Feed. | Succulent Feed. | Succulent Feed. | Dry Feed. | Dry Feed. | Succulent Feed. |
| Average weight to start | Lbs. | .......... | .......... | 994 | 972 | 1,007 | 1,049 | 1,022 | 988 |
| Average weight at end of 2 weeks | " | .......... | .......... | 1,007 | 1,004 | 1,049 | 1,016 | 1,011 | 1,027 |
| Loss or gain, + | " | .......... | .......... | +13 | +32 | +42 | —33 | —11 | +39 |
| Meal fed group in 1 day | " | 30 | 29 | 31 | 30½ | 29 | 30 | 30½ | 29¾ |
| Hay " | " | 12 | 12 | 82 | 20 | 20 | 80 | 81 | 20 |
| Ensilage and roots fed group in 1 day | " | 200 | 190 | .......... | 252 | 242 | .......... | .......... | 247 |
| Meal fed in 2 weeks | " | 420 | 406 | 434 | 427 | 406 | 420 | 427 | 416 |
| Hay " | " | 168 | 168 | 1,150 | 280 | 280 | 1,120 | 1,135 | 280 |
| Ensilage and roots fed in 2 weeks | " | 2,800 | 2,660 | .......... | 3,530 | 3,388 | .......... | .......... | 3,459 |
| Value of food fed group in 2 weeks | $ | 7 59 | 7 25 | 8 37 | 8 78 | 8 42 | 8 12 | 8 25 | 8 60 |
| " 1 cow in 1 day | Cts. | 13·5 | 12·75 | 15 | 15·6 | 15 | 14·7 | 14·9 | 15·3 |
| Milk produced by group in 2 weeks | Lbs. | 1,286 | 1,023½ | 998 | 888½ | 944 | 819 | 906 | 916 |
| First day's milk from group | " | 92½ | 73 | 90 | 68 | 70 | 60½ | 75 | 69 |
| Second " | " | 93½ | 75 | 85½ | 68 | 70½ | 60½ | 73 | 69¼ |
| Average daily yield of milk from group during 1st week. | " | 95 | 74¾ | 77¾ | 66 | 69 | 58 | 68 | 67½ |
| " " " 2nd " | " | 90 | 71¾ | 65 | 61¾ | 66 | 56 | 60½ | 64 |
| " " " 2 weeks. | " | 92 | 73¾ | 71¼ | 62 | 67½ | 57½ | 64½ | 65 |
| Next to last day's milk from group | " | 89½ | 69½ | 67 | 62½ | 65½ | 56 | 61½ | 64 |
| Last day's milk from group | " | 87 | 69 | 69 | 62½ | 65½ | 55 | 62 | 64 |
| Decrease in rate of daily milk yield in 2 weeks | " | 5 | 5 | 20 | 5½ | 4½ | 5 | 13 | 5 |
| Per cent decrease in rate of daily milk yield | p. c. | 5½ | 6⅔ | 22 | 8 | 6½ | 8½ | 17 | 7 |

ROOTS AND ENSILAGE, TURNIPS AND SUGAR MANGELS

and

ROOTS AND ENSILAGE, SUGAR MANGELS AND SUGAR BEETS.

The experiments with sugar beets, sugar mangels and turnips may hardly be said to be as instructive as the previous experiments. They were not carried out quite so fully for two reasons: the supply of sugar beets was quite limited, and the effects of the turnips on the butter was very injurious.

So far as turnips are concerned, the results show them more expensive than ensilage and roots and not much more effective, since the natural rate of decrease is not retarded. They were fed in large quantities and rendered the butter quite unsaleable When fed after the milk was drawn night and morning the effect was not quite so noticeable but still sufficient to render the butter unpalatable.

Sugar beets was the only succulent food fed that succeeded in entirely overcoming the normal rate of decrease and in even turning it into an increase of about 3½ per cent in two weeks. But the cost was increased although the amount fed was less than in the case of sugar mangels.

ROOTS AND ENSILAGE, TURNIPS, SUGAR MANGELS AND SUGAR BEETS.

| — | Method of Feeding. | | | | | |
|---|---|---|---|---|---|---|
| | Group G. | | | Group H. | | |
| | 1st Period. | 2nd Period | 3rd Period | 1st Period. | 2nd Period | 3rd Period |
| | Regular Ration. | Turnips, Hay, Meal | Sugar, Mangels, Hay, Meal | Regular Ration. | Sugar Mangels, Hay, Meal | Sugar Beets, Hay, Meal |
| | Number in group, 4. | Number in group, 4. | Number in group, 4. | Number in group, 3. | Number in group 3. | Number in group 3. |
| Average weight to start..........Lbs | ......... | 1,009 | 1,016 | ......... | 1,003 | 1,002 |
| Average weight at end of 2 weeks.. " | ......... | 1,016 | 1,051 | ......... | 1,002 | 1,037 |
| Loss — or gain + ................ " | ......... | +7 | +35 | ......... | —1 | +35 |
| Meal fed group in 1 day........... " | 30 | 25½ | 23 | 22 | 22½ | 20 |
| Hay " " .......... " | 12 | 20 | 20 | 9 | 15 | 15 |
| Roots and ensilage fed group in 1 day " | 200 | ......... | ......... | 150 | ......... | ......... |
| Sugar mangels " " " | ......... | ......... | 280 | ......... | 218 | ......... |
| Turnips " " " | ......... | 277 | ......... | ......... | ......... | ......... |
| Sugar beets " " " | ......... | ......... | ......... | ......... | ......... | 210 |
| Meal fed in 2 weeks.............. " | 420 | 357 | 322 | 308 | 315 | 280 |
| Hay " ............ " | 168 | 280 | 280 | 126 | 210 | 210 |
| Roots and ensilage fed in 2 weeks.. " | 2,800 | ......... | ......... | 2,100 | ......... | ......... |
| Sugar mangels " .. " | ......... | ......... | 3,920 | ......... | 3,050 | ......... |
| Sugar beets fed in 2 weeks ...... " | ......... | ......... | ......... | ......... | ......... | 2,940 |
| Turnips " " ...... " | ......... | 3,880 | ......... | ......... | ......... | ......... |
| Value of food fed group in 2 weeks. $ | 7.59 | 8.43 | 8.12 | 5.62 | 6.94 | 7.94 |
| " " 1 cow in 1 day.... Cts. | 13·5 | 15 | 14·5 | 13·3 | 16·5 | 18·8 |
| Milk produced by group in 2 weeks Lbs. | 928 | 806 | 692½ | 836½ | 760 | 835½ |
| First day's milk from group....... " | 71½ | 60½ | 54 | 60½ | 59 | 57½ |
| Second " " ...... " | 71 | 59½ | 55 | 63 | 57 | 58½ |
| Average daily yield of group during 1st week .................... " | 68½ | 61 | 50½ | 61½ | 55½ | 58 |
| Average daily yield of group during 2nd week...................... " | 64½ | 54 | 48½ | 57¾ | 54 | 61½ |
| Average daily yield of group during 2 weeks. ... ............ " | 66¼ | 57¾ | 50 | 60 | 54 | 60 |
| Next to last day's milk from group " | 64 | 53 | 48½ | 57 | 54 | 60½ |
| Last day's milk from group........ " | 62½ | 55 | 48 | 58 | 56 | 60 |
| Decrease in rate of daily milk yield in 2 weeks ................... " | 8 | 6 | 6 | 4½ | 1 | increase 2 |
| Per cent decrease in rate of daily milk yield.... ...............p. c. | 11 | 10 | 11 | 7 | 1½ | 3½ |

TWO FEEDS *vs.* THREE FEEDS DAILY.

It is the regular practice here to feed the dairy cows as well as all other cattle twice a day as follows:—roots, ensilage and meal at 5.30 o'clock, first thing in the morning, followed by hay in about an hour and a half, in the afternoon about 3.30 o'clock the other half of the roots and ensilage and meal is given, and shortly after 5 o'clock the rest of the hay is fed. The meal is mixed with the roots and ensilage after it is before the animal and the hay is fed uncut.

Many feeders claim that it is better to feed three times in the day rather than twice even though no more food be fed. The following experiment would seem to indicate that two feeds a day is quite as effective as three feeds.

In lot 'B' one of the cows calved during the preliminary or check fortnight, but as this happened before the real experiment began, it does not affect the results as each group is fed each way.

TWO FEEDS vs. THREE FEEDS DAILY.

| | METHOD OF FEEDING. | | | | | | SUMMARIES. | |
|---|---|---|---|---|---|---|---|---|
| | 1st period of 2 weeks. | | 2nd period of 2 weeks. | | 3rd period of 2 weeks. | | | |
| — | Group A. | Group B. | Group A. | Group B. | Group A. | Group B. | Summary. | Summary. |
| | 2 feeds. | 2 feeds. | 2 feeds a day. | 3 feeds a day. | 3 feeds a day. | 2 feeds a day. | 3 feeds. | 2 feeds. |
| | Number in group, 4. | Number in group, 4. | Number in group, 4. | Number in group, 4. | Number in group, 4. | Number in group, 4. | Number in group, 4. | Number in group, 4. |
| Average weight to start | ... | ... | 1,442½ | 1,212½ | 1,461 | 1,226 | 1,337 lbs. | 1,334 |
| Average weight at end 2 weeks | ... | ... | 1,461 | 1,226 | 1,462 | 1,227 | 1,344 " | 1,344 |
| Loss — or gain + | ... | ... | +19 | +14 | +1 | +1 | + 7 | +10 |
| Meal fed group in 1 day | 29 | 27 | 24½ | 28⅓ | 25 | 28 | 26½ lb. | 26¼ |
| Hay " | 12 | 12 | 20 | 20 | 20 | 20 | 20 | 20 |
| Ensilage and roots fed group in 1 day | 200 | 180 | 277 | 276 | 237 | 250 | 256 | 263 |
| Mangels " " | ... | ... | ... | ... | ... | ... | ... | ... |
| Turnips " " | ... | ... | ... | ... | ... | ... | ... | ... |
| Sugar beets " " | ... | ... | ... | ... | ... | ... | ... | ... |
| Sugar mangels " " | ... | ... | ... | ... | ... | ... | ... | ... |
| Ensilage " " | ... | ... | ... | ... | ... | ... | ... | ... |
| Meal fed group in 2 weeks | 406 | 378 | 342 | 399 | 350 | 392 | 374 | 367 |
| Hay " " | 168 | 168 | 280 | 280 | 280 | 280 | 280 | 280 |
| Ensilage and roots fed group in 2 weeks | 2,800 | 2,520 | 3,881 | 3,861 | 3,320 | 3,498 | 3,590 | 3,689 |
| Value of feed fed group " | $7 45 | $6 89 | $8 28 | $8 83 | $7 80 | $8 40 | $8 32 | $8 34 |
| Value of feed fed 1 cow in 1 day | 13·25 | 12·3 | 14·1cts. | 15·8cts. | 14cts. | 15cts. | 15 cts. | 14·5 |
| Milk produced by group in 2 weeks | 334 | 529 | 289 lbs. | 743 | 235 | 724 | 439 | 506 |
| First day's milk from group | 26½ | 39½ | 22 " | 54 | 18 | 53 | 36 | 37½ |
| Second " " | 26 | 39½ | 21 " | 53½ | 19 | 52½ | 36 | 37 |
| Average daily yield of group during 1st week | 25½ | 39 | 21½ " | 53¾ | 17 | 51½ | 35½ | 36½ |
| " " 2nd " | 22 | 36½ | 19½ 2 | 52¼ | 16½ | 52 | 34½ | 36 |
| " " 2 weeks | 24 | 37¾ | 20½ " | 53 | 16¾ | 51¾ | 34½ | 36 |
| Next to last day's milk from group | 22 | 33½ | 19 " | 51½ | 16 | 50½ | 34 | 35 |
| Last day's milk from group | 22 | 33½ | 18 " | 55½ | 15 | 51 | 35 | 34½ |
| Decrease in rate of daily milk yield in 2 weeks | 4 | 6 | 2 " | —0 | 3 | 1 | 1½ | 1½ |
| Per cent decrease in rate of daily milk yield | 16% | 15% | 9% | ... | 16⅔% | 2% | 8% | 6% |

REFUSE APPLES AS FEED FOR MILCH COWS.

Every season the disposition to be made of low grade apples is a matter of more or less moment to many farmers. To be in a position to give some exact data as to their value as food for at least some classes of live stock, a few experiments in feeding them were conducted here in the autumn. Among others was one to study their effect upon milk secretion and upon the health of dairy cattle.

Four grade cows about six months in milk were selected. They were fed on the usual ration of ensilage, pulped roots and hay for two weeks, then put on a ration of meal, hay, ensilage and roots and apples.

Below are submitted a few particulars.

## FIRST PERIOD.

NO APPLES.

| | | | |
|---|---|---|---|
| Number of cows in experiment | | 4 | |
| Average ration fed each cow during 2 weeks previous to apple feeding experiment and 2 weeks after apple feeding experiment. | Ensilage and roots | 50 | lbs. |
| | Hay | 4 | " |
| | Meal | 7½ | " |
| Feed consumed by group in average 2 weeks | Ensilage and roots | 2,800 | " |
| | Hay | 224 | " |
| | Meal | 420 | " |
| Value of feed in average 2 weeks | | $ 7.78 | |
| Cost to feed 1 cow 1 day | | 13·9 | cts. |
| Milk yielded by group in average 2 weeks | | 1,353 | lbs. |
| Daily average for cow during 2 weeks | | 24·2 | " |

## SECOND PERIOD.

APPLES IN RATION.

| | | | |
|---|---|---|---|
| Average ration for each cow during 2 weeks on experiment | Apples | 25 | " |
| | Roots and ensilage | 20 | " |
| | Hay | 4 | " |
| | Meal | 7½ | " |
| Feed consumed by group in 2 weeks while experiment lasted | Apples | 1,400 | " |
| | Roots and ensilage | 1,120 | " |
| | Hay | 224 | " |
| | Meal | 420 | " |
| Value of feed, other than apples, fed during 2 weeks | | $ 6.10 | |
| Cost to feed one cow 1 day (apples not valued) | | 10·9 | cts. |
| Milk yielded by group in 2 weeks while eating apples | | 1,395 | " |
| Daily average for cow during 2 weeks | | 24·9 | " |
| Difference in milk yield in favour of apple ration, for 2 weeks | | 42 | " |
| Average weight of cows when going on apple feeding period | | 985 | " |
| Average weight of cows at end of apple feeding period | | 1,008 | " |
| Gain in weight on average | | 23 | " |
| Average weight at end of last 2 weeks | | 992 | " |
| Loss in average weight during 2 weeks | | 16 | " |

It is only fair to credit the refuse apples as being worth the value of the food saved in the 2 weeks. On such a basis, therefore, refuse apples may be valued at $2.40 per ton, or about 7 cents per bushel, when roots and ensilage are valued at $2 per ton for cattle feed.

By way of comment it might be added that the cows seemed to relish the apples, which were of different sorts, and to thrive upon them as shown by the quite considerable gain of 23 pounds per cow made in 14 days while on apples, whereas during the subsequent 2 weeks a loss of 16 pounds per cow is shown. The health of the cows seemed to be very favourably affected by the apples, as might be inferred from the above.

Calves given a few of the apples each day seemed to like them, and did well on them.

## BEEF PRODUCTION.

### EXPERIMENTS IN 1903-4.

The lines of experiment followed in the winter of 1903-4 were:—Influence of age on cost of beef; influence of manner of housing, *i.e.*, feeding loose vs. feeding tied; baby beef; values of feeds.

On the whole the steer feeding operations may be considered successful from the financial point of view since the selling price covered the cost of the steers, the cost of the feed at market prices, and left a fair margin for profit. Full particulars are given in the group reports.

In conducting feeding operations the farmer may seldom expect to make much over and above market prices for his feeds, but he will, of course, have saved himself the trouble of marketing the feeds and will have retained on his farm a large amount of material for fertilizing purposes without which it is practically impossible to long farm successfully in Canada.

### LOOSE VS. TIED.

The experiment of feeding lots of steers loose as compared with feeding similar lots tied has been continued as indicated above and is concluded. The results in 1903-4 are decidedly in favour of loose box feeding. The loose box fed lots gained on the average 311 pounds per steer in 129 days, while the tied steers gained 275 lbs. in 129 days. The loose box steers put on flesh at a cost of \$4.76 per 100 lbs., while the tied lots cost \$5.39 per 100 lbs. gain in live weight.

*Lot 'A'—(Three-year-olds)—Loose.*

| | | |
|---|---|---|
| Number of steers in lot | 8 | |
| First weight, gross | 9,888 | lbs. |
| First weight, average | 1,236 | " |
| Finished weight, gross | 12,240 | " |
| Finished weight, average | 1,530 | " |
| Total gain in 129 days | 2,352 | " |
| Average gain per steer | 294 | " |
| Daily gain for lot, 8 steers | 18·24 | " |
| Daily gain per steer | 2·28 | " |
| Gross cost of feed | $ 122 89 | |
| Cost of 100 pounds gain | 5 22 | |
| Cost of steers, 9,888 lbs. at $4 per 100 lbs | 395 52 | |
| Total cost to produce beef, $395.52 + $122..89 | 518 41 | |
| Sold, 12,240 lbs. at $5 per 100 lbs., less 5 per cent | 581 40 | |
| Profit on lot | 62 99 | |
| Net profit per steer | 7 87 | |
| Average buying price per steer | 49 44 | |
| Average selling price per steer | 72 67 | |
| Average increase in value | 23 23 | |
| Average cost of feed per steer | 15 36 | |

| | |
|---|---|
| Amount of meal eaten by lot of 8 steers | 4,127 lbs. |
| Amount of ensilage and roots | 49,728 " |
| Amount of hay | 6,328 " |
| Amount of straw eaten | 4,872 " |

*Lot 'B'—(Three-year-olds)—Tied.*

| | |
|---|---|
| Number of steers in lot | 9 |
| First weight, gross | 11,097 lbs. |
| First weight, average | 1,233 " |
| Finished weight, gross | 13,563 " |
| Finished weight, average | 1,507 " |
| Total gain in 129 days | 2,466 " |
| Average gain per steer | 274 " |
| Daily gain for lot, 9 steers | 19·08 " |
| Daily gain per steer | 2·12 " |
| Gross cost of feed | $ 137 78 |
| Cost of 100 pounds gain | 5 59 |
| Cost of steers, 11,097 lbs. at $4 per 100 lbs. | 443 88 |
| Total cost to produce beef, $443.88 + $137.78 | 581 66 |
| Sold, 13,563 lbs. at $5 per 100 lbs., less 5 per cent. | 644 25 |
| Profit on lot | 62 59 |
| Net profit per steer | 6 95 |
| Average buying price per steer | 49 32 |
| Average selling price per steer | 71 58 |
| Average increase in value | 22 26 |
| Average cost of feed per steer | 15 31 |
| Amount of meal eaten by lot of 9 steers | 4,662 lbs. |
| Amount of ensilage and roots | 55,536 " |
| Amount of hay | 7,119 " |
| Amount of straw eaten | 5,355 " |

*Lot 'C'—(Two-year-olds)—Tied.*

| | |
|---|---|
| Number of steers in lot | 9 |
| First weight, gross | 9,216 lbs. |
| First weight, average | 1,024 " |
| Finished weight, gross | 11,709 " |
| Finished weight, average | 1,301 " |
| Total gain in 129 days | 2,493 " |
| Average gain per steer | 277 " |
| Daily gain for lot, 9 steers | 19·35 " |
| Daily gain per steer | 2·15 " |
| Gross cost of feed | $ 128 40 |
| Cost of 100 pounds gain | 5 16 |
| Cost of steers, 9,216 lbs. at $4 per 100 lbs. | 368 64 |
| Total cost to produce beef, $368.64 + $128.40 | 479 04 |
| Sold, 11,709 lbs. at $5 per 100 lbs., less 5 per cent. | 556 20 |
| Profit on lot | 59 16 |
| Net profit per steer | 6 57 |
| Average buying price per steer | 40 96 |
| Average selling price per steer | 61 80 |
| Average increase in value | 20 84 |
| Average cost of feed per steer | 14 25 |
| Amount of meal eaten by lot of 9 steers | 4,613 lbs. |
| Amount of ensilage and roots | 47,943 " |
| Amount of hay | 7,219 " |
| Amount of straw | 4,536 " |

*Lot 'D'—(Two-year-olds)—Loose.*

| | |
|---|---|
| Number of steers in lot | 8 |
| First weight, gross | 7,736 lbs. |
| First weight, average | 967 " |
| Finished weight, gross | 10,424 " |
| Finished weight, average | 1,303 " |
| Total gain in 129 days | 2,516 " |
| Average gain per steer | 327 " |
| Daily gain for lot, 8 steers | 21·24 |
| Daily gain per steer | 2·53 |
| Gross cost of feed | $ 122 89 |
| Cost of 100 pounds gain | 4 30 |
| Cost of steers, 7,736 lbs. at $3.90 per 100 lbs | 294 00 |
| Total cost to produce beef, $294 + $122.89 | 416 89 |
| Sold, 10,424 lbs. at $4.85 per 100 lbs., less 5 per cent | 480 29 |
| Profit on lot | 63 40 |
| Net profit per steer | 7 92 |
| Average buying price per steer | 36 75 |
| Average selling price per steer | 60 03 |
| Average increase in value | 23 28 |
| Average cost of feed per steer | 15 36 |
| Amount of meal eaten by lot of 8 steers | 4,102 lbs. |
| Amount of ensilage and roots | 43,110 " |
| Amount of hay | 6,328 " |
| Amount of straw eaten | 3,032 " |

INFLUENCE OF AGE ON COST OF BEEF.

*Cost of producing Beef with three-year-olds, two-year-olds, yearlings, six months' calves and new-born calves.*

The experiments to gain some data as to the influence of age upon the cost of producing a pound of beef have been continued and are now concluded.

Lots of animals of as nearly uniform type and breeding as possible were selected and fed such rations as were found to suit them best. The roughage ration in each case consisted of roots, ensilage and hay, the concentrates fed to three-year-olds, two-year-olds, and yearlings was gluten meal. The calves were fed a meal ration made up of oats, pease, barley, oil meal and gluten mixed in different proportions at different periods.

Full statements of the particulars in connection with each lot will be found below. A few of the more important particulars are grouped for comparison, as follows:—

| Ages. | Daily Gain. | Gain in 129 days. | Cost 100 lbs. Gain. |
|---|---|---|---|
| | Lbs. | Lbs. | $ cts. |
| Three-year-olds | 2·28 | 294 | 5 22 |
| Two-year-olds | 2·53 | 327 | 4 30 |
| Yearlings | 1·9 | 242 | 5 62 |
| Six month calves | 1·75 | 267 | 4 48 |
| Skim-milk calves, new born | 1·68 | 360 | 2 77 |

INFLUENCE OF AGE OF STEERS ON COST OF PRODUCTION OF BEEF.

*Lot 'E'—(Three-year-olds)—Loose.*

| | | |
|---|---|---|
| Number of steers in lot | 8 | |
| First weight, gross | 9,888 | lbs. |
| First weight, average | 1,236 | " |
| Finished weight, gross | 12,240 | " |
| Finished weight, average | 1,530 | " |
| Total gain in 129 days | 2,352 | " |
| Average gain per steer | 294 | " |
| Daily gain for lot, 8 steers | 18·24 | " |
| Daily gain per steer | 2·28 | " |
| Gross cost of feed | $ 122 89 | |
| Cost of 100 pounds gain | 5 22 | |
| Cost of steers, 9,888 lbs. at $4 per 100 lbs | 395 52 | |
| Total cost to produce beef, $395.52 + $122.89 | 518 41 | |
| Sold, 12,240 lbs. at $5 per 100 lbs., less 5 per cent | 581 40 | |
| Profit on lot | 62 99 | |
| Net profit per steer | 7 87 | |
| Average buying price per steer | 49 44 | |
| Average selling price per steer | 72 76 | |
| Average increase in value | 23 23 | |
| Average cost of feed per steer | 15 36 | |
| Amount of meal eaten by lot of 8 steers | 4,127 | " |
| Amount of ensilage and roots | 49,728 | " |
| Amount of hay | 6,328 | " |
| Amount of straw eaten | 4,872 | " |

*Lot 'F'—(Two-year-olds)—Loose.*

| | | |
|---|---|---|
| Number of steers in lot | 8 | |
| First weight, gross | 7,736 | lbs. |
| First weight, average | 967 | " |
| Finished weight, gross | 10,424 | " |
| Finished weight, average | 1,303 | " |
| Total gain in 129 days | 2,516 | " |
| Average gain per steer | 327 | " |
| Daily gain for lot, 8 steers | 21·24 | " |
| Daily gain per steer | 2·53 | " |
| Gross cost of feed | $ 122 89 | |
| Cost of 100 pounds gain | 4 30 | |
| Cost of steers, 7,736 lbs. at $3.90 per 100 lbs | 294 00 | |
| Total cost to produce beef, $294 + $122.89 | 416 89 | |
| Sold, 10,424 lbs. at $4.85 per 100 lbs., less 5 per cent | 480 29 | |
| Profit on lot | 63 40 | |
| Net profit per steer | 7 92 | |
| Average buying price per steer | 36 75 | |
| Average selling price per steer | 60 03 | |
| Average increase in value | 23 28 | |
| Average cost of feed per steer | 15 36 | |
| Amount of meal eaten by lot of 8 steers | 4,102 | lbs. |
| Amount of ensilage and roots | 43,110 | " |
| Amount of hay | 6,328 | " |
| Amount of straw eaten | 3,032 | " |

*Lot 'G'—(Yearlings)—Loose.*

| | |
|---|---|
| Number of steers in lot | 8 |
| First weight, gross | 6,464 lbs. |
| First weight ,average | 808 " |
| Finished weight, gross | 8,400 " |
| Finished weight, average | 1,050 " |
| Total gain in 129 days | 1,936 " |
| Average gain per steer | 242 " |
| Daily gain for lot, 8 steers | 15·2 |
| Daily gain per steer | 1·9 |
| Gross cost of feed | $ 108 80 |
| Cost of 100 pounds gain | 5 62 |
| Cost of steers, 6,464 lbs. at $3.50 per 100 lbs. | 226 24 |
| Total cost to produce beef, $226.24 + $108.80 | 335 04 |
| Sold, 8,400 lbs. at $4.75 per 100 lbs., less 5 per cent. | 379 05 |
| Profit on lot | 44 01 |
| Net profit per steer | 5 50 |
| Average buying price per steer | 28 28 |
| Average selling price per steer | 47 43 |
| Average increase in value | 19 15 |
| Average cost of feed per steer | 13 60 |
| Amount of meal eaten by lot of 8 steers | 4,102 lbs. |
| Amount of ensilage and roots | 38,360 " |
| Amount of hay | 6,104 " |
| Amount of straw eaten | 4,032 " |

*Lot 'H'—(Calves over 6 months)—Loose.*

| | |
|---|---|
| Number of steers in lot | 5 |
| First weight, gross | 1,930 lbs. |
| First weight, average | 386 " |
| Finished weight, gross | 3,265 " |
| Finished weight, average | 653 " |
| Total gain in 152 days | 1,335 " |
| Average gain per steer | 267 " |
| Daily gain for lot, 5 steers | 8·75 " |
| Daily gain per steer | 1·75 " |
| Gross cost of feed for 152 days | $ 59 83 |
| Cost of 100 pounds gain | 4 48 |
| Average cost of feed per steer for 152 days | 11 96 |
| Amount of meal eaten by lot of 5 steers | 2,674 lbs. |
| Amount of ensilage and roots | 20,377 " |
| Amount of hay | 1,820 " |
| Amount of straw eaten | 980 " |
| Amount of sugar beet pulp and molasses (dried) | 343 " |

*Lot 'I'—(Calves under 6 months)—Loose.*

| | |
|---|---|
| Number of steers in lot | 6 |
| First weight, gross | 740 lbs. |
| First weight, average | 123 " |
| Finished weight, gross | 2,900 " |
| Finished weight, average | 483 " |
| Total gain in 214 days | 2,160 " |
| Average gain per steer | 360 " |
| Daily gain for lot, 6 steers | 10·08 " |
| Daily gain per steer | 1·68 " |

| | |
|---|---|
| Gross cost of feed | $ 59 83 |
| Cost of 100 pounds gain | 2 77 |
| Average cost of feed per steer | 9 97 |
| Amount of meal eaten by lot of 6 steers | 2,361 lbs. |
| Amount of ensilage and roots | 9,240 " |
| Amount of hay | 1,512 " |
| Green feed | 9,408 " |

### BABY BEEF.

The fourth and fifth lots of calves of the series of baby beef experiments are now under way. It is proposed to end this experiment when the present lots are slaughtered. Since a full discussion of the matter will be necessary when the final lots are reported upon, no comment is made upon the lots now being fed and herewith reported upon up to date.

*Lot 'J'—(Yearlings)—Fattening Lot.*

| | |
|---|---|
| Number of steers in lot | 5 |
| First weight, gross | 1,930 lbs. |
| First weight, average | 386 " |
| Last weight, gross | 4,950 " |
| Last weight, average | 990 " |
| Total gain in 365 days | 3,020 " |
| Average gain per steer | 604 " |
| Daily gain for lot, 5 steers | 8·25 " |
| Daily gain per steer | 1·65 " |
| Gross cost of feed | $108 46 |
| Cost of 100 lbs. gain | 3 59 |
| Average cost of feed per steer | 21 69 |
| Amount of meal eaten by lot of 5 steers | 4,699 " |
| Amount of ensilage and roots | 40,862 " |
| Amount of hay | 3,370 " |
| Amount of straw | 1,540 " |
| Amount sugar beet pulp (dried) | 378 " |

Meal consumed consisted of : Oats, 2,091 lbs.; oil meal, 937 lbs.; bran, 1,027 lbs.; and gluten, 644 lbs.

*Lot 'K'—(Yearlings)—Limited Ration Lot.*

| | |
|---|---|
| Number of steers in lot | 5 |
| First weight, gross | 1,760 lbs. |
| First weight, average | 325 " |
| Finished weight, gross | 3,690 " |
| Last weight, average | 738 " |
| Total gain in 365 days | 1,930 " |
| Average gain per steer | 386 " |
| Daily gain for lot, 5 steers | 5·30 " |
| Daily gain per steer | 1·06 " |
| Gross cost of feed | $63 68 |
| Cost of 100 lbs. gain | 3 30 |
| Average cost of feed per steer | 12 73 |
| Amount of meal eaten by lot of 5 steers | 898 lbs. |
| Amount of ensilage and roots | 40,370 " |
| Amount of hay | 3,277 " |
| Amount of straw eaten | 1,190 " |
| Amount of potatoes | 816 " |
| On pasture 6 months | 36 mos. |

Meal consumed consisted of : Oats, 387 lbs.; gluten, 255½ lbs.; oil meal, 101½ lbs.; bran, 154.

*Lot 'L'—(Steer Calves)—Fattening Ration.*

| | |
|---|---|
| Number of steers in lot | 6 |
| First weight, gross | 740 lbs. |
| First weight, average | 123 " |
| Last weight, gross | 2,900 " |
| Last weight, average | 483 " |
| Total gain in 214 days | 2,160 " |
| Average gain per steer | 360 " |
| Daily gain for lot, 6 steers | 10·08 " |
| Daily gain per steer | 1·68 " |
| Gross cost of feed | $ 59 83 |
| Cost of 100 lbs. gain | 2 77 |
| Average cost of feed per steer | 9 97 |
| Amount of meal eaten by lot of 6 steers | 2,025 lbs. |
| Amount of roots and ensilage | 9,240 " |
| Amount of hay | 1,512 " |
| Green feed | 9,408 " |

Meal consumed consisted of : Oats, 780 lbs.; oil meal, 171 lbs.; barley meal, 336; and bran, 738.

*Lot 'M'—(Steer Calves)—Limited Ration Lot.*

| | |
|---|---|
| Number of steers in lot | 6 |
| First weight, gross | 490 lbs. |
| First weight, average | 81 " |
| Last weight, gross | 2,530 " |
| Last weight, average | 421 " |
| Total gain in 214 days | 2,040 " |
| Average gain per steer | 340 " |
| Daily gain for lot, 6 steers | 9·53 " |
| Daily gain per steer | 1·58 " |
| Gross cost of feed | $ 57 90 |
| Cost of 100 lbs. gain | 2 83 |
| Average cost of feed per steer | 9 65 |
| Amount of meal eaten by lot of 6 steers | 1,878 lbs. |
| Amount of ensilage and roots | 10,842 " |
| Amount of hay | 1,599 " |
| Amount of green feed | 7,266 " |

Meal consumed consisted of : Oats, 780 lbs.; oil meal, 96; barley meal, 273; bran, 729.

## SUGAR BEET PULP.

'Improved Molasses Cattle Feed,' the name under which the Dresden Beet Sugar Manufacturing Company placed the combined dried sugar beet pulp and residual molasses from their factory upon the market, is a feed that has received a fairly thorough and very careful test during the past winter months.

Before entering into a full report of the experiments conducted it may be stated in a general way that this preparation is one that, according to shipments received here lacks in uniformity of composition. The molasses would appear to have been mixed with the pulp in an irregular way so that when feeding it to animals there is not likely to be much uniformity in the composition of succeeding portions fed. This peculiarity is, of course, decidedly objectionable, especially where it is fed in any considerable quantities per diem.

It is objectionable in this, that the effect it will have upon the digestive organs of the animal fed cannot be counted upon. The molasses part of the preparation is somewhat laxative in character and when it is in excess, as occurs occasionally, the animal's digestive organs are more or less deranged for a longer or shorter period. The average feeder would be quite unlikely to note the excess of molasses by looking at the feed.

Where fed in small quantities, say 1 to 3 lbs. per diem, to either calves or mature cattle, however, this peculiarity is of no consequence.

### VALUE OF PRODUCT.

We have found the preparation of particular value for feeding to young steers or beef animals. Its value lies in its extreme palatability. It serves to whet the appetite of the otherwise sated fatting calves and induces them to eat not only the portion of Improved Molasses Cattle Feed fed them in excess of the previous ration but quite frequently seems to cause them to eat more of other and possibly more fattening feeds. It is in this direction, that is as an appetiser, that the future of the feed lies, if our experiments count for anything.

### EXPERIMENTS WITH DAIRY COWS.

It was fed to dairy cows both in excess of the normal meal ration usually fed and as replacing part of the meal ration. It proved of quite low value in this connection, being apparently equivalent to about half an equal weight of bran as an incentive to greater or even equal milk production.

### WITH TWO-YEAR-OLD AND THREE-YEAR-OLD STEERS.

It was used also on some two-year-old and on some three-year-old steers. It was used as an addition to the meal ration and latterly as a substitute for part of the meal ration. In neither case did it prove to be equal to more than about half its weight of bran or other concentrate ration. It was of value, however, in improving the appearance of the cattle, giving them a sleek look scarcely attainable otherwise.

### AS ROUGHNESS.

An experiment to determine its value as a substitute for roots or ensilage was conducted and the results are given:—

Nine three-year-old steers were chosen and divided into three groups of three each.

Lot 1. Received no improved molasses cattle feed.

Lot 2. Received 8 lbs. improved molasses cattle feed per diem and half amount other roughness fed Lot 1.

Lot 3. Received 12 lbs. improved molasses cattle feed and 4 lbs. straw per diem.

All lots received equal amounts of long hay and meal.

Particulars are as follows :—

Lot 1. Receiving no improved molasses cattle feed—

| | | Lbs. |
|---|---|---|
| First weight, December 28, 1903 | Total | 3,880 |
| | Average | 1,293 |
| Last weight, March 22, 1904 | Total | 4,380 |
| | Average | 1,460 |
| Gain in 83 days | Total | 500 |
| | Average | 167 |
| **Daily rate of gain per steer** | | **2** |

Three steers consumed of roughness—

| | Lbs. | Per ton. | Value. |
|---|---|---|---|
| Ensilage | 8,106 | $2 00 | $8 11 |
| Roots | 1,621 | 2 00 | 1 62 |
| Straw | 996 | 4 00 | 1 99 |
| Total cost of roughness used | | | $11 72 |

Cost of roughness used in producing 1 lb. increase in live weight, 2·35 cents.

Lot 2. Receiving 8 lbs. improved molasses cattle feed and one-half other roughness—

| | | Lbs. |
|---|---|---|
| First weight, December 28, 1903 | Total | 4,115 |
| | Average | 1,372 |
| Last weight, March 22, 1904 | Total | 4,730 |
| | Average | 1,577 |
| Gain in 83 days | Total | 615 |
| | Average | 205 |
| Daily rate of gain per steer | | 2·47 |

Three steers consumed of roughness:—

| | Lbs. | Per ton. | Value. |
|---|---|---|---|
| Ensilage | 4,053 | $ 2 00 | $ 4 05 |
| Roots | 810 | 2 00 | 0 81 |
| Straw | 498 | 4 00 | 1 00 |
| Improved molasses cattle feed | 1,992 | 15 00 | 14 94 |
| Total cost of roughness used | | | $20 80 |

Cost of roughness used in producing 1 lb. increase in live weight, 3·38 cents.

Lot 3 Receiving 12 lbs. improved molasses cattle feed and 4 lbs. straw per diem—

| | | Lbs. |
|---|---|---|
| First weight, December 28, 1903 | Total | 3,990 |
| | Average | 1,330 |
| Last weight, March 22, 1904 | Total | 4,455 |
| | Average | 1,485 |
| Gain in 83 days | Total | 465 |
| | Average | 155 |
| Daily rate of gain per steer | | 1·87 |

| | Lbs. | Per ton. | Value. |
|---|---|---|---|
| Improved molasses cattle feed | 2,928 | $15 00 | $21 97 |
| Straw | 996 | 4 00 | 1 99 |
| Total cost of roughness used | | | $23 96 |

Cost of roughness used in producing 1 lb. increase in live weight, 5·15 cents.

From the above data it is evident that where 8 lbs. Improved Molasses Cattle Feed took the place of half the straw, roots, and ensilage, it may be said to have been worth $5.86 for 1,992 lbs., or about $5.90 per ton.

In the case of lot 3, where 12 lbs. was fed per diem, a slightly higher value is indicated, namely, $6.30 per ton.

## UVECO FOR BEEF PRODUCTION.

Uveco, a prepared food (see page 74), was fed in small quantities to a number of steers and all seemed to be very fond of it. The supply was limited, however, and so it was possible to feed only two steers with this food as an exclusive grain ration.

Two small steers put upon this feed as an exclusive meal ration on April 14, weighed together 1,685 lbs. on that date. They thrived very well and on May 30, 45 days after starting, weighed 1,810 lbs., a gain of 125 lbs. for the pair, or 62½ lbs. per steer, which was at the rate of about 1·4 lb per diem.

The meat from these steers was of very excellent quality, due in some measure no doubt to the good quality of the food fed.

So far as gains are concerned, it will of course be noted that much larger daily gains were quite possible.

## PORK PRODUCTION.

### PIG FEEDING EXPERIMENTS.

A large number of pigs have been fed during the year. Most of them were pastured for a shorter or longer time on hog lands. (See plan and report, page 80).

These experiments in pasturing are incomplete and will be reported upon at a later date.

### WINTERING SOWS OUTSIDE VS. INSIDE.

Where much pasturing of pigs is carried on the wintering of the sows and the fall litters is always a problem of considerable difficulty, since the full utilization of pastures requires pigs ready to turn out at an early date in the spring.

During the past winter a number of the brood sows were housed in the small single board cabins used on the pastures in summer. They did well and were healthy, but cost about 25 per cent more to maintain in good condition than did their mates housed in the regular brood sow run or house.

### WINTERING YOUNG PIGS OUTSIDE VS. INSIDE.

A study was also made of the comparative economy of feeding fall pigs outside and inside.

Below is a statement of the results secured. There were two lots inside and two lots outside. The lots were from two different litters, some from each being inside and the rest outside.

YOUNG PIGS WINTERED INSIDE vs. OUTSIDE.

| — | Lot 1. | Lot 2. | Lot 3. | Lot 4. | Lots 1 & 3. | Lots 2 & 4. |
|---|---|---|---|---|---|---|
| Location | Inside. | Outside. | Inside. | Outside. | Inside. | Outside. |
| Number of pigs in lot | 5 | 4 | 4 | 7 | 9 | 11 |
| Number of days on feed ... Days | 60 | 60 | 60 | 60 | 60 | 60 |
| Description of ration fed ... Lbs. | Shorts 100 Gluten 100 | Shorts 100 Gluten 100 | Oil meal 100 Shorts 400 | Shorts 400 Oil meal 100 | Mixed meals. | Mixed meal as inside. |
| Pounds of mixture required for 100 lbs. gain | 417 | 552½ | 280 | 502 | 365½ | 526 |
| Amount fed in period ... Lbs. | 993 | 1,071 | 400 | 1,265 | 1,393 | 2,336 |
| Value ... $ | 10.67 | 11.51 | 4.00 | 12.65 | 14.67 | 24.16 |
| Gain made by lot ... Lbs. | 238 | 192 | 143 | 252 | 381 | 444 |
| Average gain per pig ... " | 48 | 48 | 35¾ | 36 | 42½ | 40½ |
| Average rate of gain per diem. " | .82 | .80 | .6 | .6 | .70 | .68 |
| Cost of 100 lbs. increase in live weight ... $ | 4.48 | 6.00 | 2.80 | 5.02 | 3.85 | 5.42 |
| Health and appearance | Good. | Good. | Good. | Good. | Good. | Good. |
| Weight of lot to start ... Lbs. | 496 | 400 | 181 | 331 | 677 | 731 |
| Average weight to start ... " | 99 | 100 | 45¼ | 47 | 75 | 66½ |
| Weight of lot at finish ... " | 734 | 592 | 324 | 583 | 1,058 | 1,175 |
| Average weight at finish ... " | 147 | 148 | 81 | 83 | 117½ | 107 |

### RAISING YOUNG PIGS.

A problem that confronts the farmer who wishes to go heavily into bacon production is the raising of young pigs to the age of 3 or 4 months without the help of skim-milk or whey. This difficulty is more particularly noticed in winter or autumn. To gain some information as to the probably best meal mixtures for the purpose, two experiments were tried in January, February and March, 1904. One was conducted outside with pigs housed in small cabins, as mentioned above, and the other inside the regular piggery.

In determining the value of a meal mixture the items to be considered are the rate of gain and the cost of 100 pounds increase in weight.

### OUTSIDE FEEDING.

An examination of the reports of the experiments carried on outside, submitted below, shows that a mixture of shorts 4 parts and oil meal 1 part produced pork for $5.02 per 100 pounds at the rate of 6-10ths of a pound per day. Shorts and gluten meal equal parts produced pork at a more rapid rate, viz.: 8-10th pounds per day, but at a slightly higher cost, viz., $6 per 100 pounds. The difference may have been due to the difference in the age of the pigs. A mixture of shorts and oil meal equal parts gave very poor results since it cost $7.93 to produce 100 pounds live weight at the rate of 47-100th pounds per pig per day.

### INSIDE FEEDING.

When similar feeds were fed inside much better results were noted. Both the rate of gain per day being slightly increased and the cost of production lowered. The mixture of shorts 4 parts and oil meal 1 part was again to the fore, as gains were made at a cost of $2.80 per 100 pounds gain and at the rate of 6-10th pounds per pig per day.

### RATIONS FOR YOUNG PIGS OUTSIDE.

| — | Lot 3. | Lot 4. | Lot 6. | Lot 7. | Lot 8. | Lot 9. |
|---|---|---|---|---|---|---|
| Number of pigs in lot | 4 | 4 | 6 | 7 | 4 | 4 |
| Location | Outside. | Outside. | Outside. | Outside. | Outside. | Outside. |
| No. of days on feed | 60 | 60 | 60 | 60 | 60 | 60 |
| Description of ration fed... Lbs. | Shorts 100<br>Gluten 100 | Shorts 100<br>Oil meal 100 | Oats 200<br>Shorts 100 | Shorts 400<br>Oil meal 100 | Oats 100<br>Shorts 200 | Shorts 400<br>Oil meal 100<br>Gluten 100<br>Skim-milk 4½ lbs. per d. |
| Pounds of meal mixture required for 100 lbs. gain | 552½ | 721 | 600 | 502 | 600 | Meal 281⅓<br>Milk 766 |
| Amount fed in period... Lbs. | 1,071 | 808 | 1,080 | 1,265 | 1,176 | Milk 1,134<br>Meal 417 |
| Value... $ | 11.51 | 8.88 | 10.80 | 12.65 | 11.76 | 5.49 |
| Gain made by lot... Lbs. | 192 | 112 | 180 | 252 | 196 | 148 |
| Average gain per pig... " | 48 | 28 | 30 | 36 | 28 | 37 |
| Daily rate of gain... " | .8 | .47 | .5 | .6 | .47 | .62 |
| Cost of 100 lbs. increase in live weight... $ | 6.00 | 7.93 | 6.00 | 5.02 | 5.70 | 3.82 |
| Health and appearance | Good. | Good. | Good. | Good. | Fair. | Excellent. |
| Weight of lot to start... Lbs. | 400 | 155 | 384 | 331 | 556 | 256 |
| Average weight to start... " | 100 | 38·7 | 64 | 47 | 81 | 64 |
| Weight of lot at finish... " | 592 | 267 | 564 | 583 | 762 | 403 |
| Average weight at finish... " | 148 | 66·7 | 94 | 83 | 109 | 101 |

RATIONS FOR YOUNG PIGS INSIDE.

| — | Lot 1. | Lot 2. | Lot 3. | Lot 4. | Lot 5. |
|---|---|---|---|---|---|
| Number of pigs in lot | 5 | 4 | 5 | 4 | 5 |
| Location | Inside. | Inside. | Inside. | Inside. | Inside. |
| Number of days on feed | 40 | 40 | 60 | 60 | 60 |
| Description of ration fed | Oil meal 200<br>Shorts 200<br>Gluten 200<br>Oats 200<br>Skim-milk 4½ lbs. a day | Shorts.<br>Skim-milk. | Shorts 100<br>Gluten 100 | Shorts 400<br>Oil meal 100 | Oats 100<br>Oil meal 100 |
| Pounds of mixture required for 100 pounds gain ... Lbs. | 190 meal, 564 skim-milk. | 152 meal, 564 skim milk. | 417 | 280 | 322 |
| Amount fed in period ... " | 252 meal, 750 milk. | 204 meal, 756 milk. | 993 | 400 | 699 |
| Value ... $ | 3.94 | 2.96 | 10.67 | 4.00 | 8.04 |
| Gain made by lot ... Lbs. | 133 | 134 | 238 | 143 | 217 |
| Average gain per pig ... " | 26½ | 33½ | 48 | 35¾ | 44¼ |
| Average rate of gain per day ... " | .66 | .84 | .82 | .6 | .74 |
| Cost of 100 lbs. increase in live weight ... $ | 2.94 | 2.21 | 4.48 | 2.80 | 3.70 |
| Health and appearance | Very good. | Excellent. | Good. | Good. | Good. |
| Weight of lot to start ... Lbs. | 183 | 122 | 496 | 181 | 379 |
| Average weight to start ... " | 36½ | 30½ | 99 | 45¼ | 76 |
| Weight of lot at finish ... " | 316 | 256 | 734 | 324 | 595 |
| Average weight at finish ... " | 63 | 64 | 147 | 81 | 119 |

STOCK FOODS FOR PORK PRODUCTION.

In August, 32 pigs, ranging in weight from 43 to 80 pounds were divided into 8 groups of 4 pigs each, and for the next 90 days fed experimentally. In each case the individuals in a group were nearly uniform in size. The groups, however, showed considerable difference in their total weights, the heaviest group weighing 300 pounds or 75 pounds per pig, while the lightest group weighed 180 pounds or 45 pounds per pig. It was not possible to secure a more uniform lot at the time and it was considered better to have considerable difference in the total weights of the lots rather than to have some large and some small pigs in each lot.

The experiments lasted 90 days. During that time the pigs were confined in pens with small floored yards attached. Lots 7 and 8, however, were outside, lot 7 having a small unfloored yard and a cabin wherein to sleep, while lot 8 had a clover pasture of about ⅛ acre area and a cabin wherein to sleep.

The results speak for themselves, but it will be noticed that all supplementary foods fed other than skim-milk and pasture, had the effect of raising the cost of production. Skim-milk on the contrary lowered the cost very materially, and pasture had a similar effect in a lesser degree. The meal used was a mixture of half shorts and half mixed grains, oats, pease and barley.

In estimating the cost of production the meal ration is valued at $1 per 100 pounds, the skim-milk at 15 cents per 100 pounds, and the supplementary foods or stock foods at the cost of the same on the Ottawa markets, viz., Anglo-Saxon Stock Food, 10 cents per pound, International Stock Food, 15 cents per pound, Herbageum, 12½ cents per pound and Sugar and Flax 2½ cents per pound. Pasture is not valued, but its value may be deduced from the data given.

STOCK FOODS FOR PORK PRODUCTION.

| Lot | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Description of Ration | Meal, Inside. | Meal, Anglo Saxon Stock Food. | Meal, Internation'l Stock Food. | Meal, Sour skim-milk. | Meal, Herbageum. | Meal, Sugar and Flax. | Meal, Outside. | Meal, Pasture Clover and Rape. |
| No. of Pigs | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| No. of days on feed | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 |
| Total weight to start | 300 lbs. | 206 lbs. | 208 lbs. | 180 lbs. | 220 lbs. | 240 lbs. | 204 lbs. | 250 lbs. |
| Average weight to start | 75 " | 51½ " | 52 " | 45 " | 55 " | 60 " | 51 " | 62½ " |
| Total weight at end of experiment | 725 " | 565 " | 541 " | 612 " | 673 " | 711 " | 657 " | 653 " |
| Average weight at end of experiment | 181¼ " | 141¼ " | 135¼ " | 153 " | 168 " | 178 " | 164 " | 163 " |
| Amount meal eaten | 1,860 " | 1,551 " | 1,456 " | 1,275 " | 1,781 " | 1,880 " | 1,942 " | 1,741 " |
| Amount other food | ........ | 80 " | 42 " | 1,335 " | 45 " | 322 " | ........ | Pasture. |
| Total gain of lot in 90 days | 425 lbs. | 359 " | 333 " | 432 " | 453 " | 471 " | 453 lbs. | 413 lbs. |
| Amount meal required for 100 lbs. gain | 438 " | 432 " | 437 " | 295 " | 393 " | 399 " | 431 " | 421 " |
| Amount other food for 100 lbs. gain | ........ | 22 " | 12 " | 309 " | 10 " | 68 " | ........ | Pasture. |
| Cost of 100 lbs. gain | $4.38 | $6.52 | $6.17 | $3.42 | $5.15 | $5.69 | $4.31 | $4.21 |
| Daily rate of gain per pig | 1·171 lbs. | 1·00 lbs. | ·925 lbs. | 1·20 lbs. | 1·25 lbs. | 1·31 lbs. | 1·25 lbs. | 1·15 lbs. |
| Total gain per pig in 90 days | 106¼ " | 89¾ " | 83¼ " | 108 " | 113¼ " | 117¾ " | 113¼ " | 103¼ " |

The Anglo-Saxon Stock Food, the International Stock Food and Herbageum were all fed according to manufacturers' directions both as to quantity to feed and method of feeding.

### UVECO VS. SHORTS AND OATS FOR PORK PRODUCTION.

In the winter of 1904 a shipment of a prepared food called 'Uveco' was received from 'Uveco Cereals, Ltd., Usk Vale Mills, Newport, Mon., England.

This food looked as though it might have been prepared from Indian corn by cooking or steaming and then passing between heated rollers while still wet. It was fed to a lot of 3 pigs for 7 weeks, with results given below. At the same time a similar lot of pigs was fed on an equal amount of a mixture of equal parts shorts and crushed oats.

| | Uveco. | Shorts and Oats. |
|---|---|---|
| Weight of pigs to start May 5 | 239 | 239 |
| Average weight | $79\frac{2}{3}$ | $79\frac{2}{3}$ |
| Weight of pigs, July 11 | 405 | 363 |
| Average weight of July 11 | 135 | 121 |
| Increase in weight in lot | 166 | 124 |
| Gain per pig in 49 days | 55 | 41 |
| Daily rate of gain | 1·12 | ·84 |
| Amount food consumed | 533 | 533 |
| Value of food required for 100 lbs. gain | | $ 4 08 |

An examination of the table shows that while 430 pounds of shorts and oats was required to produce 100 pounds increase in live weight, only 321 pounds of Uveco was required to secure a similar result. If 430 pounds of shorts and oats be worth $4.08 it is evident that 321 pounds of Uveco may be claimed to be worth the same amount, *i.e.*, Uveco may be said to be worth $1.27 per 100 pounds.

This is of course a single trial and no definite conclusion should be based upon the results.

The food was evidently very palatable as the pigs ate it with avidity, and when it was fed in small quantities to young pigs they always seemed to want more of it than of any of the regular meals fed.

The keenness of appetite for the food wore off as the experiment advanced, however, and it seemed evident that some other food would have to be fed along with the Uveco if a long feeding period were intended.

## LARGE BLACKS.

For a number of years Large Blacks have been bred on the farm to gain some information as to their value as a class of swine for bacon production. They have been tested in various ways, and the results may be summarized as follows:—

1. As prolific and healthy breeding stock they cannot be surpassed by any of the breeds now commonly bred in Canada.

2. As pigs for crossing they are exceedingly impressive whether male or female, and leave their mark stamped very distinctly no matter what the other cross may be. The cross-breds have also been uniformly healthy and quick feeders, the cross with the Tamworth being particularly remarkable in this respect.

3. As pure-bred pigs they have been found to be rapid and easy fatteners, exceedingly good grass or pasture pigs, and have stood all kinds of weather without any apparent evil effects.

4. As pigs for bacon production, however, they have proven to be a complete failure. The carcases have been invariably scored as falling far short of the ideal in (*a.*) quality of meat, (*b.*) uniformity of fat layer on the back, (*c.*) length of side, (*d.*) too little thickness of belly meat and too great a proportion of belly meat to the rest of the carcase, and (*e.*) a marked tendency to lay on fat thickly rather than develop a large amount of lean meat.

A pair was exhibited at the Guelph Fat Stock Show in December, 1903, and experts from the largest packing houses were at one in condemning them for the reasons I have given above.

COMPARATIVE *Statement of Crops on '200 Acre Farm,' from 1899 to 1904, inclusive. (200 Acre Farm includes 7 Acres of Roads.)*

| Year. | Grain. | | Hay. | | Roots and Corn. | | Pasture. | | Soiling Crop. | | Pig Pasture. | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Area in Acres. | Yield in Pounds. | Area in Acres. | Yield in Tons. | Area in Acres. | Yield in Tons. | Area in Acres. | Number of Cattle. | Area in Acres. | Disposition of Crops. | Area in Acres. | Crops Grown for Pasture. | |
| 1899 | 73 | 118,466 | 39 | 93 | 40 | 326½ | 40 | 36 | 1 | Fed to dairy cows | .... | ........ | Generally considered a good year for all crops. |
| 1900 | 80 | 126,621 | 53 | 138 | 40 | 743 | 20 and aftermath | 49 | .... | ........ | .... | ........ | Season very favourable for most crops. |
| 1901 | 79 | 114,472 | 58 | 210 | 40 | 702 | 16 and aftermath | 52 | .... | ........ | .... | ........ | Season very favourable for most crops. |
| 1902 | 74 | 144,914 | 60 | 216 | 39 | 665 | 20 and aftermath | 62 | .... | ........ | 5 | Clover, rape and aftermath. | Season favourable for hay, bad for corn. |
| 1903 | 69 | 126,619 | 62 | 154 | 34 | 473 | 16 and aftermath | 96 | 5 | Dairy cows, bulls and calves. | 6 | Clover and rape. | Season very unfavourable for most crops, particularly adverse to corn and roots. No second crop hay. |
| 1904 | 67 | 112,009 | 60 | 192 | 46¾ | 674 | 13·75 | 98 | 3 | Dairy cows, bulls and calves. | 3 | Clover and rape. | Season unfavourable for grain and corn, good for hay and roots. |

The variety of crops grown and the varying areas under each crop each year make it quite difficult to make a comparison of the returns of the different years, so to simplify matters I would suggest that a fixed valuation be put upon the products, and the returns of each year valued accordingly.

Fixing prices as follows : Grain, $1 per 100 lbs.; roots and ensilage, $2 per ton; hay, $7 per ton; pasturing cattle, $8 per season: and area under pigs, $15 per acre; the returns from the '200 Acre Farm' for the years mentioned may be said to have been worth $2,776.66 in 1899; $4,110.21 in 1900; $4,434.72 in 1901; $4,787.14 in 1902; $4,148.19 in 1903; $4,741.09 in 1904.

## UTILIZATION OF FEED.

An examination into the supply of feed produced on the '200 Acre Farm,' the experimental plots of roots and corn, and the meal or grain purchased for use in the barns, together with a detailed statement of the disposal thereof, and a statement of the kinds of grain and meal consumed from July 1, 1903, to June 30, 1904, follows :—

SUMMARY of Feed of all kinds used for Stock on 200 Acre Farm from July 1, 1903, to June 30, 1904.

| — | Straw. | Grain or Meal. | Roots and Ensilage. | Hay. |
|---|---|---|---|---|
| | Lbs. | Lbs. | Lbs. | Lbs. |
| Grown on 200 Acre Farm, (crop of 1903) | 120,000 | 106,621 | 900,000 | 304,000 |
| Received from Experimental Department | 10,000 | ........... | 217,745 | |
| Received from Distribution Division (refuse grain) | ........... | 39,318 | | |
| Purchased | 110,000 | 249,863 | ........... | 8,000 |
| Total | 240,000 | 395,802 | 1,117,745 | 312,000 |

DISPOSITION of Feed harvested on, and bought for use of Live Stock on 200 'Acre Farm.'

| Class Fed. | Hay. | Grain and Meal. | Corn and Roots. | Feeding Straw. | Bedding Straw. |
|---|---|---|---|---|---|
| | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. |
| 19 horses | 130,000 | 115,512 | 3,000 | ......... | 28,000 |
| 81 steers | 37,393 | 36,107 | 340,400 | 24,563 | 50,600 |
| 38 milch cows, all breeds | 53,480 | 63,144 | 344,128 | 15,460 | 30,650 |
| 40 young stock and bulls, all breeds | 40,500 | 15,680 | 200,040 | 20,478 | 30,480 |
| 75 sheep | 20,500 | 9,041 | 5,000 | ......... | 5,000 |
| 400 swine | ......... | 110,500 | 25,000 | ......... | 20,000 |
| Poultry division | ......... | 21,615 | 2,700 | ......... | 13,950 |
| Loss by experimental curing | 4,000 | ......... | 5.500 | ......... | ......... |
| Total accounted for | 285,873 | 371,599 | 925,768 | 60,501 | 178,680 |
| Amount harvested and received | 312,000 | 395,802 | 1,117,745 | ......... | ......... |
| Shrinkage or loss | 26,127 | 24,203 | 191.977 | ......... | ......... |
| Percentage shrinkage or loss | 8·38% | 6·12% | 17·17% | ......... | ......... |

The meal consumed consisted of :—

| | Lbs. |
|---|---|
| Oats | 168,777 |
| Barley | 3,761 |
| Bran | 81,549 |
| Shorts | 76,101 |
| Gluten meal | 27,000 |
| Mixed grain (oats, pease, barley) | 23,399 |
| Corn meal | 956 |
| Oil meal | 5,400 |
| Uveco | 2,717 |
| Other special feeds | 6,142 |
| Total | 395,802 |

## BALANCE SHEET OR FINANCIAL STATEMENT OF LIVE STOCK FEEDING OPERATIONS ON 200 ACRE FARM, JULY 1, 1903, TO JUNE 30, 1904

In compiling the following table, the figures in the columns headed 'Value' in both 1903 and 1904 represent either the cost price of the animals included, where recently bought, or the fair merchantable price of the same at the date of valuation.

Under the heading 'Returns' are included values of products and services during the year.

LIVE STOCK INVENTORIES.

| — | July 1, 1903. | | June 30, 1904. | | | | Gross returns made up of increase in value, value of products and animals sold. |
|---|---|---|---|---|---|---|---|
| | Number on hand. | Value. | Number handled during year. | Number on hand. | Value. | Returns of all descriptions. | |
| | | $ cts. | | | $ cts. | $ cts. | $ cts. |
| Horses | 19 | ..... .... | .......... | 19 | ......... | 2,630 00 | 2,630 00 |
| Shorthorns—Pure-breds (15) and grades (3) | 20 | 3,410 00 | 25 | 18 | 3,495 00 | 726 29 | 811 29 |
| Ayrshires—Pure-breds (18) and grades (10) | 30 | 2,410 00 | 39 | 28 | 2,560 00 | 1,240 50 | 1,390 50 |
| Guernseys—Pure-breds (13) and grades (10) | 23 | 1,956 00 | 28 | 23 | 2,040 00 | 1,160 72 | 1,244 72 |
| Canadians—Pure-breds (8) and grades (2) | 9 | 895 00 | 14 | 10 | 1,075 00 | 542 40 | 622 40 |
| Steers | 67 | 2,307 00 | 67 | 22 | 440 00 | 3,005 50 | 1,138 50 |
| Sheep | 64 | 935 00 | 96 | 66 | 1,020 00 | 160 00 | 245 00 |
| Swine | 255 | 2,040 00 | 405 | 260 | 2,090 00 | 1,860 55 | 1,910 55 |
| Total | .......... | 13,953 00 | ...... .. . | 446 | 12,720 00 | 11,325 96 | 9,992 96 |

The variety of crops grown and the varying areas under each crop each year make it quite difficult to make a comparison of the returns of the different years, so to simplify matters I would suggest that a fixed valuation be put upon the products, and the returns of each year valued accordingly.

Fixing prices as follows : Grain, $1 per 100 lbs.; roots and ensilage, $2 per ton; hay, $7 per ton; pasturing cattle, $8 per season: and area under pigs, $15 per acre; the returns from the '200 Acre Farm' for the years mentioned may be said to have been worth $2,776.66 in 1899; $4,110.21 in 1900; $4,434.72 in 1901; $4,787.14 in 1902; $4,148.19 in 1903; $4,741.09 in 1904.

UTILIZATION OF FEED.

An examination into the supply of feed produced on the '200 Acre Farm,' the experimental plots of roots and corn, and the meal or grain purchased for use in the barns, together with a detailed statement of the disposal thereof, and a statement of the kinds of grain and meal consumed from July 1, 1903, to June 30, 1904, follows :—

SUMMARY of Feed of all kinds used for Stock on 200 Acre Farm from July 1, 1903, to June 30, 1904.

| —— | Straw. | Grain or Meal. | Roots and Ensilage. | Hay. |
|---|---|---|---|---|
| | Lbs. | Lbs. | Lbs. | Lbs. |
| Grown on 200 Acre Farm, (crop of 1903) | 120,000 | 106,621 | 900,000 | 304,000 |
| Received from Experimental Department | 10,000 | ........... | 217,745 | |
| Received from Distribution Division (refuse grain) | ........... | 39,318 | | |
| Purchased | 110,000 | 249,863 | ........... | 8,000 |
| Total | 240,000 | 395,802 | 1,117,745 | 312,000 |

DISPOSITION of Feed harvested on, and bought for use of Live Stock on 200 'Acre Farm.'

| Class Fed. | Hay. | Grain and Meal. | Corn and Roots. | Feeding Straw. | Bedding Straw. |
|---|---|---|---|---|---|
| | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. |
| 19 horses | 130,000 | 115,512 | 3,000 | ......... | 28,000 |
| 81 steers | 37,393 | 36,107 | 340,400 | 24,563 | 50,600 |
| 38 milch cows, all breeds | 53,480 | 63,144 | 344,128 | 15,460 | 30,650 |
| 40 young stock and bulls, all breeds | 40,500 | 15,680 | 200,040 | 20,478 | 30,480 |
| 75 sheep | 20,500 | 9,041 | 5,000 | ......... | 5,000 |
| 400 swine | ......... | 110,500 | 25,000 | ......... | 20,000 |
| Poultry division | ......... | 21,615 | 2,700 | ......... | 13,950 |
| Loss by experimental curing | 4,000 | ......... | 5.500 | ......... | ......... |
| Total accounted for | 285,873 | 371,599 | 925,768 | 60,501 | 178,680 |
| Amount harvested and received | 312,000 | 395,802 | 1,117,745 | ......... | ......... |
| Shrinkage or loss | 26,127 | 24,203 | 191.977 | ......... | ......... |
| Percentage shrinkage or loss | 8·38% | 6·12% | 17·17% | ......... | ......... |

The meal consumed consisted of :—

| | Lbs. |
|---|---|
| Oats | 168,777 |
| Barley | 3,761 |
| Bran | 81,549 |
| Shorts | 76,101 |
| Gluten meal | 27,000 |
| Mixed grain (oats, pease, barley) | 23,399 |
| Corn meal | 956 |
| Oil meal | 5,400 |
| Uveco | 2,717 |
| Other special feeds | 6,142 |
| Total | 395,802 |

## BALANCE SHEET OR FINANCIAL STATEMENT OF LIVE STOCK FEEDING OPERATIONS ON 200 ACRE FARM, JULY 1, 1903, TO JUNE 30, 1904

In compiling the following table, the figures in the columns headed 'Value' in both 1903 and 1904 represent either the cost price of the animals included, where recently bought, or the fair merchantable price of the same at the date of valuation.

Under the heading 'Returns' are included values of products and services during the year.

LIVE STOCK INVENTORIES.

| — | July 1, 1903. | | June 30, 1904. | | | | Gross returns made up of increase in value, value of products and animals sold. |
|---|---|---|---|---|---|---|---|
| | Number on hand. | Value. | Number handled during year. | Number on hand. | Value. | Returns of all descriptions. | |
| | | $ cts. | | | $ cts. | $ cts. | $ cts. |
| Horses | 19 | .... | .... | 19 | .... | 2,630 00 | 2,630 00 |
| Shorthorns—Pure-breds (15) and grades (3) | 20 | 3,410 00 | 25 | 18 | 3,495 00 | 726 29 | 811 29 |
| Ayrshires—Pure-breds (18) and grades (10) | 30 | 2,410 00 | 39 | 28 | 2,560 00 | 1,240 50 | 1,390 50 |
| Guernseys—Pure-breds (13) and grades (10) | 23 | 1,956 00 | 28 | 23 | 2,040 00 | 1,160 72 | 1,244 72 |
| Canadians—Pure-breds (8) and grades (2) | 9 | 895 00 | 14 | 10 | 1,075 00 | 542 40 | 622 40 |
| Steers | 67 | 2,307 00 | 67 | 22 | 440 00 | 3,005 50 | 1,138 50 |
| Sheep | 64 | 935 00 | 96 | 66 | 1,020 00 | 160 00 | 245 00 |
| Swine | 255 | 2,040 00 | 405 | 260 | 2,090 00 | 1,860 55 | 1,910 55 |
| Total | .... | 13,953 00 | .... | 446 | 12,720 00 | 11,325 96 | 9,992 96 |

## SUMMARY.

RETURNS.

| | | |
|---|---|---|
| Gross returns from animals of all classes, including value of products, value of services and increase in value of young stock | | 9,992 96 |
| Manure, 1,100 tons | | 1,100 00 |
| | | $11,092 96 |

EXPENDITURE.

*Value of Food Consumed.*

| | | |
|---|---|---|
| Meal | | $3,560 89 |
| Hay | | 1,078 00 |
| Roots and ensilage | | 1,109 54 |
| Whole milk, 17,640 lbs | | 176 40 |
| Skim-milk, 180,000 lbs | | 270 00 |
| | | 6,194 83 |
| Straw, 112 tons at $4 per ton | | 448 00 |
| Cost of labour in connection with care of horses, cattle, sheep and swine:— | | |
| Herdsman | $660 00 | |
| Two men at $480 | 960 00 | |
| Three men at $432 | 1,296 00 | |
| Extra help, teaming, &c | 461 40 | |
| | $3,377 40 | 3,377 40 |
| | | $10,020 23 |
| Balance | | 1,072 73 |

It will be noted that the clear profit after all items have been paid is rather small when the number of animals is considered. It must be remembered, however, that all feeds are charged at market prices and no allowance made for shrink or loss in curing; further, that straw for bedding, &c., is charged at $4 per ton. The wage item in connection with the care and feeding is likewise open to criticism, but may be explained as follows. In the first place, experimental feeding demands more time and a higher class service than is generally used by farmers; in addition, proximity to Ottawa raises the wage rate, and lastly, the buildings and facilities for feeding and caring for the stock are not nearly so good as they should be.

## ROTATION EXPERIMENT.

For five years, from 1899 to 1903, inclusive, the '200-acre farm' has been cropped under a rotation of five years' duration as follows: Clover hay; Timothy or mixed hay or pasture; grain, 10 pounds Red Clover for fertilizing purposes; corn or roots; grain, 8 pounds Red Clover, 10 pounds Timothy seed for meadow.

The results have been very interesting, since the aggregate annual crop returns from the farm seemed to have been materially increased. The fact that a rotation of the character described above seemed to help increase the crop returns from a given area and at the same time increase the fertility of that area, has led to the putting under way of a number of rotations of different lengths, with different crops in different orders and with different purposes in view.

It is not possible this year to explain or outline the whole scheme, but brief descriptions of the rotations, the areas devoted to each and the results obtained from each field, are submitted herewith.

The rotations are as follows:—

Rotation A.—Five years, Clover hay, Timothy hay, grain, corn, grain.

Rotation B.—Five years, Clover hay, grain, Clover hay, corn, grain.

Rotation E.—Three years, pasture, corn, grain.

Rotation Z.—Three years, Clover hay, corn, grain.

Rotation S.—Four years, shallow cultivation, Clover hay, Timothy hay, roots, grain.

Rotation D.—Four years, deep cultivation, Clover hay, Timothy hay, roots, grain.

Rotation H.—Three years, hog pasture, roots, grain or soiling crop.

Rotation T.—Four years, sheep pasture, roots and soiling crop, grain, Clover hay.

Rotation M.—Six years, grain, grain, Clover hay, Timothy hay for three years.

Rotation N.—Six years, grain, grain, Timothy hay for four years.

Rotation O.—Three years, grain, Timothy hay, Timothy hay.

Rotation P.—Three years, grain, Clover hay, Timothy hay.

In the descriptions of the rotations and fields that follow, an effort is made to give as concisely as possible the location of each field, its size, the character of its soil, its drainage and its general crop history.

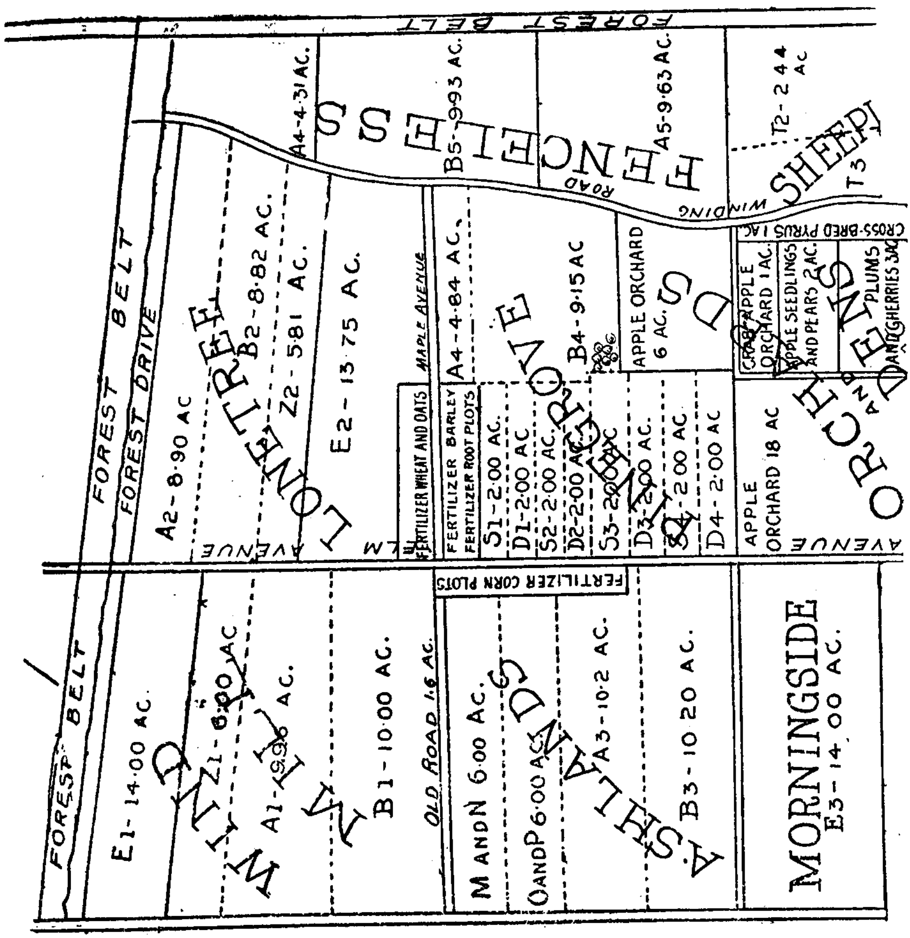
In the tables will be found all items of expenditure. The manure is applied in the same ratio to each field in each rotation. To illustrate: if to the corn land in Rotation 'Z,' 15 tons of manure per acre is applied; this is equivalent to 5 tons per acre per annum, as Z is a three year rotation. Then in applying manure to M, 30 tons per acre would be applied, as M is a six year rotation. Since the manure must vary slightly in quantity each year, $3 per annum per acre is charged in each rotation.

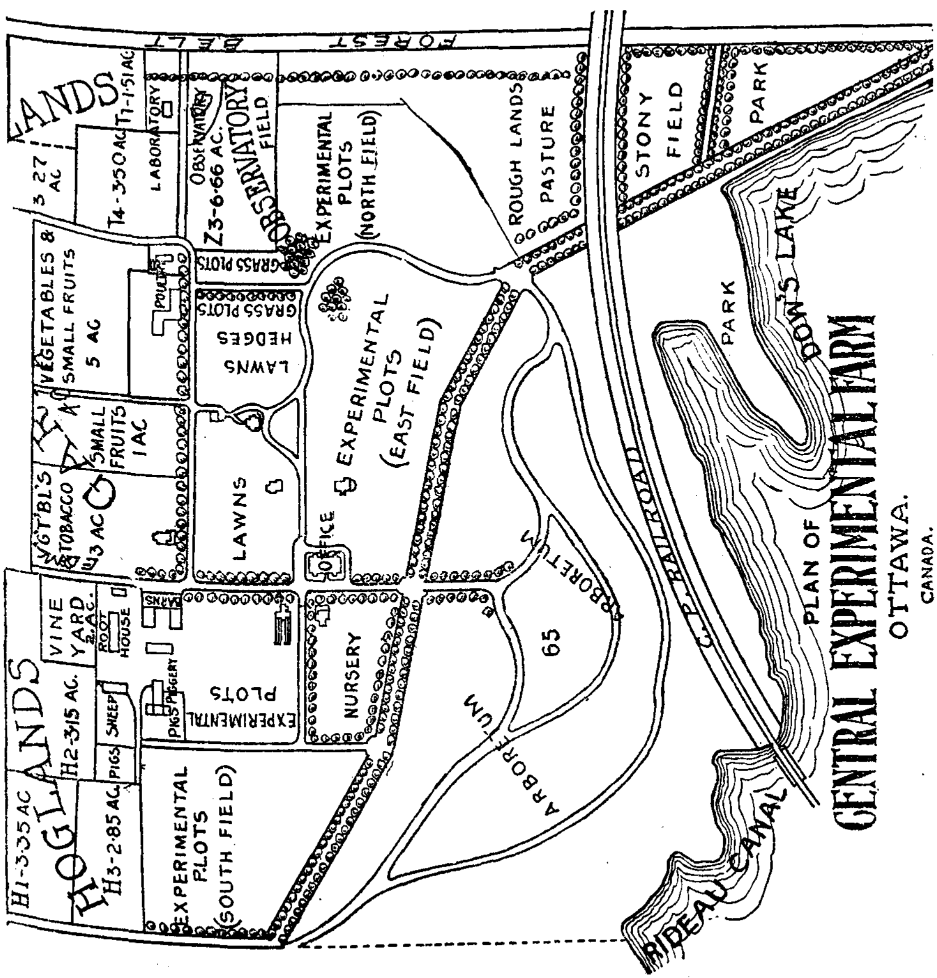
The total amount of each kind of crop material is divided so as to show the production capacity of one acre under each rotation.

## ROTATION 'A.'

This rotation of five years' duration includes grain, Clover hay, Timothy or mixed hay, grain and corn in the order named. The grain crop mentioned first comes after corn. The corn stubble is torn up with a strong stiff-toothed cultivator run across, and angling to both right and left, of the direction of the rows. The surface soil and roots so loosened up are then ridged up in drills about 21 inches apart and 8 inches high. The drills are broken down the next spring by means of the disc harrow or stiff-toothed cultivator, harrowed once, and the field is ready to sow. Red clover 8 pounds, Alsike clover 1 pound, and Timothy seed 10 pounds per acre, is sown with the grain, and the land then rolled.

The clover field is mown as early as possible to insure a second crop. The mixed hay or Timothy is cut just as the bloom fades away, and a second cut is taken if growth warrants the expense of cutting. In any case the land is ploughed 4 inches deep about the end of August.


FOREST BELT
FOREST DRIVE
A2-8·90 AC
B2-8·82 AC.
Z2-5·81 AC.
E2-13·75 AC.
A4-4·31 AC.
B5-9·93 AC.
A5-9·63 AC.
T2-2·44 AC
T3
WINDING ROAD
MAPLE AVENUE
A4-4·84 AC.
B4-9·15 AC
APPLE ORCHARD 6 AC.
CROSS-BRED PYRUS 1 AC.
CRAB APPLE ORCHARD 1 AC.
APPLE SEEDLINGS AND PEARS 2 AC.
PLUMS AND CHERRIES 3 AC
FERTILIZER WHEAT AND OATS
FERTILIZER BARLEY
FERTILIZER ROOT PLOTS
S1-2·00 AC.
D1-2·00 AC
S2-2·00 AC.
D2-2·00 AC.
S3-2·00 AC
D3-2·00 AC.
S4-2·00 AC
D4-2·00 AC
APPLE ORCHARD 18 AC
AVENUE
FERTILIZER CORN PLOTS
E1-14·00 AC.
Z1-6·00 AC
A1-9·96 AC.
B1-10·00 AC.
OLD ROAD 1·6 AC.
M AND N 6·00 AC.
O AND P 6·00 AC.
A3-10·2 AC.
B3-10·20 AC.
MORNINGSIDE
E3-14·00 AC.
LONETREE
ASHLAND


PLAN OF
CENTRAL EXPERIMENTAL FARM
OTTAWA.
CANADA.
FOREST BELT
ROUGH LANDS PASTURE
STONY FIELD
PARK
PARK
DOW'S LAKE
C. P. RAILROAD
RIDEAU CANAL
ARBORETUM
ARBORE-UM
65
NURSERY
EXPERIMENTAL PLOTS (EAST FIELD)
EXPERIMENTAL PLOTS (NORTH FIELD)
EXPERIMENTAL PLOTS (SOUTH FIELD)
EXPERIMENTAL PLOTS
LAWNS
LAWNS
HEDGES
GRASS PLOTS
GRASS PLOTS
OFFICE
POULTRY
BARNS
ROOT HOUSE
PIGGERY
PIGS
PIGS
SHEEP
VINE YARD 2 AC.
HOG LANDS
H1-3·35 AC
H2-3·15 AC.
H3-2·85 AC.
VEGETABLES & SMALL FRUITS 5 AC
SMALL FRUITS 1 AC
VG'T'BL'S & TOBACCO 3 AC
OBSERVATORY FIELD
OBSERVATORY
Z3-6·66 AC.
LABORATORY
T4-3·50 AC
T1-1·51 AC
3·27 AC

The grain crop mentioned second is sown after the Timothy or mixed hay. The land is ploughed shallow in August, harrowed and cultivated at intervals till October 15 or later, then put up into ridges by means of a double mould board plough. The seed is sown after the ridges are broken down in the spring, and with the oats 10 pounds of Red Clover to the acre is sown.

Corn follows this grain crop. The clover is allowed to grow within a day or two of the date on which it is desired to sow the corn. Meanwhile manure will have been spread upon the field in the fall, put there in small heaps during the winter and spread as soon as the land was bare, or spread from the wagon as early as possible in the spring. The Clover growing up through it facilitates the ploughing, which is done with a shallow wide furrow. The land is thoroughly disked, harrowed and then seeded with corn in rows 42 inches apart. It receives all the cultivation necessary to insure the retention of moisture and the killing of weeds between the rows.

A 1, 9·96 acres in Windmill is a long narrow, slightly rolling field, sand and muck predominating, but ranging to loam in spots, and is all underdrained.

It has given fairly good crops of all kinds in the past, 1902 oats, 1903 hay.

A 2, 8·90 acres in Lonetree; long, narrow, slightly rolling; sand to heavy loam in spots, mostly underdrained; fairly good crops; 1902 corn, 1903 oats.

A 3, 10·20 acres in Ashlands; oblong, slightly sloping to east and south; sand, heavy loam, muck and hardpan, mostly underdrained; fairly good crops; particularly good hay yields; 1902 hay, 1903 hay and pasture.

A 4, 9·15 acres, West Pine Grove and Fenceless; slightly sloping in Pine Grove; rolling in Fenceless; sand, muck loam to clay; underdrained; fair crops; 1902 oats, 1903 corn.

A 5, 9·63 acres Fenceless; square, rolling, sand loam, muck and clay, mostly underdrained; rather poor crops in past, save in case of hay; 1902 hay, 1903 oats.

There was nothing remarkable in connection with the crops on this rotation this year save that in A 2 there was some Alfalfa Clover as well as Red and Alsike.

### ROTATION 'B.'

This rotation of five years' duration includes Grain, Clover, Hay, Grain, Clover Hay and Corn in the order named.

The grain crop mentioned first comes after corn. The treatment of the corn stubble is the same as in the case of Rotation 'A.' With the Grain is sown 10 pounds Red Clover, 1 pound Alsike and 5 pounds Timothy seed per acre. The Clover field mentioned first is cut twice, if possible, then ploughed about the end of August, cultivated and harrowed at intervals and ridged up late in October.

The Grain crop mentioned second is sown on a field treated as just described, the ridges being broken down in the spring by means of the disc harrow, and 10 lbs. Red Clover, 1 lb. Alsike and 5 lbs. Timothy seed per acre. The Clover field mentioned first is cut twice, if possible, then ploughed about the end of August, cultivated and harrowed at intervals and ridged up late in October.

The Grain crop mentioned second is sown on a field treated as just described, the ridges being broken down in the spring by means of the disc harrow, and 10 lbs Red Clover, 1 lb. Alsike and 5 lbs. Timothy sown with the grain.

The Clover field mentioned second is cut twice if possible, and the aftermath or third crop allowed to stand all winter.

Corn follows the Clover crop just mentioned. The treatment is exactly the same as described for corn in Rotation 'A.'

B 1, 10·00 acres, Windmill; long narrow field, nearly level; sand, sandy loam and muck; all underdrained but somewhat springy; most crops fair, Timothy hay particularly good; 1902 oats, 1903 hay.

B 2, 8·82 acres, Lonetree; long, narrow, slightly rolling; sand to medium loam, some black muck; mostly underdrained; fairly good crops; 1902 corn, 1903 oats.

B 3, 10·20 acres, Ashlands; oblong slightly rolling sand to heavy sandy or light clay loam; mostly underdrained; fairly good crops in past; 1902 hay, 1903 hay and pasture.

B 4, 9·15 acres, West Pine Grove; square slightly sloping to north-west; sand, sandy loam, muck and clay underdrained; fair crops, some bad spots; 1902 oats, 1903 corn.

B 5, 9·93, Fenceless; square fairly flat loam. clayey loam and clay, mostly clay, well underdrained; rather poor crops in past save in hay; 1902 hay; 1903 grain.

The crops on the various fields in this rotation in 1904 were uniformly fair; in A 1, owing to a new spring appearing, nearly an acre of corn was lost; in B 5 part of the field had been in pease in 1903, so had to be sown down to oat hay in the spring, and the rest of the field had had no timothy sown with the clover in 1903, and had in addition been tramped by the cattle in the fall of 1903, as it was not known then that it would be in hay in 1904.

## ROTATION

This rotation of five years duration is that which has been followed for the

| Lot. | Location. | Description of Soil. Sand. | Sandy Loam. | Clayey Loam. | Clay. | Black Muck. | Gravel. | Hardpan. | Area in Acres. | Crop. | Crop. | Rent and Manure. | Seed, Twine and use of Machinery. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | p. c. | p. c. | p. c. | p. c. | p. c. | p. c. | p. c. | | 1903. | 1904. | $ cts. | $ cts. |
| A 1 | W.S. 3 | 30 | 45 | .... | .... | 25 | .... | .... | 9·96 | Hay | Hay | 59 76 | 11 35 |
| A 2 | L.S. 1 | 30 | 65 | 5 | .... | .... | .... | .... | 8·90 | Oats | " | 53 40 | 17 44 |
| A 3 | A.S. 14 | 10 | 15 | 20 | 20 | 15 | .... | 20 | 10·20 | Pasture & hay. | Oats | 61 20 | 16 32 |
| A 4 | W.P.G.S. 1. F.S. 1 | 70 | 20 | 10 | .... | .... | .... | .... | 9·15 | Corn | " | 54 90 | 14 53 |
| A 5 | F.S. 3 | .... | 35 | 30 | 10 | 15 | 10 | .... | 9·63 | Grain | Corn | 57 78 | 11 78 |
| | Aggregate | | | | | | | | 47·84 | | | 287 04 | 71 42 |
| | Average per acre | | | | | | | | 1 | | | 6 00 | 1 49 |

## ROTATION

This rotation of five years duration is a modification

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B 1 | W.S. 4 | 5 | 35 | 5 | 50 | 5 | .... | .... | 10·00 | Hay | Corn | 60 00 | 12 00 |
| B 2 | L.S. 2 | 20 | 70 | .... | 5 | 5 | .... | .... | 8·82 | Oats | Hay | 52 92 | 17 29 |
| B 3 | A.S. 15 | 20 | 60 | 5 | .... | 15 | .... | .... | 10·20 | Hay & pasture. | Oats | 61 20 | 16 32 |
| B 4 | W.P.G.S. 2. | 20 | 60 | 15 | .... | 5 | .... | .... | 9·15 | Corn | Grain | 54 90 | 14 53 |
| B 5 | F.S. 2 | .... | 30 | 30 | 40 | .... | .... | .... | 9·93 | Grain | Hay | 59 58 | 19 46 |
| | Aggregate | | | | | | | | 48·10 | | | 288 60 | 79 60 |
| | Average per acre | | | | | | | | 1 | | | 6 00 | 1 66 |

### ROTATION 'E.'

This rotation of three years duration includes grain, pasture and corn.

The grain comes after the corn, the stubble of which is treated as described under Rotation 'A.' With the grain in the spring is sown 10 lbs. red clover, 1 lb. alsike clover, 5 lbs. Alfalfa clover and 5 lbs. timothy seed per acre. If weather permits the field is pastured slightly in the fall.

After the grain crop the land is pastured, the grass seeding having been done with this object in view. In estimating the value of the returns from this field, pasture is charged at $1 per month per cow. At this rate the returns fall very far short of what would have been the returns if a hay crop had been harvested, if we may judge by the returns from 'Z 2.' This rotation and Rotation 'Z' were introduced into the list in order to gain some idea as to the difference in returns probable from land pastured and land from which all the crops are harvested. Of course, it is just possible that the corn crop after the pasture may in a measure make up for the difference in favour of the no pasture rotation 'Z.'

Corn follows the pasture. Manure is applied during the fall and winter and turned under with the growth of clover in the spring. The land is ploughed shallow

'A.'

last five years on the whole "200 acre farm." Area, 47·84 acres.

| Items of Expense in Raising Crop of 1904. | | | | | | | | Particulars of Crop of 1904. | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Manual Labour. | | Horse Labour. | | | | | | | | | | | | |
| No. of hours. | Cost of Manual Labour. | No. of hours with Team. | No. of hours with Single Horse. | Value of Horse Labour. | Threshing. | Total Cost. | Cost for 1 Acre. | Grain. | Straw. | Hay. | Roots and Ensilage. | Total Value. | Value of Crop per Acre. | Profit per Acre in 1904. |
| Hrs. | $ cts. | Hrs | Hrs | $ cts. | $ cts. | $ cts. | $ cts. | Lbs. | Lbs. | Lbs. | Lbs. | $ cts. | $ cts. | $ cts. |
| 144 | 19 20 | 48 | 27 | 16 73 | ...... | 107 04 | 10 75 | ...... | .... . | 44,000 | ........ | 154 00 | 15 46 | 4 71 |
| 207 | 27 52 | 50⅗ | 35⅗ | 18 88 | ..... | 117 24 | 13 17 | ..... | ...... | 77,483 | ........ | 271 19 | 30 47 | 17 30 |
| 43 | 5 74 | 163 | .... | 40 75 | 13 14 | 137 15 | 13 44 | 22,114 | 25,333 | ........ | ........ | 271 81 | 26 65 | 13 31 |
| 38 | 5 07 | 118⅕ | ... | 29 55 | 7 94 | 112 09 | 12 24 | 13,236 | 20,711 | ........ | ........ | 172 76 | 18 54 | 6 30 |
| 452 | 60 25 | 278 | 26 | 74 05 | ... . | 203 86 | 21 17 | ... . | ...... | ........ | 279,060 | 279 06 | 28 98 | 7 81 |
| 884 | 117 78 | 657⅘ | 88⅗ | 179 96 | . .. | 677 38 | 14 37 | 35,350 | 46,044 | 121,483 | 279,060 | 1,154 82 | 24 33 | 9 96 |
| 18·48 | 2 46 | 13¾ | 1⅘ | 3 76 | ..... | 14 37 | 14 37 | 738 | 962 | 2,537 | 5,833 | 24 33 | 24 33 | 9 96 |

'B.'

of Rotation "A." Area, 48·10 acres.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 470 | 62 65 | 292 | 28 | 77 90 | ..... | 212 55 | 21 25 | ...... | ...... | ........ | 216,755 | 216 75 | 21 67 | 0 42 |
| 205 | 27 33 | 50⅕ | 35⅕ | 18 71 | ...... | 116 25 | 13 18 | ...... | ...... | 76,787 | ........ | 268 75 | 30 47 | 17 29 |
| 43 | 5 74 | 163 | .... | 40 75 | 11 31 | 135 32 | 13 27 | 18,848 | 28,516 | ........ | ........ | 245 51 | 24 07 | 10 80 |
| 38 | 5 07 | 118⅕ | .... | 29 55 | 7 94 | 112 09 | 12 24 | 13,722 | 22,118 | ........ | ........ | 181 45 | 19 83 | 7 59 |
| 202 | 26 94 | 48 | 43 | 19 52 | .... | 125 50 | 12 64 | ...... | .... . | 63,430 | ........ | 222 00 | 22 35 | 9 71 |
| 958 | 127 73 | 571⅖ | 66½ | 186 43 | .... | 701 71 | 14 59 | 32,570 | 50,634 | 140,217 | 216,755 | 1,134 41 | 23 58 | 8 99 |
| 19·9 | 2 6[illegible] | 13·9 | 1·38 | 3 87 | ...... | 14 59 | 14 59 | 677 | 1,052 | 2,914 | 4,506 | 23 58 | 23 58 | 8 99 |

and disc harrowed, the corn is then sown in rows 42 inches apart and receives the usual treatment during the rest of the season.

E 1, 14·00 acres, Windmill; rolling land, well drained; sand, sandy loam, small amount clayey loam; good crops; 1902, oats; 1903, hay.

E 2, 13·75, Lonetree; rolling land, well underdrained; sand, sandy loam, muck, small amount clay and clayey loam; good crops; 1902, corn; 1903, oats.

E 3, 14·00 acres, Morningside; rolling land, well drained; sand, sandy loam, small amount clayey loam; good crops; 1902, pasture; 1903, grain.

ROTATION 'Z.'

This rotation of 3 years' duration includes corn, grain and clover hay, in the order named.

Corn comes after the clover hay. The manure is applied in the fall or during the winter and spring and the clover allowed to grow up through it, so facilitating the turning of the whole mass of manure and spring growth and late fall growth of

ROTATION

This rotation of three years duration includes an area of 9·35 acres.

| Lot. | Location. | Description of Soil. Sand. | Sandy Loam. | Clayey Loam. | Clay. | Black Muck. | Gravel. | Hardpan. | Area in Acres. | Crop. | Crop. | Rent and Manure. | Seed, Twine and use of Machinery. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | p.c. | p.c. | p.c. | p.c. | p.c. | p.c. | p.c. | Ac. | 1903. | 1904. | $ cts. | $ cts. |
| H 1 | H.S. 1 | 30 | 40 | 20 | 10 | .... | .... | .... | 3·35 | Grain | Pasture and hay. | 20 10 | 5 35 |
| H 2 | H.S. 2 | 25 | 45 | 20 | 10 | .. | .... | .... | 3·15 | " | Roots | 18 90 | 3 69 |
| H 3 | H.S. 3 | 10 | 20 | 50 | 20 | .... | .... | .... | 2·85 | Rape and pasture. | Pasture and soiling crop. | 17 10 | 3 65 |
| Aggregate | | | | | | | | | 9·35 | | | 56 10 | 12 69 |
| Average per acre | | | | | | | | | 1 | | | 6 00 | .... |

ROTATION

This rotation of four years duration is devoted to

| Lot. | Location. | Description of Soil. Sand. | Sandy Loam. | Clayey Loam. | Clay. | Black Muck. | Gravel. | Hardpan. | Area in Acres. | Crop. | Crop. | Rent and Manure. | Seed, Twine and use of Machinery. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | p. c. | p. c. | p. c. | p. c. | p. c. | p. c. | p. c. | Ac. | 1903. | 1904. | $ cts. | $ cts. |
| T 1 | S.S. 1 | 10 | 90 | .... | .... | .... | .... | .... | 1·51 | Pasture | Roots and soiling. | 9 06 | 3 90 |
| T 2 | S.S. 2 | 15 | 85 | .... | .... | .... | .... | .... | 2·44 | Rape, pastured | Rape, p'std | 14 64 | 2 43 |
| T 3 | S.S. 3 | .... | 100 | .... | .... | .... | .... | .... | 3·27 | Pasture. | Soiling | 19 62 | 6 98 |
| T 4 | S.S. 4 | 15 | 85 | .... | .... | .... | .... | .... | 3·50 | " | Pasture | 21 00 | 6 00 |
| Aggregate | | | | | | | | | 10·72 | | | 64 32 | 19 31 |
| Average per acre | | | | | | | | | ..... | | | 6 00 | 1 80 |

devoted to pasturing sheep, but it has been divided into four rather unequal fields susceptible of further subdivision and devoted to a rotation considered suitable for sheep.

'H.'

It is as far as possible devoted to pork production.

| Items of Expense in Raising Crop of 1904. | | | | | | | | Particulars of Crop of 1904. | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Manual Labour. | | Horse Labour. | | | | | | | | | | | | |
| No. of Hours. | Cost of Manual Labour. | No. of hours with Team. | No. of hours with single Horse. | Value of Horse Labour. | Threshing. | Total Cost. | Cost for one Acre. | Grain. | Pasture for Pigs. | Hay. | Roots and Green Feed. | Total Value. | Value of Crop per Acre. | Profit per Acre in 1904. |
| | $ cts. | Hrs | Hrs | $ cts. | $ | $ cts. | $ cts. | Lbs. | Mos. | Lbs. | Lbs. | $ cts. | $ cts. | $ cts. |
| 2 | 0 27 | 5 | 2 | 1 60 | ..... | 27 32 | 8 15 | ..... | 63 | 3,580 | 14,570 | 38 70 | 11 55 | 3 40 |
| 493 | 65 61 | 32 | 28 | 12 90 | ..... | 101 10 | 32 10 | ..... | ..... | ..... | 132,570 | 132 57 | 42 09 | 9 99 |
| ..... | ..... | 23½ | .... | 5 87 | ..... | 26 62 | 9 34 | ..... | 10 | ..... | 42,735 | 44 73 | 15 69 | 6 35 |
| 495 | 65 88 | 60½ | 30 | 20 37 | ..... | 155 04 | ..... | ..... | ..... | 3,580 | 189,875 | 216 00 | 23 10 | 6 52 |
| ..... | ..... | ..... | .... | .... | ..... | 16 58 | 16 58 | .... | 7·80 | 382 | 20,307 | 23 10 | 23 10 | 6 52 |

'T.'

Sheep, it includes an area of 10·72 acres.

| Items of Expense in Raising Crop of 1904. | | | | | | | | Particulars of Crop of 1904. | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Manual Labour. | | Horse Labour. | | | | | | | | | | | | |
| No. of Hours. | Cost of Manual Labour. | No. of hours with Team. | No. of hours with single Horse. | Value of Horse Labour. | Threshing. | Total Cost. | Cost for one Acre. | Grain. | Sheep on Pasture. | Hay. | Roots, Ensilage and Soiling Crop. | Total Value. | Value of Crop per Acre. | Profit per Acre in 1904. |
| | $ cts. | Hrs | Hrs | $ cts. | $ | $ cts. | $ cts. | Lbs. | Mos. | Lbs. | Lbs. | $ cts. | $ cts. | $ cts. |
| 100 | 13 33 | 13½ | .... | 3 37 | ..... | 29 66 | 19 64 | .... | ..... | ..... | 30,684 | 30 68 | 20 32 | 0 68 |
| 2 | 0 27 | 16 | .... | 4 00 | ..... | 21 34 | 8 75 | .... | 87·1 | ..... | ..... | 17 42 | 7 14 | *1 61 |
| ..... | ..... | 34 | .... | 8 50 | ..... | 35 10 | 10 73 | ..... | 73·5 | ..... | 40,315 | 55 02 | 16 82 | 6 12 |
| ..... | ..... | ... | .... | ..... | ..... | 27 00 | 7 71 | .... | 143·6 | ..... | ..... | 28 72 | 8 21 | 0 50 |
| 102 | 13 60 | 63½ | .... | 15 87 | ..... | 113 10 | .... | ..... | 304·2 | ..... | 70,999 | 131 84 | 12 30 | 1 75 |
| 9½ | 1 27 | 6 | .... | 1 48 | ..... | 10 55 | 10 55 | ..... | 28·22 | ..... | 6,623 | 12 29 | 12 30 | 1 75 |

* Loss.

The root field is devoted to white turnips, Swedes, cabbage, Kohl Rabi, thousand headed kale, rape, &c. It comes after the pasture, the land being manured and plowed in the fall.

## ROTATION

Four year rotation, with Deep

| Lot. | Location. | Description of Soil. Sand. | Sandy Loam. | Clayey Loam. | Clay. | Black Muck. | Gravel. | Hardpan. | Area in Acres. | Crop. | Crop. | Rent and Manure. | Seed, Twine and use of Machinery. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | p. c. | p. c. | p. c. | p. c. | p. c. | p. c. | p. c. | | 1903. | 1904. | $ cts. | $ cts. |
| D 1 | E.P.G.S. 2 | 20 | 80 | .... | .... | .... | .... | .... | 2 | Corn | Oats | 12 00 | 3 20 |
| D 2 | " 4 | 20 | 80 | .... | .... | .... | .... | .... | 2 | " | Oat hay | 12 00 | 2 60 |
| D 3 | " 6 | 30 | 70 | .... | .... | .... | .... | .... | 2 | " | " | 12 00 | 2 60 |
| D 4 | " 8 | 60 | 40 | .... | .... | .... | .... | .... | 2 | Roots | Roots | 12 00 | 2 35 |
| | Aggregate | | | | | | | | 8 | | | 48 00 | 10 75 |
| | Average per Acre | | | | | | | | 1 | | | 6 00 | 1 34 |

## ROTATION

Four year rotation, with Shallow

| Lot. | Location. | Sand. | Sandy Loam. | Clayey Loam. | Clay. | Black Muck. | Gravel. | Hardpan. | Area in Acres. | Crop. 1903. | Crop. 1904. | Rent and Manure. | Seed, Twine and use of Machinery. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S 1 | E.P.G.S. 1 | 20 | 80 | .... | .... | .... | .... | .... | .... | Corn | Oats | 12 00 | 3 20 |
| S 2 | " 3 | 20 | 80 | .... | .... | .... | .... | .... | .... | " | Oat hay | 12 00 | 2 60 |
| S 3 | " 5 | 30 | 70 | .... | .... | .... | .... | .... | .... | " | " | 12 00 | 2 60 |
| S 4 | " 7 | 60 | 40 | .... | .... | .... | .... | .... | .... | " | Roots | 12 00 | 2 35 |
| | Aggregate | | | | | | | | .... | | | 48 00 | 10 75 |
| | Average per Acre | | | | | | | | .... | | | 6 00 | 1 34 |

Grain follows the root land, and with the grain various clovers and grass seeds are sown to prepare for the ensuing two years. The grain may be harvested or used as soiling crop for sheep.

The hay field is expected to give one crop of hay and then be devoted to pasture for lambs as soon as they are weaned.

The pasture field is the field that has been hay the previous year. Alfalfa, Red clover, Alsike clover, Bromus inermis and Timothy are the clovers and grasses used.

T 1, 1·51 acres, Sheeplands; fairly level, quite stony, light loam; always in pasture till 1904.

T 2, 2·44 acres, Sheeplands; quite level loamy; 1902, grain; 1903, rape.

T 3, 3·27 acres, Sheeplands; rolling, very stony shallow light loam soil; always in pasture till 1904.

T 4, 3·50 acres, Sheeplands; slightly rolling sand, sandy loam; 1902, hay; 1903, pasture.

### ROTATION 'D.'

*Deep Ploughing.*

This rotation is of four years' duration and includes grain, clover hay, mixed clover and timothy hay and roots.

'D.'

late Fall Plowing Area 8 acres.

| Items of Expense in Raising Crop of 1904. | | | | | | | | Particulars of Crop of 1904. | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Manual Labour. | | Horse Labour. | | | | | | | | | | | | |
| No. of Hours. | Cost of Manual Labour. | No. of hours with Team. | No. of hours with single Horse. | Value of Horse Labour. | Threshing. | Total Cost. | Cost for 1 Acre. | Grain. | Straw. | Hay. | Roots and Ensilage. | Total Value. | Value of Crop per Acre. | Profit per Acre in 1904. |
| Hrs. | $ cts. | Hrs | Hrs | $ ts. | $ cts. | $ cts. | $ cts. | Lbs. | Lbs. | Lbs. | Lbs. | $ cts. | $ cts. | $ cts. |
| 20 | 2 67 | 23⅗ | .... | 5 85 | 1 15 | 24 87 | 12 43 | 1,916 | 5,344 | ........ | ........ | 29 85 | 14 92 | 2 48 |
| 57 | 7 60 | 25⅗ | 13 | 8 63 | ...... | 30 83 | 15 41 | ...... | .... | 9,553 | ........ | 33 37 | 16 68 | 1 27 |
| 57 | 7 60 | 25⅗ | 13 | 8 63 | ...... | 30 83 | 15 41 | ...... | ...... | 9,553 | ........ | 33 37 | 16 68 | 1 27 |
| 323⅔ | 43 15 | 44½ | 23 | 15 15 | ...... | 72 65 | 36 32 | ...... | ...... | ........ | 87,245 | 87 25 | 43 62 | 7 30 |
| 457⅔ | 61 02 | 118⅔ | 49 | 38 26 | ...... | 159 18 | .... | 1,916 | 5,344 | 19,106 | 87,245 | 183 84 | 22 98 | 3 09 |
| 57⅕ | 7 63 | 14¾ | 6⅛ | 4 78 | ..... | 19 89 | 19 89 | 239·5 | 668 | 2,388 | 10,905 | 22 98 | 22 98 | 3 09 |

'S.'

early Fall Plowing Area 8 acres.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 2 67 | 23⅗ | .... | 5 85 | 1 15 | 24 87 | 12 43 | 1,916 | 5,344 | ........ | ........ | 29 85 | 14 92 | 2 48 |
| 57 | 7 60 | 25⅗ | 13 | 8 63 | ..... | 30 83 | 15 41½ | .... | ..... | 9,533 | ........ | 33 37 | 16 68 | 1 27 |
| 57 | 7 60 | 25⅗ | 13 | 8 63 | ...... | 30 83 | 15 41½ | .... | .... | 9,533 | ........ | 33 37 | 16 68 | 1 27 |
| 323⅔ | 43 15 | 44½ | 23 | 15 15 | ...... | 72 65 | 36 32 | .... | ...... | ........ | 87,245 | 87 25 | 43 62 | 7 30 |
| 457⅔ | 61 02 | 118⅔ | 49 | 38 26 | ..... | 159 18 | ..... | ..... | ..... | 19,066 | 87,245 | 183 84 | 22 98 | 3 09 |
| 57⅕ | 7 63 | 14¾ | 6⅛ | 4 78 | ...... | 19 89 | 19 89 | 239·5 | 668 | 2,383 | 10,905 | 22 98 | 22 98 | 3 09 |

The grain crop is sown after roots. Afer the roots are harvested the land is ploughed 5½ inches deep, and then left till the next spring, when it is harrowed and seeded to oats. With the grain is sown 10 pounds Red clover, 1 pound Alsike clover and 10 pounds Timothy seed per acre.

The clover hay is cut twice in the season, and the second aftermath left on the field, *i.e.*, it is not pastured off.

The mixed clover and timothy hay is cut twice if possible and plowed 7 inches deep early in October. Manure is applied and the land replowed in the spring with a shallower furrow.

The roots are sown on ridges drilled up after the spring ploughing, and receive the usual cultivation.

D 1, 2 acres, East Pine Grove; slopes to north-west, is partly underdrained; sand to rather heavy sandy loam; has given fair crops for most part, but has small 'bad land' spots; 1902, oats; 1903, corn.

D 2, 2 acres, East Pine Grove; slopes from both ends to centre; underdrained; sand to heavy loam; has given good crops for most part, but has some 'bad land' spots; 1902, oats; 1903, corn.

D 3, 2 acres, East Pine Grove; slopes from both ends to centre; underdrained; sand to sandy loam, underdrained; good crops; 1902, oats; 1903, corn.

ROTATION

This rotation of six years

| Lot. | Location. | Description of Soil. Sand. | Sandy loam. | Clayey loam. | Clay. | Black muck. | Gravel. | Hardpan. | Area in acres. | Crop. | Crop. | Rent and manure. | Seed, twine and use of machinery. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | p. c. | p. c. | p. c. | p. c. | p. c. | p. c. | p. c. | Ac. | 1903. | 1904. | $ cts. | $ cts. |
| M 1 | A.S. 2 | .... | 30 | 15 | .... | 45 | .... | 10 | 1 | Meadow and pasture. | Oats | 6 00 | 1 60 |
| M 2 | A.S. 4 | .... | 30 | 15 | .... | 45 | .... | 10 | 1 | " | Oat hay | 6 00 | 1 30 |
| M 3 | A.S. 6 | .... | 30 | 15 | .... | 45 | .... | 10 | 1 | " | " | 6 00 | 1 30 |
| | Aggregate | | | | | | | | 3 | | | 18 00 | 4 20 |
| | Average per acre | | | | | | | | 1 | | | 6 00 | 1 40 |

ROTATION

This rotation of six years duration includes no clover save such

| Lot. | Location. | Sand. | Sandy loam. | Clayey loam. | Clay. | Black muck. | Gravel. | Hardpan. | Area in acres. | Crop. 1903. | Crop. 1904. | Rent and manure. | Seed, twine and use of machinery. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N 1 | A.S. 3 | .... | 30 | 15 | .... | 45 | .... | 10 | 1 | Meadow and pasture. | Oats | 6 00 | 1 60 |
| N 2 | A.S. 5 | .... | 30 | 15 | .... | 45 | .... | 10 | 1 | " | Oat hay | 6 00 | 1 30 |
| N 3 | A.S. 7 | .... | 30 | 15 | .... | 45 | .... | 10 | 1 | " | " | 6 00 | 1 30 |
| | Aggregate | | | | | | | | 3 | | | 18 00 | 4 20 |
| | Average per acre | | | | | | | | 1 | | | 6 00 | 1 40 |

D 4, 2 acres, East Pine Grove; slopes to south-east; sandy loam; partly underdrained; good crops; 1902, oats; 1903, roots.

ROTATION 'S.'

*Shallow Ploughing.*

This rotation is of 4 years' duration, and includes grain, clover hay, mixed clover and timothy hay and roots.

The grain crop is sown after roots. After the roots are harvested in the fall, the land is ploughed shallow, 4 inches deep, and then left till the next spring, when it is harrowed and seeded to oats. With the grain is sown 10 pounds red clover, 1 pound alsike clover and 10 pounds timothy seed per acre.

The clover hay is cut twice in the season and the second aftermath left on the field; that is, it is not pastured off, as is usually done.

The mixed clover and timothy hay is cut twice if possible, and in August the land ploughed with a shallow furrow (exactly 4 inches deep). The land is kept cultivated and harrowed at intervals till late October, when it is ridged up with the double mould board plough. To this field destined for roots, manure is applied during the winter, 'M.'

duration includes the clover hay. Area 3 acres.

| Items of Expense in raising Crop of 1904. | | | | | | | | Particulars of Crop of 1904. | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Manual Labour. | | Horse Labour. | | | | | | | | | | | | |
| No. of hours. | Cost of manual labour. | No. of hours with team. | No. of hours with single horse. | Value of horse labour. | Threshing. | Total cost. | Cost for 1 acre. | Grain. | Straw. | Hay. | Roots and ensilage. | Total value. | Value of crop per acre. | Profit per acre in 1904. |
| Hrs. | $ cts. | Hrs | Hrs | $ cts. | $ cts. | $ cts. | $ cts. | Lbs. | Lbs. | Lbs. | Lbs. | $ cts. | $ cts. | $ cts. |
| 4 | 0 53 | 16 | .... | 4 00 | 0 90 | 13 04 | 13 04 | 1,493 | 3,182 | ...... | ........ | 21 29 | 21 29 | 8 25 |
| 15 | 2 00 | 16½ | .... | 4 12½ | .... | 13 60 | 13 60 | ...... | ...... | 3,670 | ........ | 12 85 | 12 85 | *0 75 |
| 15 | 2 00 | 16½ | .... | 4 12½ | ..... | 13 60 | 13 60 | .. .. | ...... | 3,670 | ........ | 12 85 | 12 85 | *0 75 |
| 34 | 4 53 | 49 | .... | 12 25 | ...... | 40 24 | 13 41 | 1,493 | 3,182 | 7,340 | ....... | 46 99 | 15 66 | 2 25 |
| 11⅓ | 1 51 | 16⅓ | ... | 4 08 | ..... | 13 41 | 13 41 | 498 | 1,061 | 2,447 | ... ... | 15 66 | 15 66 | 2 25 |

* Loss.

'N.'

as may happen to get into the field from unknown sources. Area 3 acres.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 0 53 | 16 | .... | 4 00 | 0 90 | 13 04 | 13 04 | 1,493 | 3,182 | ........ | ........ | 21 29 | 21 29 | 8 25 |
| 15 | 2 00 | 16½ | .... | 4 12½ | ... ... | 13 60 | 13 60 | ...... | ...... | 3,670 | ........ | 12 85 | 12 85 | *0 75 |
| 15 | 2 00 | 16½ | .... | 4 12½ | ...... | 13 60 | 13 60 | ..... | ..... | 3,670 | ..... .. | 12 85 | 12 85 | *0 75 |
| 34 | 4 53 | 49 | . . | 12 25 | 0 90 | 40 24 | 13 41 | 1,493 | 3,182 | 7,340 | ........ | 46 99 | 15 66 | 2 25 |
| 11⅓ | 1 51 | 16⅓ | .... | 4 08 | 0 30 | 13 41 | 13 41 | 498 | 1,061 | 2,447 | ........ | 15 66 | 15 66 | 2 25 |

* Loss.

disked in the spring and the land again ridged up and sown to roots, which receive the usual cultivation.

S 1, 2 acres, East Pine Grove; slopes to north-west; is partly underdrained; sand to rather heavy sandy loam; has given fair crops for most part, but has small 'bad land' area; 1902, oats; 1903, corn.

S 2, 2 acres, East Pine Grove; slopes from both ends to centre; sand to heavy loam; underdrained for most part; has given good crops for most part but has some 'bad land' spots; 1902, oats; 1903, corn.

S 3, 2 acres, East Pine Grove; slopes from both ends to centre, underdrained; sand to sandy loam; underdrained; good crops; 1902, oats; 1903, corn.

S 4, 2 acres, East Pine Grove; slopes to south-east; sandy loam; partly underdrained; good crops; 1902, oats; 1903, corn.

ROTATION 'M.'

This rotation of six years duration includes in its crops grain, grain, clover hay and then Timothy hay or mixed hay for three years.

The first year, grain is sown on sod plowed late in the fall. In the spring the land is disked, harrowed and sown with 10 pounds of red clover seed per acre at the same

ROTATION

This rotation of three years duration has no

| Lot. | Location. | Description of Soil. Sand. | Sandy loam. | Clayey loam. | Clay. | Black muck. | Gravel. | Hardpan. | Area in acres. | Crop. | Crop. | Rent and manure. | Seed, twine and use of machinery. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | p. c. | p. c. | p. c. | p. c. | p. c. | p. c. | p. c. | Ac. | 1903. | 1904. | $ cts. | $ cts. |
| O 1 | A. S. 8 | .... | 30 | 15 | .... | 45 | .... | 10 | 1 | Meadow and pasture. | Oat hay | 6 00 | 1 30 |
| O 2 | A. S. 10 | .... | 30 | 15 | .... | 45 | .... | 10 | 1 | " | " | 6 00 | 1 30 |
| O 3 | A. S. 12 | .... | 30 | 15 | .... | 45 | .... | 10 | 1 | " | Oats | 6 00 | 1 60 |
| | Aggregate | | | | | | | | 3 | | | 18 00 | 4 20 |
| | Average per acre | | | | | | | | 1 | | | 6 00 | 1 40 |

ROTATION

This rotation of three years duration

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P 1 | A. S. 9 | .... | 30 | 15 | .... | 45 | .... | 10 | 1 | Meadow and pasture. | Oat hay | 6 00 | 1 30 |
| P 2 | A. S. 11 | .... | 30 | 15 | .... | 45 | .... | 10 | 1 | " | " | 6 00 | 1 30 |
| P 3 | A. S. 13 | .... | 30 | 15 | .... | 45 | .... | 10 | 1 | " | Oats | 6 00 | 1 60 |
| | Aggregate | | | | | | | | 3 | | | 18 00 | 4 20 |
| | Average per acre | | | | | | | | 1 | | | 6 00 | 1 40 |

time as the grain is sown. After the grain is harvested the clover is allowed to grow as late as possible and the land plowed the last thing in the fall. The next spring 8 pounds of Red clover and 10 pounds Timothy seed is sown with the grain and the land put in as good shape as possible.

Clover hay follows the second year grain. It is cut twice in the year and the last aftermath not pastured.

Timothy hay or mixed hay then occupies the land for three consecutive years. Manure is applied in the fall of the second year that the field is under hay.

M 1, 1 acre, Ashlands; long narrow field, sandy loam, clayey loam, black muck, hardpan; underdrained; good crops; 1902, hay; 1903, hay and pasture.

M 2, and M 3, are quite similar to M 1 in every respect.

The crops of hay on M 2 and M 3 this year should not be taken as a fair sample of what may be expected from these fields in the future as it was impossible to have them under the right kind of hay the first year and so they were put under oat hay.

ROTATION 'N.'

This rotation of six years duration includes in its crops grain, grain and Timothy hay for four years.

The first years grain is sown on land that had been plowed six inches deep the fall previous. No grass or clover seed of any kind is sown with it. The stubble is plowed

'O.'

clover included in its crops. Area 3 acres.

| Items of Expense in Raising Crop of 1904. | | | | | | | | Particulars of Crop of 1904. | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Manual Labour. | | Horse Labour. | | | | | | | | | | | | |
| No. of hours. | Cost of manual labour. | No. of hours with team. | No. of hours with single horse. | Value of horse labour. | Threshing. | Total cost. | Cost for 1 acre. | Grain. | Straw. | Hay. | Roots and ensilage. | Total value. | Value of crop per acre. | Profit per acre in 1904. |
| Hrs. | $ cts. | Hrs | Hrs | $ cts. | $ cts. | $ cts. | $ cts. | Lbs. | Lbs. | Lbs. | Lbs. | $ cts. | $ cts. | $ cts. |
| 15 | 2 00 | 16½ | .... | 4 12½ | ...... | 13 60 | 13 60 | ..... | ...... | 3,670 | ........ | 12 85 | 12 85 | *0 75 |
| 15 | 2 00 | 16½ | ... | 4 12½ | ..... | 13 60 | 13 60 | ...... | ...... | 3,670 | ........ | 12 85 | 12 85 | *0 75 |
| 4 | 0 53 | 16 | .... | 4 00 | 1 30 | 13 43 | 13 43 | 2,169 | 2,482 | ........ | ........ | 26 65 | 26 65 | 13 22 |
| 34 | 4 53 | 49 | ... | 12 25 | 1 30 | 40 63 | 13 54 | 2,169 | 2,482 | 7,340 | ........ | 52 35 | 17 45 | 3 91 |
| 11⅓ | 1 51 | 16⅓ | .... | 4 08 | 0 43 | 13 54 | 13 54 | 723 | 827 | 2,447 | ........ | 17 45 | 17 45 | 3 91 |

* Loss.

'P.'

includes clover. Area 3 acres.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 2 00 | 16½ | .... | 4 12½ | .... . | 13 60 | 13 60 | ...... | ...... | 3,670 | ........ | 12 85 | 12 85 | * 0 75 |
| 15 | 2 00 | 16½ | ... | 4 12½ | ..... | 13 60 | 13 60 | ..... | ..... | 3,670 | ........ | 12 85 | 12 85 | * 0 75 |
| 4 | 0 53 | 16 | .... | 4 00 | 1 30 | 13 43 | 13 43 | 2,169 | 2,482 | ........ | ........ | 26 65 | 26 65 | 13 22 |
| 34 | 4 53 | 49 | .... | 12 25 | 1 30 | 40 63 | 13 54 | 2,169 | 2,482 | 7,340 | ........ | 52 35 | 17 45 | 3 91 |
| 11⅓ | 1 51 | 16⅓ | ·43 | 4 08 | 0 43 | 13 54 | 13 54 | 723 | 827 | 2,447 | .... ... | 17 45 | 17 45 | 3 91 |

*Loss.

in the fall and with the grain of the second year Timothy seed is sown at the rate of 12 pounds per acre. Every care is taken to insure a good catch and the land put in as good shape as possible to remain in meadow four years.

Timothy hay is then the crop for four years, manure being applied in the fall of the second year of hay.

N 1, 1 acre, Ashlands; long narrow field, sandy loam, clayey loam, black muck, hardpan; well underdrained; good crops; 1902, hay; 1903, hay and pasture.

N 2, and N 3 are quite similar to N 1 in every particular.

### ROTATION 'O.'

This rotation is of three years duration and includes grain, timothy hay, timothy hay.

The field intended for grain is ploughed early in the fall and cultivated at intervals tc insure the sod rottening. It is ploughed again late in the fall and with the grain, the next spring, timothy seed is sown at the rate of 12 lbs. to the acre.

Timothy hay is cut for two years and the land again ploughed early in the fall. Manure is applied in the fall of the first year under hay.

It was impossible to get the proper fields under timothy hay for this year, so it was necessary to sow oat hay. The results were not very satisfactory, so this year's crop on O 1 and O 2 need not be taken as an example of what may be expected from these fields in the future.

O 1, 1 acre, Ashlands, long narrow field, rolling, sandy loam, clayey loam, black muck, hardpan; underdrained, good crops; 1902, hay; 1903, hay and pasture.

O 2, and O 3 are similar to O 1 in every particular.

### ROTATION 'P.'

This rotation is of three years duration and includes grain, clover hay, and timothy hay or mixed hay.

The field intended for grain is ploughed early the previous fall and cultivated at intervals to insure the sod rotting. It is again ploughed late in the fall and left till seed time the next spring. With the grain is sown ten pounds clover and ten pounds timothy.

Manure is applied in the fall of the first year hay.

P 1, 1 acre, Ashlands; long narrow rolling sandy loam, clayey loam, black muck, hardpan; underdrained; good crops; 1902, hay; 1903, hay and pasture.

## EXPERIMENTS WITH GRASSES AND CLOVERS FOR HAY.

Some further experiments to gain some information as to the comparative economy of different mixtures of grasses and clovers have been carried on during the year.

In comparison with the usual grass mixture of eight pounds timothy and ten pounds red clover, there were tested several others not so commonly used. Bromus inermis, orchard grass, alfalfa and alsike were the other grasses and clovers used. The following table gives full particulars of the different plots tested.

Particulars of seeding and returns in hay are as follows:—

| — | Seed sown per acre. | | | | Yield of Hay July 5. | Yield of Hay Aug. 18. | Total yield Hay per lot. | Total yield Hay per acre. | Yield Green Feed Oct. 7. |
|---|---|---|---|---|---|---|---|---|---|
| | Grasses. | Lbs. | Clovers. | Lbs. | Tons. lbs. | Tons. lbs. | Tons. lbs. | Tons. lbs. | Tons. lbs. |
| Plot 1, 3½ acres | Timothy | 10 | Common Red | 8 | 11 1,220 | 4 760 | 15 1,980 | 4 1,137 | ......... |
| Plot 2, 5 acres | Timothy<br>Bromus Inermis<br>Orchard grass | 4<br>8<br>8 | ..............<br>Alfalfa<br>Common Red | <br>8<br>6 | 16 42 | 6 520 | 22 560 | 4 912 | 7 330<br>put in silo |
| Plot 3, 5 acres | Timothy<br>Bromus Inermis<br>Orchard | 4<br>8<br>8 | Alsike<br>Common Red<br>Alfalfa | 2<br>6<br>2 | 18 1,267 | 5 1,970 | 24 1,337 | 4 1,867 | ......... |
| Plot 4, 5 acres | Timothy<br>Orchard | 5<br>16 | Alsike<br>Common Red | 2<br>6 | 12 1,072 | 6 1,690 | 19 762 | 3 1,752 | ......... |
| Plot 5, 5 acres | Timothy<br>Bromus Inermis | 5<br>15 | Alsike<br>Common Red | 2<br>6 | 13 192 | 7 190 | 20 382 | 4 76 | ......... |
| Total .... | .................. | 91 | | 48 | 71 1,793 | 30 1,130 | 102 1,021 | 4 943 | 7 330 |

Very little need be said in explanation or amplification of the above.

The early part of the season was very suitable for hay, and the first cut was most excellent in quality and large in quantity.

July and August were dry months in the Ottawa district, and consequently the second cut was quite light.

Plot 2, the seed on which included 8 pounds Alfalfa, was cut a third time, October 7, and the material (about 78 per cent Alfalfa) put in the experimental silo.

PASTURE.

None of these particular plots was pastured in 1904. A plot of 13·75 acres seeded with 10 pounds Timothy and 8 pounds Common Red clover was under pasture. This plot had been seeded down with oats the previous year. It made a very rapid growth in the spring, and the cattle were turned in May 20.

During the season 4,290 days' pasture was furnished by the 13·75 acres. This amount of pasture at $1 per month per head would be worth $143, or $10.41 per acre.

A field of 5·81 acres of similar seeding yielded during the season 25 tons, 763 pounds hay worth at $7 per ton $177.67. It will, however, be remembered that to harvest the hay cost considerable, about $1.66 per ton.

## YIELDS AND COST OF VARIOUS CLASSES OF HAY.

In the following statement of cost of producing 1 ton and 1 acre of various sorts of hay and hay mixtures, labour, seed, rent and manure are all considered. Where more than one crop was harvested in the year the seed rent and manure were, of course, counted only once.

| Kind of Hay. | Amount seed. | Cost per Acre to grow. | Cost per Ton to produce. | Yield per Acre. | Value of Hay per Ton. | Remarks. |
|---|---|---|---|---|---|---|
| | | $ cts. | $ cts. | Tons. lbs. | $ cts. | |
| Timothy | 10 | 10 75 | 4 87 | 2 400 | 8 00 | |
| Timothy | 10 | 13 17 | 2 90 | 4 1,137 | 7 00 | |
| R. Clover | 8 | | | | | |
| Alfalfa | 8 | | | | | |
| Timothy | 4 | 13 90 | 3 10 | 4 912 | 7 00 | A further aftermath cut for silage not considered in this estimate. |
| Brome | 8 | | | | | |
| Timothy | 8 | 13 77 | 2 82 | 4 1,800 | 7 00 | |
| Alsike | 6 | | | | | |
| Oat hay | 68 | 13 60 | 7 40 | 1 1,670 | 7 00 | |
| Oat and Pea hay | 50 | 15 41 | 6 46 | 2 766 | 7 00 | |
| " " | 30 | | | | | |

TIMOTHY.

Timothy is of course the favourite hay for horses. It is, however, usually expensive to produce since it yields only one crop in the season, and two tons is considered a very good yield per acre Freedom from dust, good keeping qualities, palatabilty and wholesomeness are its chief recommendations. It depletes the soil of fertility to a certain extent and very few fields should be left longer than two years under this crop.

TIMOTHY AND CLOVER.

Timothy and Red Clover mixed is a hay that, if well made, can scarcely be surpassed for any class of live stock, combining as it does in itself, palatability, wholesomeness, high digestibility, and high nutritive qualities. It is better for horses than pure Timothy, and should be fed much more extensively than is at present the case in this country, provided, of course, that it is well made.

The Red Clover part of the mixture adds to the fertility of the soil and makes up in some measure for the loss entailed by the growing of the Timothy along with it.

#### ALFALFA.

Alfalfa, Timothy and Brome makes a most excellent hay for cattle of all descriptions and horses do very well on it. The Alfalfa part of the mixture increases the nitrogen content of the soil, but the other two constituents of the mixture are soil robbers.

#### TIMOTHY AND ALSIKE.

Timothy and Alsike is a hay of a very high value for cattle, but not so good for horses. Timothy is, of course, again a factor in lowering the fertility of the soil, but the Alsike being a perennial clover may be expected to replace at least a portion of the nitrogen removed.

#### OAT HAY.

Oat hay is not a hay that can be recommended to the farmers of this country, as it is expensive, only fairly palatable and not highly nutritious. To give the best results it must be cut the very day it is in the thin milk stage. Any later date means a great loss in palatability.

#### OAT AND PEA HAY.

Oats and pease make a very good hay mixture, but not equal to any of the other hays discussed, save only pure oat hay, which it surpasses for cattle and sheep and at least equals for horses.

## MIXED CROP EXPERIMENT.

On West Pine Grove field, which had been under corn in 1903, were grown in 1904, in lots of 1 acre each, 7 different sorts of grain or grain mixtures. The aim was to determine if possible the comparative economy of sowing each sort of grain by itself or mixed with one or more other sorts. This experiment has been carried on for five years now and as the seasons have been quite varied and the soils used have been of different character each year, it may safely be considered as having been a fair test.

The results this year are as follows :—

| | Grain, lbs. per acre. |
|---|---|
| Plot 1, pure pease, yielded | 1,135 |
| Plot 2, pure barley, yielded | 1,662 |
| Plot 3, pure oats, yielded | 1,687 |
| Plot 4, mixture, pease 1 bushel, barley 1 bushel, oats 1 bushel, yielded | 1,550 |
| Plot 5, mixture, pease 1 bushel, oats 2 bushels, yielded | 1,447 |
| Plot 6, mixture, oats 1½ bushels, barley 1 bushel, yielded | 1,689 |
| Plot 7, mixture, wheat ½ bushel, barley ¾ bushel, oats 1 bushel, and pease ¾ bushel yielded | 1,493 |

A summary of the results for the five years is herewith submitted :—

| — | Pounds of Grain per Acre. | | | | | |
|---|---|---|---|---|---|---|
| | 1900. | 1901. | 1902. | 1903. | 1904. | Five year average per acre. |
| | | | | | | Lbs. |
| Plot 1, pure pease, yielded | 1,101 | 1,140 | 1,805 | 1,140 | 1,135 | 1,264 |
| Plot 2, pure barley, yielded | 1,252 | 1,070 | 2,490 | 1,070 | 1,662 | 1,507 |
| Plot 3, pure oats, yielded | 2,059 | 1,819 | 2,495 | 1,819 | 1,687 | 1,976 |
| Plot 4, mixture, barley 1 bushel, oats 1 bushel, pease 1 bushel, yielded | 1,559 | .......... | 2,183 | .......... | 1,550 | 1,764 |
| Plot 5, mixture, pease 1 bushel, oats 2 bushels, yielded | 1,247 | 746 | 2,382 | .......... | 1,447 | 1,455 |
| Plot 6, mixture, oats 1½ bushels, barley 1 bushel, yielded | 1,458 | 1,239 | 2,360 | 1,238 | 1,689 | 1,597 |
| Plot 7, mixture, wheat ½ bushel, barley ¾ bushel, oats 1 bushel, pease ¾ bushel, yielded | 1,560 | 888 | 2,225 | 888 | 1,498 | 1,412 |
| Plot 8, mixture, oats and pease equal parts by weight, yielded | 1,341 | 1,052 | 2,160 | 1,052 | .......... | 1,401 |
| Plot 9, mixture, oats and pease equal parts by measure, yielded | .......... | 1,011 | 2,165 | 1,011 | .......... | 1,396 |

The results seem to indicate that, generally speaking, pure grains may be expected to give more pounds to the acre than mixtures.

## CORN.

Owing to difficulty in procuring seed of fair germinable quality, it was necessary to sow considerably more large growing late varieties than was desired. Several mixtures were sown, and herewith are submitted a few notes on the pure lots as well as on the mixed lots. Judging by the stand and the weights secured from some small lots cut before the frost of September 23, the yields from the different lots would have been from three to five tons per acre greater than was the actual yield when cut about the end of September and the first week in October.

### LEAMING.

Leaming, 14 7/12 acres sown in drills 42 inches apart on June 1, cut for ensilage September 30. It yielded at the rate of 14 tons 610 lbs. per acre. The stand was very good, but frost coming on September 23 and 24 did a great deal of harm. The corn stood from 8 to 11 feet high and was fairly well cobbed.

### LONGFELLOW AND RED COB ENSILAGE.

Longfellow and Red Cob Ensilage, 3¼ acres, sown June 8, cut for ensilage, October 6. Growth strong and fairly even, well cobbed in late milk at date of cutting. It stood from 8 to 10 feet high. It was badly frozen, but yielded 11 tons 1,968 lbs. per acre. The two made a very good mixture, which would have made excellent ensilage under favourable conditions.

### SOUTHERN MAMMOTH SWEET AND EARLY BUTLER.

Southern Mammoth Sweet and Early Butler, 7 acres, sown June 6, cut for ensilage September 28. It made a strong even growth, but showed very few cobs on either sort. It got past the late milk stage before being cut, but suffered very severely from the frost. It stood 7 to 9 feet high, and yielded at the rate of 12 tons 30 lbs. per acre.

### CUBAN GIANT AND KING OF THE EARLIEST.

Cuban Giant and King of the Earliest, 6 7/12 acres, sown June 8, cut for ensilage October 5. This mixture made a strong, even growth, and was fairly well cobbed in the milk stage at time of cutting. It stood about 9 feet high, was very badly frozen, but yielded 92 tons 995 pounds, or 14 tons 353 pounds per acre. In a good season for corn this mixture would be a most profitable one to sow, particularly so on early or light soil.

### NORTH DAKOTA AND RED COB ENSILAGE.

North Dakota and Red Cob Ensilage, 8 7-12 acres, sown June 7, cut for ensilage September 29. Rather uneven in growth, due to character of soil. Few cobs on North Dakota, none on Red Cob. Grew 8 to 10 feet high, and yielded 96 tons 1,355 pounds, or at the rate of 11 tons 527 pounds per acre. This mixture to be a success must have a fairly long season.

A summary of the cost of growing the whole 40 acres is submitted herewith. For particulars of soil preparation, methods of manuring, &c., the reader is referred to the paragraphs discussing the different rotations.

Cost of growing and returns from 40 acres of corn:—

| | |
|---|---|
| Rent of land at $3 per acre | $120 00 |
| Manure at $3 per acre (same allowance made for all crops) | 120 00 |
| Ploughing, 25·2 days at $2.50 per day | 63 00 |
| Disc harrowing, 12·6 days at $2.50 per day | 31 50 |
| Harrowing, 4 days at $2.50 | 10 00 |
| Seeding, 4 days at $2.50 | 10 00 |
| Seed, 20 bushels at $1.20 per bushel | 24 00 |
| Hoeing, 80 days at $1.33⅓ per day | 106 66 |
| Cultivating, team 32 days at $2.50 per day | 80 00 |
| Cultivating, single horse 11·2 days at $1.75 per day | 19 60 |
| Cutting with corn harvester, 11·4 days | 28 50 |
| Loading, unloading, tramping and putting into silo, 80 days at $1.33⅓ per day | 106 66 |
| Drawing with teams, 30·4 days at $2.50 per day | 76 00 |
| Twine, 2½ pounds per acre | 12 00 |
| Use of machinery at 30 cents per acre | 12 00 |
| Use of engine, &c., 6 days at $5 | 30 00 |
| | $849 92 |

Forty acres yielded 520 tons 1,690 lbs.
Average yield per acre, 13 tons 42 lbs.
To produce 1 ton ensilage in silo cost $1.63.
Cost to produce 1 acre corn in silo ready to feed, $21.25.

## EXPERIMENTAL SILO.

Some years ago a small silo was constructed, to be used for the purpose of experimenting with various crops as material for preservation as ensilage.

Different green crops have been tested from time to time, since its construction, as to their fitness for ensilage manufacture, and reported upon in previous reports.

In September, 1903, the silo was again filled with the following materials and mixtures, beginning at the bottom:—

| | | Lbs. |
|---|---|---|
| 1. | Pure corn, late milk stage.... .... .... .... ........ | 9,370 |
| 2. | Corn, late milk stage.... .... .... .... ........ | 5,280 |
| | Rape cut when about 15 inches high, mixed while going through blower or cut box.... .. .... ........ | 5,280 |
| 3. | Pure corn, late milk stage.... .... .... .... ........ | 960 |
| 4. | Pure rape, cut when about 15 inches high.... ........ | 5,620 |
| 5. | Corn, late milk stage.... .... .... .... ........ | 12,370 |
| | Sunflower heads, mixed going through machine.. .... | 2,120 |
| 6. | Horse beans....... .... .... .... .... ........ | 1,002 |
| | Total weight put in silo..... .... .... ........ | 42,002 |

The silo was emptied in March, 1904, with the following results:—

1. Pure corn, late milk stage (bottom layer), weighed out on March 29, gave an excellent sample of ensilage palatable and sweet. All classes of stock seemed to like it. As noted above, there was put into the silo 9,370 pounds. The amount weighed out was considerably less, being........ .... .... .... .... 7,950
   A loss of about 15 per cent.

2. Corn, late milk stage, and rape, mixed in the proportion of 5,280 of corn to 5,280 of rape, removed and fed on March 18, gave a very excellent sample of ensilage that seemed to suit the palates of all classes of horned cattle even better than the pure corn ensilage. While 10,560 pounds of the mixture was weighed in, only 7,680 pounds was taken out, being a loss of about 33 per cent. Removed from silo..... .... ........ 7,680

3. Pure corn, late milk stage, came out in condition quite similar to layer 1, and was quite as palatable.

4. Pure Rape, cut as described above, was taken out and fed March 16. It came out in excellent shape, and was eaten with avidity by all classes of cattle. It had a pleasant smell, and a rather pleasing taste. It was not leathery, as any one familiar with rape might have anticipated, but seemed quite as crisp and almost as fresh as when put into the silo. It seemed to be by far the most popular feed that could be given the cattle from among all our succulent feeds, as they would push the corn ensilage and roots away to get at the rape ensilage. The chief objection to be raised is this, that the loss in weight while in the silo is very great. The amount put into the silo was, as already stated, 5,620 pounds, but the amount taken out was only.. .. .. .. .. .. .. .. .. .. 2,590

5. The corn and sunflower came out in good shape, and as usual made good ensilage. The loss was considerable, but not nearly so great as in the case of rape. There was placed in the silo 14,470 pounds, while the amount removed was.. .. .. .. .. .. .. .. .. 11,500

| | |
|---|---|
| 6. The horse beans were at the top, and were spoiled entirely. The weight of material taken out, however, was | 610 |
| Total weight removed was | 29,330 |

Percentage loss on pure corn........ 15 per cent of gross weight.
" " corn and rape .... 33 " "
" " pure rape....... 54 " "

COMPOSITION.

For a full discussion of the composition and nutritive value of these mixtures, the reader is referred to the report of the Chemist, but a few remarks might not be out of place here.

According to the analysis, the rape on going into the silo showed a dry matter content of 13·95 per cent, of which 1·91 was crude protein. When it came out the dry matter content was found to be 21·81 per cent, of which 2·56 was crude protein. Thus, while the loss is still very considerable, it will be observed that it is not nearly so heavy as might be concluded if the weights alone were considered. When the dry matter content of the rape as it entered the silo is computed it is found to be about 784 pounds, while a calculation shows the dry matter content of the rape ensilage as it came out of the silo to be about 565 pounds, a loss of 219 pounds on 784 pounds, or about 26·5 per cent of loss in the feeding value, as nearly as we may judge of feeding value by the chemical composition.

THE EXPERIMENTAL SILO IN 1904.

The experimental silo has been filled again with the following layers and mixtures:—

| | | |
|---|---|---|
| 1. | (Top). Pure corn | 3,195 |
| 2. | Corn | 5,910 |
| | Alfalfa | 2,050 |
| 3. | Alfalfa. (This alfalfa was part of the third crop off a field of mixed clovers and grasses. A botanical analysis showed about 22 per cent of other clovers and grasses which were of course left in the mixture when it was put in the silo) | 4,920 |
| 4. | Corn | 4,450 |
| | Alfalfa | 5,100 |
| 5. | Corn | 4,950 |
| | Alfalfa | 2,210 |
| 6. | Corn (pure) | 3,390 |
| | Total in silo | 36,175 |

This silo was filled on October 7, 1904, and will be fed out during the winter.

## AUTUMN CULTIVATION.

For several years early shallow plowing has been advocated and practised on the 200 acre farm, where meadow or pasture land was to be put in grain the next year. Two years ago a field of 18 acres was divided into 3 six acre parts.

One part was plowed 4 inches deep in August, and the land cultivated at intervals until late in October, when the surface soil was gathered together into ridges by means of a double mould board plow and put by for the winter.

Another part was torn up with a stiff toothed cultivator and the loosened soil so exposed to the sun was moved at intervals to allow the grass to die. Late in the fall the field, was ploughed and put by for the winter. The other field was not touched till late in the fall, when it was plowed about 6½ or 7 inches deep and left for the winter.

It was impossible to keep track of the returns from each of the parts separately but appearances were much in favour of the early fall plowing and ridging up.

In the fall of 1903 the experiment was repeated and things arranged to permit of a record of the grain crop being secured for each part. Each lot was 5 acres in area.

Lot 1. Ploughed late in the fall 6 inches deep, disc harrowed twice and harrowed once in the spring, sown with seeder. Yielded 8,553 lbs. of oats.

Lot 2. Cultivated 5 times with stiff toothed cultivator, harrowed 5 times and plowed in late autumn about 6 inches deep, was harrowed once in the spring and sown with the seeder. Yielded 9,995 lbs. oats.

Lot 3. Plowed shallow with gang plow in August; cultivated 3 times; harrowed three times, and then the surface soil gathered into ridges for the winter, was cultivated once in the spring, harrowed once and sown with seeder. Yielded 10,845 lbs. oats.

The three lots were each seeded with clover. Lot 1 was a poor catch; lot 2, a fair catch, and lot 3, a very excellent catch.

It is to be regretted that lot 3 cannot be left in hay in 1905. Lots 1 and 2 will be in hay, however, and will be watched with interest. The experiment is being repeated.

# REPORT OF THE HORTICULTURIST.

(W. T. Macoun.)

December 1, 1904.

Dr. Wm. Saunders,
Director, Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to submit herewith the eighteenth annual report of this division.

In the following pages will be found the results of some of the most important experiments conducted during the past year, and information regarding other work done.

### CHARACTER OF SEASON.

The winter of 1903-4 was the most severe winter that has been experienced in Ottawa for many years, and the past summer has been one of the coolest summers. The frost last winter played great havoc in the orchards of Ontario and Quebec, many fruit trees being killed which had never been previously injured, and in the Essex district the peach trees were nearly all destroyed.

Winter set in on November 16, 1903, and there was sufficient snow for sleighing by November 24, and on the 26th of that month the temperature fell to zero. December, January and February were all very cold months, the temperature only rising above the freezing point three times in December and twice in February, and then only for a short time, there being no real thaw. In January it never thawed. During the winter the temperature fell below zero 58 times, and lower than 20° F. below zero 15 times. In the coldest spell, which lasted from December 26 to January 6, the minimum temperature ranged from 4 to 30 degrees F. below zero for twelve consecutive days, and on 6 of the 12 days it was between 20° and 30° F. below zero. The lowest temperature recorded during the winter was 30·2° F. below zero on January 5. This continuous, dry, cold weather was very hard on fruit trees and a large number were killed. Fortunately, there was a good covering of snow all winter and little, if any frost in the ground, so that vegetation below the snow line was practically uninjured. The snow was at its greatest depth on March 21st., when there were about four feet on the level. There was a thaw on March 22, and by April 1, sleighing was practically gone. By April 11, the snow was out of the orchards and the soil in most of the apple and plum orchards was in condition for ploughing at once. The indications were that the injury from mice would have been great if the trees had not been protected, as a few seedling trees not protected were badly injured. April was a very cool month, with much cloudy weather, the highest temperature recorded being 66° F. on the 24th. On the 20th, there was a heavy fall of snow and good sleighing for cutters. The early part of May was quite warm and owing to the rapid development of the leaves the planting season was much shorter than usual, but it was a fine month for sowing seeds. The highest temperature in May was on the 9th., when the thermometer registered 85° F. There were no frosts in May, and in fact none since April 23. June was a much cooler month than usual. The highest temperature was on the 25th, when it was 87·5° F. There was one warm week in July, but the month on the whole was cool and cloudy, and especially cool at nights. The highest temperature during the month was 95° F. on the 19th. This was the only day during the summer when it rose to 90 or above. August was also cooler than the average, and while there were a few warm days the temperature did not rise very high, 83·5° F. being the highest reached, on the 5th. The summer was not a favourable one for the ripening of tender vegetables, such as melons and tomatoes, nor for other plants which require warm weather. September was another cool, cloudy month with much rain and not favourable for the ripening of grapes, of which there was a large crop, but of which few kinds matured. There was a severe frost on the night of September 21-22, the temperature falling to 27·5° F. and practically everything tender was killed, including tomatoes, melons, corn, cucumbers, beans and grape leaves. Up to this time, although there had been local white frosts, not registered at the Experimental Farm, there had been no frost recorded and no injury from frost since April 23. October was a very cool month with only about one week of fine, pleasant weather. Severe frosts were frequent, the temperature falling to 19° F. on the 31st. and from the 29th on the frost did not leave the ground, as during the early part of November the weather, though fine, was cold. The frosts were so severe during the second week of November that ploughing was stopped, but most of the frost came out again. Winter set in on November 24, with snow and frost in the ground.

## FRUIT AND VEGETABLE CROPS.

In the provinces of Ontario and Quebec the apple crop, although an average one in some places, was not quite as large as in 1903, and below the average on the whole, nor was the fruit as good in quality, being smaller and more spotted in most districts. The crop of pears was good, but peaches and plums were light crops. Owing to the very cool summer and autumn, grapes did not ripen as soon nor as well as usual, but there was a good crop in most places, although the black rot was very destructive in some cases. There was a light crop of strawberries in western Ontario owing to winter-killing of the plants, but in eastern Ontario and the province of Quebec the crop, although lighter than usual, was not much below the average. The raspberry crop was good.

The fruit crop at the Central Experimental Farm was, on the whole, a good one. There was a large crop of apples, the fruit being clean and of good size. There was a fine crop of Americana and Native plums, and the fruit was larger than usual. The strawberry crop, although not as large as in some other seasons, was not much below the average; while currants, raspberries and gooseberries all bore well. There was never a better crop of grapes here, but owing to the cool autumn comparatively few kinds ripened thoroughly.

Some kinds of vegetables were not very satisfactory this year owing to the cool weather, the crop of tomatoes being light, and melons almost a total failure except where forced. The yields from the experimental plots of potatoes averaged well.

## MEETINGS ATTENDED, PLACES VISITED AND ADDRESSES DELIVERED DURING THE YEAR.

Annual meeting, Quebec Pomological Society, Hemmingford, December 17-18, 1903. Address: 'Why Fruit Trees Die or Fail to Produce Fruit.'

Annual meeting, Nova Scotia Fruit Growers' Association, Bridgewater, N.S., January 27-28, 1904. Address: 'Causes of Failure in Beginning Fruit Growing.'

Farmers' Institute Meeting, Orillia, Ont., January, 11-12, 1904. Address: 'Orchard Management and Work of the Dominion Experimental Farms.'

International meeting, Port Huron, Mich., U.S., March 3-4, 1904. Address: 'Hardy Fruits for Cold Climates.'

Hamilton Horticultural Society, Hamilton, Ont., March 24, 1904. Address: 'Hardy Climbers, with Notes on some of the Newer Annuals and Perennials.'

Guelph Horticultural Society, Guelph, Ont., March 25, 1904. Address: 'Hardy Climbers for the Home Grounds.'

Canadian Florists' Association, Ottawa, Ont., August 9-10-11. Address: 'Hardy Perennials Suitable for Florists.'

Orchard meetings, at Cumberland, Hazeldean and City View, Ont., August 15-16-17, 1904. Address: 'Demonstrations in Orchard Management.'

Summer meeting, Quebec Pomological Society, St. Jerome, Que., August 24-25, 1904. Address: 'Hints to Beginners in Fruit Culture.'

St. Catharines Horticultural Society, St. Catharines, Ont., September 12, 1904, 'Work of the Horticultural Society.'

Annual meeting, Ontario Fruit Growers' Association, Toronto, Ont., November 15-19, 1904, 'Hardy Climbing Plants,' 'Report on New Fruits,' 'Discussion on Grape Rots.'

The following places were also visited during the year for the purpose of obtaining information which would be of service in furthering the fruit-growing interests of Canada. Returning from the summer meeting of the Quebec Pomological Society, I drove through the fruit districts of Dundas county, Ontario, visiting particularly the orchards of A. D. Harkness and Dr. Harkness, Irena, Ont., and Allan McIntosh, Dundela, Ont. Here were seen the oldest McIntosh Red apple trees in existence, including the original McIntosh Red tree itself, which is now almost dead. At Irena, Dundela and vicinity there are orchards of McIntosh Red apples producing from 100 to 200 barrels of this delicious variety. On September 4 and 5 I visited the Toronto Exhibition, and in studying the collections of fruit there, added considerably to my knowledge of varieties. On the occasion of my attendance at the meeting of the St. Catharines Horticultural Society, I took the opportunity of visiting a number of vineyards at St. Catharines and Winona in order to study the diseases of the grape which are causing much loss in the vineyards there, the Black Rot especially being very destructive. From October 17 to 22, I visited the World's Fair at St. Louis and made a careful comparison of the fruit exhibits form the various States and Canada, and had a particularly good opportunity of examining the different collections, as for two days I acted as a temporary judge. While at St. Louis I took the opportunity of visiting the Missouri Botanical Gardens, and in comparing the gardens there with our own, and examining the specimens was able to carry away impressions which may be put to good use. On my way home I visited the orchards of W. H. Dempsey, Trenton, Ont., and others in that district and studied the methods of picking, packing and storing apples employed in this fine apple district. While here I was able to obtain some good fruit for the Canadian exhibit at the World's Fair.

## ACKNOWLEDGMENTS.

I can but repeat this year the expression of appreciation made in past years of the work done in my department by Mr. J. F. Watson and Mr. H. Holz. The efficient manner in which the work they had to do has been accomplished is both gratifying to myself, and, I believe, a credit to the department. I also again wish to thank all those persons both in Canada and the United States who have, by the information so kindly furnished and by the plants, scions and seeds donated, and in other ways, aided me in trying to promote the horticultural interests of Canada.

## DONATIONS.

There has been a large number of donations again this year which are gratefully acknowledged herewith. Some of the most valuable and interesting things which have been tested by the horticultural division are received in this way :—

| Sender. | Donation. |
|---|---|
| Arnold Arboretum, Jamaica Plain, Mass.. .... | 100 species Grataegus and other plants. |
| D. F. Aikin, Farmington, Minn.. .. .. .. .... | Scions, seedling apple. |
| H. Beyer, New London, Iowa.. .. .. .. .. .. .. | 6 plants Everbearing raspberry. |
| Botanic Garden, Upsala, Sweden.. .. .. .. .. | Collection of seeds. |
| R. Brodie, Westmount, Q.. .. .. .. .. .. .. .. | Scions, Ogilvie apple. |
| Botanic Garden, Lausanne, Switzerland.. .. .. | 66 packages of seeds. |
| Botanic Garden, Karlsruhe, Baden.. .. .. .. .. | 58 packages of seeds. |
| Thos. Connolly, Lindsay, O.. .. .. .. .. .. .. | Scions, seedling apple. |
| Wm. Craig, Abbotsford, Q.. .. .. .. .. .. .. | Scions, Victoria apple. |
| Mr. L. Cameron, Iroquois, O.. .. .. .. .. .. .. | Buds of seedless apple. |
| J. K. Darling, Almonte, O.. .. .. .. .. .. .. | Scions, unknown apple. |
| B. Edwards, Covey Hill, Q.. .. .. .. .. .. .. | Apple scions. |
| Geo. Fraser, Ucluelet, B.C.. .. .. .. .. .. .. | Plants of "Pyrus rivularis." |
| H. N. Grant, Newtonbrook, O.. .. .. .. .. .. | Scions, seedling apple. |
| A. Harkness, Lancaster, O.... .. .. .. .. .. | Scions, unknown apple. |
| Robert Hamilton, Grenville, Q.. .. .. .. .. .. | Scions, seedling apple. |
| A. D. Harkness, Irena, Ont.. .. .. .. .. .. .. | Scions, seedless apple. |
| C. P. Hanon, Mount St. Hilaire, Q.. .. .. .. .. | Scions of red apple. |
| N. E. Jack, Chateauguay Basin, Q.. .. .. .. .. | Queen Mary plum scions. |
| Daniel, Lack, Lindsay, Ont.... .. .. .. .. .. | Scions, seedling apple. |
| J. S. Littooy, Everett, Wash.. .. .. .. .. .. .. | 6 plants Superlative raspberry . |
| Prof. J. Macoun, Ottawa, Ont.. .. .. .. .. .. | Bulbs of "Erythronium grandiflorum." |
| E. Morris, Fonthill, Ont.. .. .. .. .. .. .. .. | Scions, McDonald apple. |
| Prof. J. Macoun, Ottawa, Ont.. .. .. .. .. .. | Evergreens from Rocky Mountains. |
| D. C. McKinnon, Atherley, O.. .. .. .. .. .. .. | Scions, seedling apple. |
| Geo. H. McMillan, Dunbar, O.. .. .. .. .. .. | I case of Bug Death. |
| New York Experiment Station, Geneva, N.Y.... | Scions, seedling apple. |
| C. P. Newman, Lachine Locks ,Q.. .. .. .. .. | Grape cuttings. |
| A. W. Peart, Leamington, O.. .. .. .. .. .... | Scions, seedling apple like McIntosh also Williams' Favorite. |
| E. M. Richardson, Toronto, O.. .. .. .. .. .... | Scions, unknown apple. |
| Heber Rawlings, Forest, O.. .. .. .. .. .. .. | Ash Leaf Kidney potato. |
| Royal Gardens, Kew, England.. .. .. .. .. .. | Collection of seeds. |
| Royal Botanic Gardens, St. Petersburg, Russia. | Packages of seeds. |
| N. Smith & Son, Adrian, Mich.. .. .. .. .. .. | 6 plants "Helianthus sparsifolia." |
| C. H. Snow, Cumming's Bridge, O.. .. .. .. .. | Scions, Red Sports of St. Lawrence apple. |
| C. L. Stephens, Orillia, Ont.. .. .. .. .. .. .. | Scions, hardy peach and Red Russet apple. |
| F. G. Semple, Brule, N.S.. .. .. .. .. .. .. .. | Scions, unknown apple. |
| Stark Bros., Lousiana, Mo.. .. .. .. .. .. .. | Scions, E. 5, Z. 26, Bay and Black Ben Davis apples. |
| C. L. Stephens, Orillia, O.. .. .. .. .. .. .... | Scions, apples and plums. |
| Wm. Stark, Kelso, Scotland.. .. .. .. .. .. .. | Northern Star potato. |
| A. E. Sherrington, Walkerton, O.. .. .. .. .. .. | Scions, Sweet Bough and Northern Spy apples. |
| Robert Thompson, St. Catharines, Ont.. .. .. | Scions, unknown apple. |
| Prof. F. A. Waugh, Amherst, Mass.. .. .. .... | Plants of "Prunus Besseyi." |
| H. E. Wright, Summerside, P.E.I.. .. .. .. .. | Scions, Abegweit plum. |
| C. W. Young, St. Stephen, N.B.. .. .. .. .. .. | 2 Dickey Bug Death Dusters. |

I have the honour to be, sir,
Your obedient servant,

W. T. MACOUN,
*Horticulturist.*

## APPLES.

The winter of 1903-4 was the severest in the history of the Central Experimental Farm and the coldest on record in this district. In the orchards at the farm, 306 apple trees were killed, including 164 varieties. Owing to the good covering of snow there was no root killing, many trees being merely killed to the snow line, this point being clearly marked on the trunk in most cases. The vacancies caused by the death of the trees were most of them filled by varieties not hitherto tested, and by those which had proven hardy and were desired in larger numbers.

### APPLE CROP.

Notwithstanding the severe winter, the apple crop was good at the farm this year and the fruit was clean, being without spot and exceptionally free from Codling Moth.

### SEEDLING AND CROSS-BRED APPLES.

This year 192 seedlings of good varieties were added to those planted during the past four years, making the total number of apple seedlings of good varieties 1,788. Some work in cross-breeding apples was also accomplished, and the seeds obtained were sown this autumn. Some of the trees of the crosses between McIntosh Red and Lawver are approaching fruiting age and some good varieties are hoped for from these, as well as from the seedlings. This year 17 different crosses between McMahon White and Scott's Winter fruited, but although most of these resembled either or both parents in some respects, it is doubtful if any of them will be superior. There are three resembling Scott's Winter, but larger, which possibly may be useful.

### EFFECTS OF WINTER KILLING ON TOP GRAFTED TREES.

During the past six years, 90 varieties of apples have been top grafted on hardy stocks with the object of determining whether varieties which would not succeed when grown in the ordinary way would prove satisfactory when top grafted on stocks having hardy trunks. The experiment was proving very interesting and some varieties were apparently going to succeed when tested in this way, but last winter came and killed practically all those which had proven tender when tried as standard trees. Anyone who thinks that hardy stocks will make the graft noticeably hardier will have abundant proof that such is not the case from the following table. The dividing line between graft and stock was very marked in all cases examined. A Northern Spy, which had been top grafted on Duchess for 13 years, was killed completely back to the stock, which was as healthy as ever; and many other instances might be quoted. Two varieties of apples were top grafted on Wealthy in 1891. One of these, the Milwaukee, a hardy variety, and another, the Martha. Each variety occupied about half the top of the tree. The Martha was all killed, while the Milwaukee remained alive and bore a good crop of fruit. Top grafting will bring a tree into bearing sooner and will permit of growing varieties which sunscald on the trunk or are weak in the trunk in other respects, but the grafts if made any hardier are not sufficiently so to stand very severe winters.

In the following table will be found the names of the varieties of apples, 164 in number, which were killed last winter with the earliest dates of planting or top grafting the trees killed. Other varieties had been killed previous to last winter which are not recorded in this table, the Ben Davis being one of these. There were a few varieties of which one or more trees were killed, but others left uninjured, which are not included in the table, as they had proven so hardy up to last winter in this district. Among these may be mentioned American Golden Russet, Pewaukee, Baxter, and Canada Red, which are hardy enough to be given a further trial:—

VARIETIES of Apples Winter-killed, 1903-1904.

| Name. | Number of Standard or Top-grafted Trees, Winter-killed, 1903-1904. | First Dates of Planting or Top-grafting |
|---|---|---|
| Allen's Choice | 2 st | pl. 1897. |
| Allington Pippin | 1 st | pl. 1899. |
| Almond Reinette | 1 st | pl. 1895. |
| Arctic | 1 st., 4 t. gr. | pl.'98, t.g.'97 |
| Arkansas Black | 2 st | pl. 1896. |
| Aport (White Alexander) | 1 st | pl. 1897. |
| Aurora | 1 t. gr | t. gr., 1900. |
| Baldwin | 1 st., 2 t. gr. | pl.'00, t.g.'99 |
| Bayard Williams | 1 st | pl. 1899. |
| Belle de Boskoop | 1 st., 1 t. gr. | pl.'00, t.g.'98 |
| Bedfordshire Foundling | 1 st | pl. 1899. |
| Black Annette | 1 st | pl. 1899. |
| Blenheim Pippin | 2 st., 1 t. gr. | pl.'97, t.g.'03 |
| Bohemian Favorite | 1 st | pl. 1903. |
| Boiken | 4 st | pl. 1892. |
| Boy's Delight | 3 st., 1 t. gr. | pl.'97, t.g.'01 |
| Bottle Greening | 1 st | pl. 1900. |
| Bramley's Seedling | 2 st | pl. 1902. |
| Burlovka | 2 st | pl. 1888. |
| Carliss Red | 1 t. gr | t. gr., 1900. |
| Carthouse | 1 st | pl. 1903 |
| Chenango Strawberry | 1 st | pl. 1900. |
| Chelibi | 1 st | pl. 1896. |
| Cooper's Market | 1 st | pl. 1900. |
| Colvert | 1 st | pl. 1903. |
| Cox's Orange Pippin | 2 t. gr | t. gr., 1903. |
| Delicious | 1 st | pl. 1901. |
| Dempsey No. 80 | 1 st | pl. 1895. |
| Devonshire Quarrenden | 1 st | pl. 1899. |
| Dr. Noyes | 1 st | pl. 1903. |
| Dr. Walker | 2 st | pl. 1891. |
| Domine | 1 st | pl. 1901. |
| Duffey's Seedling | 1 t. gr | t. gr., 1901. |
| Ecklinville Seedling | 1 st | pl. 1902. |
| Edgehill | 2 st | pl. 1893. |
| Eisike | 2 st | pl. 1895. |
| Empress | 1 st | pl. 1899. |
| English Pippin | 1 t. gr | t. gr., 1896. |
| Esopus Spitzenburg | 1 st., 2 t. gr | pl.'00, t.g.'02 |
| Fall Jenetting | 3 t. gr | t. gr., 1900. |
| Fall Pippin | 1 st | pl. 1900. |
| Fallawater | 2 st., 2 t. gr | pl.'00, t.g.'98 |
| Fameuse Noire | 3 st | pl. 1893. |
| Fillipa's Apfel | 1 st | pl. 1899. |
| Flat Aport | 1 st | pl. 1901. |
| Flushing Spitzenburg | 2 st., 1 t. gr | pl.'02, t.g.'03 |
| Forest No. 3. | 1 st | pl. 1901. |
| Forest No. 4 | 1 st | pl. 1901. |
| Gascoigne's Seedling | 1 st | pl. 1901. |
| Gano | 4 st | pl. 1901. |
| Ghent T | 2 st., 1 t. gr | pl.'95, t.g.'03 |
| Gideon No. 20 | 1 st | pl. 1902. |
| Graham, I. J., from | 1 st | pl. 1901. |
| Golden Stone | 1 t. gr | t. gr., 1891. |
| Goode | 1 st | pl. 1900. |
| Gravenstein | 1 t. gr | t. gr., 1903. |
| Greenfield Seedling | 1 st | pl. 1899. |
| Grimes' Golden | 2 t. gr | t. gr., 1903. |
| Hebble | 1 st | pl. 1901. |
| Henzen's Gravenstein | 1 st | pl. 1899. |
| Hofgërtner Braun | 1 st | pl. 1899. |
| Holly | 1 st | pl. 1901. |
| Hoover's Seedling | 1 st | pl. 1898. |
| Hoover's Red Seedling | 1 st | pl. 1897. |
| Hubbardston | 1 t. gr | t. gr., 1903. |
| Huntsman | 1 st | pl. 1891. |
| Hurlbut | 1 t. gr | t. gr., 1901. |
| Hybrid No. 37 (Iowa) | 1 st | pl. 1897. |
| Jacob's Sweet | 1 st | pl. 1900. |
| Johnston, Asa, No. 2, from | 1 st | pl. 1902. |
| Johnston, Asa, No. 7, from | 1 st | pl. 1901. |
| Kara Synap | 2 st., 1 t. gr | pl.'96, t.g.'91 |
| Keswick Codlin | 1 st., 1 t. gr | pl.'00, t.g.'98 |
| Kinkead | 2 st | pl. 1902. |
| King | 1 t. gr | t. gr., 1901. |
| Knight's Greening | 1 st | pl. 1901. |
| Knight's No. 2 | 1 st | pl. 1899. |
| La Victoire | 1 st | pl. 1902. |
| Lady | 1 st | pl. 1888. |
| Lady Sudeley | 1 st | pl. 1899. |
| Lady Washington | 1 st | pl. 1897. |
| Lake's Pippin | 1 st | pl. 1896. |
| Lanark Greening | 1 st | pl. 1902. |
| Lamb Abbey Pearmain | 1 st | pl. 1902. |
| Lane's Prince Albert | 2 st | pl. 1899. |
| Lawver | 6 st., 1 t. gr | pl.'99, t.g.'99 |
| Leaf, W. H., from | 1 st | pl. 1897. |
| Legal Tender | 1 st | pl. 1901. |
| Lord's Late | 1 t. gr | t. gr., 1899. |
| Louise | 2 st | pl. 1893. |
| Mann | 3 st | pl. 1890. |
| Marsh, J. D., from | 1 st | pl. 1901. |
| Martha (not crab) | 1 t. gr. | t. gr., 1891. |
| Messenger, R., from | 1 t. gr | t. gr., 1903. |
| Merrit | 1 st | pl. 1901. |
| Milding | 2 st | pl. 1897. |
| Minkler | 1 st | pl. 1893. |
| Missouri Pippin | 3 st., 1 t. gr | pl.'90, t.g.'02 |
| Mitchell's No. 5 | 2 st | pl. 1896. |
| Mother | 1 t. gr | t. gr., 1900. |
| McCallum No. 102 | 1 st | pl. 1899. |
| McLure Pippin | 1 t. gr | t. gr., 1901. |
| New Winter H'wthornd'n | 1 st | pl. 1900. |
| Newell's Winter | 1 t. gr | t. gr., 1903. |
| Nodhead | 2 st., 1 t. gr | pl.'99, t.g.'03 |
| Northern Spy | 1 st., 2 t. gr | pl.'99, t.g.'91 |
| Ontario | 3 t. gr | t. gr., 1899. |
| Peasegood Nonsuch | 1 st | pl. 1899. |
| Perry's Russet | 1 st | pl. 1900. |
| Pomme Grise | 1 st | pl. 1888. |
| Primate | 2 t. gr | t. gr., 1900. |
| Princess Louise | 1 st | pl. 1899. |
| " of Denmark | 1 st | pl. 1899. |
| Ramsay, A. J., No. 2, from | 1 st | pl. 1898. |
| Red Detroit | 2 st | pl. 1901. |
| Red Subluck | 2 st | pl. 1895. |
| R. I. Greening | 1 st., 1 t. gr | pl.'00, t.g.'03 |
| Ribston Pippin | 3 st., 1 t. gr | pl.'00, t.g.'03 |
| Rockwood | 1 t. gr | t. gr., 1902. |
| Rome Beauty | 1 t. gr | t. gr., 1902. |
| Rubicon | 2 st | pl. 1895. |
| Ruby Gem | 3 st | pl. 1893. |
| St. Johnsbury | 1 st | pl. 1899. |
| Salome | 3 st | pl. 1888. |
| Sambo | 2 st | pl. 1895. |
| Saxton | 1 st | pl. 1899. |
| Senecal | 1 st | pl. 1899. |
| Shackleford | 2 st | pl. 1899. |

VARIETIES of Apples Winter-killed, 1903-1904—*Concluded.*

| Name. | Numder of Standard or Top-grafted Trees, Winter-killed, 1903-1904. | First Dates of Planting or Top-grafting | Name. | Number of Standard or Top-grafted Trees, Winter-killed, 1903-1902. | First Dates of Planting or Top-grafting |
|---|---|---|---|---|---|
| Shannon | 1 st. | pl. 1900. | Vermont Sweet | 2 st. | pl. 1899. |
| Sklianka | 2 st. | pl. 1888. | Wagener | 2 t. gr. | t. gr., 1902. |
| Smith's Cider | 1 st. | pl. 1902. | Walworth Pippin | 1 st. | pl. 1895. |
| Spencer | 2 st., 1 t. gr. | pl.'91, t.g.'02 | Warner's King | 1 st. | pl. 1892. |
| Springdale | 1 st. | pl. 1897. | Washington Royal | 1 t. gr. | t. gr., 1903. |
| Starr | 2 st. | pl. 1899. | Westfield Seek No Further | 4 st., 1 t. gr. | pl.'90, t.g.'01 |
| Stark | 3 st., 2 t. gr. | pl.'01, t.g.'03 | Willow Twig | 1 st. | pl. 1903. |
| Stettin No. 80 | 1 st. | pl. 1896. | Windsor Chief | 1 st. | pl. 1895. |
| Stuart's Golden | 1 t. gr | t. gr., 1903. | Winesap | 2 st. | pl. 1900. |
| Sturmer Pippin | 1 st. | pl. 1902. | Winter Banana | 1 t. gr. | t. gr., 1903. |
| Sugar Sweet | 1 st. | pl. 1893. | Winter Bough | 2 st. | pl. 1889. |
| Sutton Beauty | 1 t. gr | t. gr., 1902. | Winter Duchess | 1 st. | pl. 1889. |
| Summer King | 1 st. | pl. 1903. | Winter Calville | 1 st. | pl. 1899. |
| Svintzovka | 1 st. | pl. 1892. | Winter Maiden's Blush | 3 st. | pl. 1899. |
| Swaar | 1 st. | pl. 1900. | Winter Rambour | 1 st. | pl. 1895. |
| The Jake. | 1 st. | pl. 1896. | Yellow Bellflower | 2 t. gr. | t. gr., 1901. |
| The Queen | 4 st. | pl. 1901. | York Imperial | 1 t. gr. | t. gr., 1901. |
| Tom Putt | 1 st. | pl. 1902. | | | |
| Trdika | 1 st. | pl. 1899. | | | |

REVISED LIST of varieties of apples recommended for the province of Ontario between latitudes 45° and 46° and along the north side of the St. Lawrence river in the province of Quebec to about Three Rivers (District No. 7, Bulletin 37.)

Owing to the winter killing of some varieties of apples last winter, which were previously thought to be hardy, it is necessary to revise the list of apples recommended for this district. The only important changes which occur, however, are in the winter varieties.

Summer.—Yellow Transparent, Duchess of Oldenburg.

Autumn.—St. Lawrence, Wealthy, Alexander.

Early Winter.—McIntosh Red, Fameuse.

Winter.—Scott's Winter, Milwaukee, North Western Greening, Canada Baldwin, and Golden Russet in the more favoured localities.

Additional varieties suggested for home use:—

Summer.—Lowland Raspberry, Early Joe, Russell, Dyer.

Winter.—Swayzie Pomme Grise, Grimes Golden.

### A CLOSE-PLANTED WEALTHY ORCHARD.

In the Annual Report for 1902, an account was given of a close-planted orchard of Wealthy apple trees. The receipts and expenses in connection with this orchard, from the time the trees were planted until the autumn of 1902, were published in that report. It was shown that from a little less than one-third of an acre of trees planted 10 by 10 feet apart in the spring of 1896 the receipts had been $307.01, or at the rate of $940.15 per acre, and the expenses per acre $454.62, leaving the net receipts per acre $485.53. The trees began bearing well in 1899 and the receipts represent the money obtained for the fruit for four years' crops. These net receipts meant an average per year of fruiting of $121.38 per acre. There are 131 trees in this orchard left out of an original number of 144.

The crop in 1903 was a light one, being 161 gallons picked fruit, and 162 gallons windfalls, or a total crop of about 13½ barrels, but this year it was very good, and while the fruit was smaller it was highly coloured, and sold as well as could be expected on such a glutted market as there was this year.

In the following table will be found the receipts and expenditure from the year 1899, when the trees began to bear well, until the autumn of 1904. The expenses before 1899, including rent of land, cost of trees, planting and cultivating are estimated at $150 per acre.

| Receipts. | | Estimated per acre. |
|---|---|---|
| 1899-1902 | $ 307 01 | $ 940 15* |
| 1903, sold 88 baskets at 17½ cts. | 20 80 | 62 92 |
| 1904 " 60 boxes (Dublin) 4s. 6d. ($1.09) | 65 40 | 197 83 |
| " 30 boxes 3s. 6d. (85cts) | 25 50 | 77 14 |
| " 30 boxes (Glasgow) 5s. ($1.22) | 36 60 | 110 71 |
| " 46 baskets at 20cts. | 9 20 | 27 83 |
| " 42 baskets at 17½ cts. | 7 35 | 22 23 |
| " 53 bags (X grade) 30cts. | 15 90 | 48 10 |
| Total receipts, 1899-1904 | $ 487 76 | $1,486 91 |

*Expenses.*

| | Estimated per acre. |
|---|---|
| 1896-1899—Estimated expenses per acre including rent of land, cost of trees, planting and cultivating | $ 150 00 |
| 1899-1902 (For details see report for 1902). Total expenses per acre | 454 62 |
| 1903, Rent of land | 3 00 |
| Spraying | 9 44 |
| Cost of baskets (baskets at 5½ cts. each) | 14 64 |
| Cost of picking | 8 05 |
| Cost of packing | 5 32 |
| Commission on sales | 6 29 |
| 1904, Rent of land | 3 00 |
| Spraying | 9 44 |
| Cost of boxes and baskets (boxes at 14½ cts., baskets 6½ cts) | 69 27 |
| Cost of picking | 60 50 |
| Cost of packing and grading fruit in boxes, including excelsior and cardboard | 69 01 |
| Cost of packing baskets | 5 32 |
| Freight, &c., on boxes of fruit sold | 115 24 |
| Commission on fruit sold in boxes | 11 62 |
| Commission on fruit sold in baskets | 4 99 |
| Total expenses, 1896-1904 | $ 999 75 |
| Total receipts per acre, 1896-1904 | $1,486 91 |
| Total expenses per acre, 1896-1904 | 999 75 |
| Net receipts | $ 487 16 |
| Average profit per acre per year, 1896-1904 | $ 54 13 |
| Average profit per acre per year, 1899-1904 | 106 19 |

*Part of this estimate of $940.15 is based on the yields from 139 trees and part from 144. Five trees died previous to 1899 and were not replaced, hence it was considered fairer to estimate from those that remained. In 1902 and since, however, the yields have been estimated on the area occupied by the original plantation of 144 trees, as this area now is fully occupied by the trees.

*(By Frank T. Shutt.)*

WEALTHY APPLE ORCHARD (CLOSE PLANTED) IN BLOOM.

*(By Frank T. Shutt.)*

APPLE TREE TOP GRAFTED WITH TWO VARIETIES.
(ONE VARIETY WINTER KILLED, OTHER UNINJURED AND REQUIRING PROPS TO SUPPORT LOAD OF FRUIT.)
HORSE BEAN COVER CROP SHOWN IN THE FOREGROUND.

These expenses are estimated from about one-third of an acre and on the assumption that the percentage of sales in boxes and bsakets would be the same from a full acre. There was no expense for cultivating either in 1903 or 1904, as the trees being close, cultivation was impracticable. There was no expenditure on barn-yard manure or chemical fertilizers in 1903 or 1904, as none were applied up to the time of making these calculations.

While this system of close planting is not recommended for general adoption, it is well worthy of a trial by fruit specialists who will give sufficient attention to it. Only a few varieties of apples are suitable for close planting, Wealthy being one of the best, and Wagener probably almost as good, on account of their early bearing habit. The Wealthy orchard at the Central Experimental Farm will receive a good dressing of barnyard manure this winter. As the trees are now meeting and it would be unwise to continue to grow them as thick any longer, an experiment will be tried next spring of heading back a proportion of the trees severely, the object being to re-head the trees alternatively, thus keeping up the vigour and allowing light to get at the fruit. If this is not found satisfactory some of the trees will be removed altogether. The total crop this year on about one-third of an acre was 2,134 gallons, about 90 barrels, or at the rate of about 270 barrels to the acre. Thtere were 564 gallons windfalls and 1,570 gallons picked fruit. There are still 131 trees of the original 144 alive, most of them in a thrifty condition.

### EXPERIMENTAL APPLE SHIPMENTS TO IRELAND AND SCOTLAND IN 1904.

In 1902 and 1903 experimental shipments of apples in boxes were made to Glasgow, Scotland, with gratifying results, both in regard to the condition in which the fruit arrived on the other side and in the prices obtained for it. The information furnished in the annual report regarding sales and cost of shipment proved very acceptable to growers in Canada who had not had any experience in shipping apples and who did not know how to go about it.

As agents in Ireland had been requesting Canadian fruit growers to give the Irish market a trial this year, it was thought that useful information would be obtained by making some experimental shipments there. This was considered particularly desirable this year when there was such a large crop of apples in England and it was thought the Irish market would not be as well supplied with home-grown fruit, and better prices would therefore be obtained. The crop in Ireland, however, was a very large one also, and the prices obtained for summer and autumn apples from Canada was low, in some cases not covering the cost of shipment.

Six shipments in all were made, four being to Belfast, Ireland, one to Dublin, Ireland, and one in Glasgow, Scotland, for comparison. All the apples were packed in boxes 10 x 11 x 20 inches, inside measurement. The fruit was placed in regular rows and tiers in the boxes with a sheet of cardboard above and below and a very little excelsior between the cardboard and the sides of the box. The Charlamoff apples in the second shipment were wrapped in tissue paper, and the Anis and Winter Stripe in the third shipment, the others were not wrapped. As a rule the apples were well coloured but still hard, with the exception of the Duchess apples in the first shipment, which were not as well coloured as in the second, being picked earlier. The fruit was inspected by the Dominion fruit inspectors at Montreal and all graded XXX.

Following is a table showing the prices obtained for the different varieties, the date and steamer on which they were shipped ; name of variety, number of boxes, selling price per box, destination and route, and whether sent in cold storage or not. It will be seen from the table below that fair profits for the season were had from the Dublin and Glasgow shipments. The fruit sent to Belfast realized considerably less. The charges on these are not yet available, but it is expected the returns will not do much more than cover expenses.

| Date of Shipment. | Destination and Route. | Name of Steamer. | Name of Variety. | Number of Boxes. | Selling Price, per box. | Cost of Shipment, including cost of boxes, packing, material, freight, commission, &c. | Profit. |
|---|---|---|---|---|---|---|---|
| 1904. | | | | | s. d. | $ cts. | $ cts. |
| Aug. 20 | Belfast *via* Liverpool (cold storage) | Dominion...... | Duchess....... | 100 | 2 0 | .......... | |
| " 27 | " " " .. | Vancouver..... | " ...... | 55 | 2 0 | ......... | |
| " 27 | " " " .. | " ... | Charlamoff (Pointed Pipka) | 70 | 3 6 | .......... | |
| Sept. 14 | Belfast (direct)............... | Bray Head..... | Antonovka.... | 46 | 1 6 | ..... .... | |
| " 14 | " " ................ | " ..... | Anis......... | 24 | 2 6 | .......... | |
| " 14 | " " ................ | " "..... | Dudley........ | 12 | 2 6 | .......... | |
| " 14 | " " ................ | " "..... | Winter Stripe.. | 12 | 2 6 | .......... | |
| " 14 | " " ........... .. | " "..... | McMahon White.. | 6 | 2 6 | ......... | |
| " 18 | Dublin (direct)................ | Inishowen Head | Wealthy....... | 70 | 4 6 | 66 79 | 35 48 |
| " 18 | " " .. .............. | " .. | " ..... | 30 | 3 6 | | |
| " 29 | Glasgow (direct) ..... .......... | Parthenia...... | " ...... | 30 | 5 0 | 31 28 | 12 55 |
| " 29 | " " ............... | " ....... | Patten's Greening.. | 10 | 3 0 | | |
| " 30 | Belfast (direct).... ........... | Dunmore Head.. | Wealthy....... | 20 | 3 0 | ........ | |
| " 30 | " " ............... | " .. | McMahon White.. | 5 | 3 0 | ..... .... | |

The following quotations from letters received from the consignees show the condition in which the fruit arrived, and give the criticisms made upon it. These are published for the guidance of fruit growers in the future. It is very satisfactory to know that no complaints were made with regard to the packing of the fruit nor of the condition in which it arrived.

REPORT OF FIRST SHIPMENT OF DUCHESS APPLES IN COLD STORAGE TO BELFAST, IRELAND.

'BELFAST, September 7, 1904.

'I have received the 100 boxes of Duchess apples this week, and the quality of the apples is rather disappointing, as it is not good enough for eating, and for cooking, buyers prefer our own Irish apples which are an exceptionally good crop this year and very cheap. Had they been a nice good keeping eating apple and a good colour, I could have sold them, I think, very well. They are certainly very well put up and the packing very good, in fact, one of the largest buyers told me he would take the whole of the apples if they had been suitable, but he would not take a box when he saw them. He said he was quite prepared to pay me 4d. for as many of the empty boxes as I could get him, but the apples to him were useless, as they would not suit his customers at all. What we want is a nice dessert apple. We have plenty of the cooking grade here. There was only one buyer that would make me an offer at all, and the best he would make me was 2s. per box ex quay.'

(Signed) 'HUGH GORDON.'

EXTRACT FROM REPORT OF SECOND SHIPMENT (DUCHESS AND CHARLAMOFF).

BELFAST, September 14, 1904.

'The second consignment of apples has arrived, and as requested, I have examined the boxes and notice the way you have them packed. They are certainly very well put up, but some of the largest fruit merchants here state that they are the wrong kind of apples (they were Duchess and Charlamoff) you are shipping, as they will keep no time and would have to be disposed of immediately they arrive, and as there is considerable risk to the buyer, he will not be willing to give a very big price for them, as the Irish apples are so plentiful this year and are being sold at very low prices. One of the largest fruit merchants in Belfast informed me that if you could get him any barrels of Alexander apples that he would have a ready sale for them, in fact, he said that the demand was entirely on barreled apples as the boxes were difficult to place, as there is so very little bulk, and of course the prices must be higher in consequence of the expense of packing. Have only been able to get 3s. 6d. for Pipkas (Charlamoff) and 2s. for Duchess ex quay Belfast.'

(Signed) 'HUGH GORDON.'

EXTRACT FROM REPORT OF THIRD SHIPMENT (ANTONOVKA, WINTER STRIPE, ANIS, DUDLEY).

'BELFAST, October 27, 1904.

'*Re* 100 boxes of apples, they came in good order, but as I have already wrote you, you are not shipping the right sort of apple at all. What we want is a good eating apple somewhat similar to good Baldwins and packed in barrels. Apples are so very cheap here that it is impossible to get a decent price for them, and I don't know what you think of the grade you are shipping, but buyers do not care for them at all, the flavour not being nice like Baldwins. I sold 46 boxes at 1s. 6d. per box. Winter Stripe, Anis, Dudley and McMahon White, I sold at 2s. 6d. per box, less the freight, so that after deducting the freight I have practically nothing left for the apples. As you are aware, this is a very bad year for experimenting with apples, and I believe that apples in barrels would do a great deal better than in boxes as they would come cheaper.'

(Signed) HUGH GORDON.

EXTRACT FROM REPORT OF FOURTH SHIPMENT (WEALTHY).

DUBLIN, October 19, 1904.

'I duly received the consignment of 100 boxes, Wealthies per SS. *Innishown Head.* They arrived in very good condition, presenting a fine appearance when opened. The only thing I noticed in respect to the boxes was that a few of them had the end pieces broken across, but this did not cause any damage to the contents. The trip occupied twelve days and it was four days after the steamer arrived here before I got delivery, thus making sixteen days from the time of shipment, and considering that the consignment did not come in cold storage, the result was very satisfactory, as the whole lot looked as well as could be desired. If this direct shipment can be utilized by Canadian shippers it would mean a very large saving in rates. The prices realized for this consignment, namely: 30 boxes at 3s. 6d. and 70 at 4s. 6d. were not as high as I expected, but this was owing to the enormous crop of Irish grown apples on the market and some very large consignments of States fruit. The crop of Irish apples this year is the largest for ten years, but will be very quickly worked off. The consignment you sent is the very thing we want here; good colour and sound, well packed. There is no market for Canadian or American green apples suitable only for cooking.'

(Signed) 'J. H. SHERIDAN.'

EXTRACT FROM REPORT OF FIFTH SHIPMENT (PATTEN'S GREENING, AND WEALTHY).

'GLASGOW, October 19, 1904.

'I beg to send you herewith account sale for your consignment of 40 boxes apples ex steamer *Parthenian*, and draft for £5 11s. 1d. sterling in settlement of net proceeds, which please acknowledge. I can assure you we did the very best possible with this lot of apples, and trust that the result is satisfactory to you. They arrived here in prime condition and sold well under the conditions of the market. As you are doubtless, aware, large quantities of apples have been coming on the British markets this season and prices have ruled low, but for good coloured fruit lately we have experienced a strong demand in view of the near approach of Hallowe'en festivities, while for green fruit, such as Greening, Colverts and such like varieties, there has been a very poor sale owing to the large quantities of English and continental of like description.

(Signed) 'THOS. RUSSELL.'

EXTRACT FROM REPORT OF SIXTH SHIPMENT (WEALTHY AND M'MAHON WHITE).

'BELFAST, November 19, 1904.

'With reference to the last consignment of 25 boxes of apples, Wealthy and McMahon White, the Wealthy apples were certainly very nice, good flavour, but of course a shade smaller. I was unable to get a very big price for them. As I explained to you before, the Irish apples were so very plentiful, I sold them at 3s. a box to Lennon Bros. Are you able to quote apples in barrels yet, as there is a far greater demand for them than the boxes?

'HUGH GORDON' (per).

## SEEDLING FRUITS.

There have not been quite as many seedlings sent in this year as in 1903, but most of those received were above the average seedlings sent in for examination in the past. Full descriptions are published of those which were thought to be the most promising, and partial descriptions of those which are not of special merit.

As scions of most of the best seedlings which are received from year to year are obtained from the grower, a very fine collection of seedlings is being got together here, some of which should prove superior to those now generally grown.

It is hoped that anyone who has a promising seedling will send fruit for examination to the Horticulturist, Central Experimental Farm, Ottawa.

All the seedlings described below are apples, with the exception of one plum.

291. J. Gossley, Richmond Hill, Ont.—(No. 12 seedling). Medium size, sparsely splashed with purplish red. Quality good, but not attractive. Season, winter.

292. J. Gossley, Richmond Hill, Ont.—Medium size; form roundish, slightly angular; cavity deep. open; stem broken; basin medium depth and width, smooth; calyx open; colour yellow, well splashed and washed with bright red; dots few, small, yellow, indistinct; skin moderately thick, tough; flesh yellow, crisp, tender, juicy; core medium; subacid, flavour pleasant; quality good to very good; season apparently mid to late winter. Tree said to be a cross between Canada Red, Baldwin and Spy. Much like Spy in appearance and flavour, but is not as good flavour as Spy.

293. F. C. Judd, Doe Lake, Ont.—Medium size, splashed and streaked with bright red, medium quality. Season, October.

294. F. C. Judd, Doe Lake, Ont.—Medium size; yellow, red about cavity; quality above medium to good. Season late September.

295. J. W. Morrison, Acton's Corners, Ont.—Above medium size, bright red, medium quality. Season late September to October.

296. J. W. Morrison, Acton's Corners, Ont—Medium size, pale yellow; quality above medium. Season September.

297. J. W. Morrison, Acton's Corners, Ont.—Medium size, pale yellow with a pinkish blush; quality above medium. Season early to mid-winter.

298. C. H. Snow, Cummings' Bridge, Ont.—Winter Greening; medium size, pale greenish yellow with a pinkish red blush, quality above medium. Season mid to late winter.

299. H. N. Grant, Newtonbrook, Ont.—Medium size; form roundish, slightly angular; cavity medium depth and width; stem medium length, slender; basin very deep, open, wrinkled; calyx open; colour yellow washed with dark red; dots obscure; skin thick, moderately tough; flesh yellow, tender, juicy; core small; mildly subacid, pleasant flavour; quality good; season probably mid to late winter. Seedling tree growing near fence. Colour too dark to be very attractive. Only fairly promising, though better in quality than most seedlings.

300. G. H. McMillan, Dunbar, Ont.—Medium size, yellow splashed and washed with purplish red; quality medium to above. Season mid to late winter.

301.—Samuel Greenfield, Ottawa East, Ont.—Above medium size; form roundish, conical, angular; cavity medium depth and width; stem short, slender; basin medium depth and width, wrinkled; calyx closed; colour yellow, almost entirely covered with deep crimson; dots moderately numerous, yellow, distinct; skin thick, tough; flesh yellow, moderately juicy, rather coarse; core medium; subacid, with a pleasant flavour; quality good; season evidently October and perhaps later.

Seedling originated by Mr. Greenfield. If this apple has better points than Wealthy it may be useful, but it is not as juicy nor as tender in the flesh as Wealthy, though perhaps a little higher flavoured.

302. Miss P. L. Baker, Oakville, Ont.—Size large; form roundish; cavity narrow, medium depth, lipped; stem short, slender; basin narrow, medium depth, almost smooth; calyx open; colour pale yellow, almost covered with crimson; dots obscure; skin thin, tender; flesh white; core medium; subacid, slightly astringent; quality good; season evidently late August to early September. Tree a seedling about ten years old. Blossomed for the first time this year. Blossoms very large. A handsome apple, resembling Red Astrachan very much in outward appearance, and probably a seedling of it. Resembles Langford Beauty and Russell in character of flesh and flavour.

303. E. Rakestrow, Township of Ryde, Muskoka District, Ont.—Above medium size; form oblate roundish; cavity deep, medium width, russeted; stem short, moderately stout; basin open, deep; calyx open; colour yellow, well washed with bright red; dots few, indistinct; skin thick, moderately tough; flesh yellowish, tender, juicy; core medium; subacid, sprightly, with a pleasant flavour; quality good; season evidently October. Tree quite hardy. Seed sown eight years ago by daughter of Mr. Rakestrow. had one apple in 1903 and fifty this year. Fourteen miles from Gravenhurst. A promising seedling. Not as high flavoured as Wealthy, but a good apple. Promising.

304. Thos. C. Paddon, 62 Bolton Avenue, Toronto.—Plum seedling; form broad oval; size above medium; cavity deep, narrow, abrupt; suture a distinct line, not depressed; apex rounded; colour dark, purplish red; dots numerous, small, yellow, distinct; bloom appears light; skin moderately thick, tough; flesh deep greenish yellow, juicy, firm; stone medium size, practically free; moderately sweet; quality medium to above. Tree said to be a seedling. 'Tree is an upright grower, stands about 25 feet high and is a good heavy cropper.' It resembles Lombard very much. Should be a good shipper. Domestica group.

305. E. Kenny, St. Vincent de Paul, Que.—Medium size; form roundish conical, angular; cavity medium depth and width, slightly russeted; stem medium length, slender; basin shallow, narrow, wrinkled; calyx partly open; colour yellow, well splashed and washed with rich red; dots moderately numerous, yellow and gray, distinct; skin moderately thick, tough; flesh crisp, tender, yellowish, juicy; core medium; briskly

subacid with a pleasant flavour; quality good; season late winter. Tree has been planted about 20 years. Fruit has large seeds. Said to keep until June. Resembles Rubicon somewhat. September 12, 1904, received 4 specimens of same apple from Mr. Kenny kept in an ordinary cellar. Still in condition for eating, but mildly subacid at this date. Evidently a good keeper.

306. Wm. Ogilvie, Ormstown, Que.—Size large; form oblate; cavity very deep, open; stem very short, stout; basin deep, medium width, almost smooth; calyx partly open; colour yellow, well splashed and washed with lively purplish red; dots few, large, gray, prominent; skin moderately thick, tough; flesh dull white, crisp, tender, juicy; core small; subacid, sprightly; quality good; season evidently early to mid-winter or later. A large handsome apple. Should make an excellent cooking apple, and is a good dessert variety also. Mr. Robert Brodie, Westmount, P. Q., received this apple from Wm. Ogilvie, Ormstown, Que., where it was grown. He thinks it may be a variety he used to call Hemmingford.

307. J. K. McKenzie, Rogers Hill, N.S.—Above medium size; yellow washed with bright red on sunny side; medium quality; season mid to late winter.

308-314. John McCarthy, Semiwagan Ridge, N.B.—Seven seedlings.

309. Seedling No. 2. Medium size; form roundish; cavity medium depth and width; stem broken; basin medium depth and width, almost smooth; calyx open; colour pale yellow well washed with crimson; dots few, small, pale yellow, indistinct; skin thick, tough; flesh white, juicy, tender; core medium; mildly subacid with a pleasant flavour; quality good to very good; season early winter. Resembles Fameuse very much. Evidently a seedling of it.

315. A. P. Stevenson, Nelson, Man.—Martha Crab seedling; size large; form roundish to oblate, conic, angular; cavity open, medium depth; stem medium length stout; basin narrow, medium depth, much wrinkled; calyx partly open; colour yellow, well splashed and washed with bright red; dots obscure; skin moderately thick, tender; flesh yellow, rather coarse, moderately juicy; core medium size, open; briskly subacid; quality medium; season evidently early September. A large, handsome apple which is said to have been grown from Martha Crab seed sent from the Experimental Farm, Ottawa, in 1896.

## PLUMS.

Last winter was very hard on plums of the European and Japanese classes and most varieties were killed to the snow line. None of these plums have proven satisfactory here. There are, however, two seedlings of the Red June plum originated at the experimental farm which are hardier in the flower bud than any others which have been tested, and these bore some fruit this year. These have been called Togo and Oyama, and descriptions of them are given in this report. The crop of Americana and Nigra plums was the best we have ever had, both in quality and quantity, and the fruit sold well on the exchange here. Three American seedlings originated at the Central Experimental Farm were named this year, these being Gloria, Swift and Fitzroy. Descriptions of these follow. Among the newer Americana varieties which fruited this year the Admiral Schley, Bomberger, Lottie and Smith were the most promising. Descriptions of these are given also. One of our aims is to develop an

Americana plum with as tender a skin as the European, of good flavour and having a free stone. The nearest approach to this is the Welcome plum, originated at the Central Experimental Farm, and described in the report for 1903. Stones of this have been planted in the hope of getting an improvement in the next generation.

Togo (seedling of Red June).—Form roundish, somewhat heart-shaped; size above medium; cavity narrow, medium depth, abrupt; suture an indistinct, sometimes distinct, line, no depression; apex slightly flattened; colour deep red; dots numerous, small, indistinct; bloom moderate, bluish; skin moderately thick, tough; flesh yellow, firm, juicy; stone medium size, oval, slightly flattened, cling; sweet, acid next skin; quality good. A promising plum. Larger than Red June and better in quality. Handsome. Named Togo August 31, 1904, in honour of Admiral Togo. Triflora group.

Oyama (Botan seedling).—Form roundish to broad oval; size medium; cavity narrow, medium depth, abrupt; suture a distinct line, not depressed; apex rounded; colour deep red all over; dots obscure; bloom thin, pale bluish; skin moderately thick, moderately tender, bitter; flesh yellow, firm, juicy; stone small, oval, cling; sweet, not of rich flavour; quality, medium to above medium. Not specially promising. September 12, 1904. May be useful on account of hardiness of fruit buds. Triflora group.

Gloria (Wolf seedling).—Form oval to oblong, somewhat flattened; size large; cavity narrow, shallow, abrupt; suture a distinct line; apex rounded; colour uniformly bright red all over, or yellow mottled with red; dots few, yellow, small, distinct; bloom thin, bluish; skin thick, tough; flesh deep yellow, juicy; stone large, almost or quite free, oblong, considerably flattened; sweet; quality good. Owing to its large size and the almost freeness of stone, this is a promising variety. Americana group.

Swift (De Soto seedling).—Form broad oval, much flattened; size large; cavity narrow, shallow; suture merely an indistinct line; apex slightly flattened; colour yellow, mottled and washed with deep red; dots obscure; bloom slight; skin thick, moderately tough; flesh rather pale yellow, juicy; stone above medium, oval, semi-cling, almost free; flavour sweet, pleasant. A good plum and worth propagating. Americana group.

Fitzroy (Rollingstone seedling).—Form roundish, slightly heart-shaped, flattened; size above medium to large; cavity narrow, shallow, abrupt; suture a distinct line, no depression; apex rounded; colour yellow, well washed with deep red; dots numerous, small, yellow, distinct; bloom moderate; skin thick, moderately tender; flesh rather pale, yellow, juicy; stone above medium size, flattened, roundish to oval, practically free; sweet; quality good. A good plum, but cracks some, which may be against it. Freeness of stone a good point. Americana group.

Admiral Schley.—Form roundish; size very large; cavity narrow, shallow; suture a distinct line; apex rounded; colour yellow, well washed with deep bronzy red; dots numerous, small, yellow, distinct; bloom thin, bluish; skin moderately thick, tough; flesh deep yellow, juicy; stone large, oval, flat, cling; sweet, of a rich flavour; quality very good. One of the best Americana plums yet tested. An improvement over Hawkeye. Americana group.

Bomberger.—Form roundish to broad oval; size very large; cavity shallow, narrow; suture a distinct line; apex rounded; colour yellow, more or less covered with deep lively red; dots few, small, yellow, distinct; bloom medium; skin thick, tough; flesh deep yellow, juicy; stone medium size, oval, flat; sweet and rich; quality very good. A very handsome plum. More attractive than Hawkeye. Promising. Americana group.

Lottie.—Form roundish; size large; cavity shallow, narrow; suture an indistinct line; apex slightly flattened; colour yellow, mottled and washed with red; dots obscure; bloom slight; skin thick, tough; flesh sweet, juicy; stone medium size, roundish, semi-cling; sweet, rich; quality good. A handsome plum of good quality. Propagate. Americana group.

Smith.—Form roundish to broad oval; size large; cavity narrow, shallow; suture a distinct line; apex rounded; colour yellow, mottled and washed with red; dots obscure; bloom light; skin thick, moderately tough; flesh yellow, juicy; stone rather large, oval, nearly free; sweet, rich; quality good to very good. A good plum. Promising. Americana group.

## GRAPES.

There was never a finer crop of grapes at the experimental farm than there was this year, but owing to the unusually cool and cloudy summer and autumn only 32 varieties ripened thoroughly compared with 101 in 1903. As the varieties which ripened this year are those which will mature with the least amount of heat, a list of them is herewith given as a guide to those who wish to test grapes in the colder parts of Canada. These are given in order of ripening. Florence, Early Daisy, September 9. Manito, Champion, September 17. Golden Drop, Jewel, Moore's Early, September 26. Moyer, September 27. Wyoming Red, September 28. Campbell's Early, Lincoln (Read's Hybrid), Brant, Canada, Telegraph, Hartford, Potter, Pattison, Seedling No. 1, X Muscat Hamburgh, Northern Muscadine, Dracut Amber, Maxatawny, September 29. Peabody, September 30. Janesville, Early Victor, Cottage, Lutie, October 3. Early Ohio, October 4. Creveling, Marion, Jessica, Superb, October 6. Belvidere, October 8. Delaware, Lindley, Brighton, Moore's Diamond had some bunches about ripe October 6.

The following new variety is described for the first time in this report.

Lincoln (Read's Hybrid).—Concord female X Black Hamburgh male. In 1897 three vines of this grape were sent for test by Mr. M. A. Read, Port Dalhousie, Ont., son of Wm. H. Read, the originator.

This variety has proven so valuable here, and should prove so valuable even in the best grape districts, that it deserves especial mention. The vine is a vigorous grower and very productive. The bunches are below medium size, but well filled, from 4 to 5 inches in length, compact, cylindrical or slightly shouldered. Fruit below medium size, round, black with a moderate bloom. Skin thick, tough; pulp moderately firm, but breaks fairly easily. Sweet, sprightly, slightly foxy; flavour somewhat like Concord with a suggestion of Black Hamburgh. Quality almost good. This is attractive in appearaace and ripens about the same time as Moore's Early and would probably make a good shipping grape. Very promising.

In a letter received from Mr. M. A. Read, Port Dalhousie, Ont., dated December 1, 1904, further information was obtained regarding this variety. He writes:—

'The Black Hybrid grape received by your department in the year 1897 was originated by my father, the late Wm. H. Read, in the year 1887. It is a cross between the Concord and Black Hamburgh; Concord for female and Hamburgh for male. The original vine stood the test equally as well as the Concord thus far and is much more prolific, very compact, well shouldered bunch, berry medium size and of good quality, ripens about with Champion or Moore's Early, and a vigorous grower. This variety has taken first premium wherever exhibited and a special award of a silver medal at the Pan-American Exhibition, Buffalo, on its merits.'

## BUSH FRUITS.

The raspberry, currant and gooseberry crops were all good this year. The Herbert raspberry continues to be the best main crop red variety tested here. The Brighton and Count are two hardy and very productive seedlings of Dr. Wm. Saunders, but are not equal to the Herbert in size or quality. The Sarah, another of Dr. Saunders' seedlings, is the finest in quality, but the colour is rather dark and it is not productive enough. Heebner and Clarke, resembling each other very much, are two desirable varieties for home use, being hardy, productive and of good quality. Cuthbert is too tender for this district.

The blackberry crop was a failure here this year.

## STRAWBERRIES.

The strawberry crop was somewhat lighter than usual this year, not owing to unfavourable weather this season, but on account of the protracted drought in 1903, which delayed planting until June 15. Being planted so late, fewer runners were formed than usual, hence the crop was less. The plants came through the winter well, being practically uninjured.

For general purposes, the following varieties have proven among the most satisfactory, after a number of years' tests : Sample, P., Buster, P., Bisel, P., Glen Mary, B., Greenville, P., Beder Wood, B., Marie, P., Warfield, P., Enhance, B., Howard's 41, P., Barton's Eclipse, P., Thompson's Late, P. In addition to these are William's B., for shipping long distances and Bubach, P., for near market or home use. Lovett, B., is also a good, perfect berry for general purposes and for home use. Daisy is very handsome and productive, but soft. Afton, Steven's Early and Daniel Boone all resemble Warfield so much that they cannot be distinguished from it. Among the newer varieties which fruited this year for the first time, the following are considered promising :—

Pocomoke, B.—This was the most productive variety in the plantation this year, size large to very large; form obtusely conical; colour, bright glossy red but inclined to have white tip; very firm; flesh juicy, briskly subacid; quality above medium. Season medium to late. Plant a vigorous grower with good foliage. Quite promising as a productive berry for long shipment.

Lyon, P.—Size medium to above medium; form long, pointed or wedge-conical; colour deep red; moderately firm; flesh juicy, briskly subacid, pleasant flavour; quality good. Season early to medium. Plant a vigorous grower, with good foliage. A productive variety which this year ripened a good deal of fruit early.

Early Beauty, P.—Size medium to above medium; form roundish; colour deep glossy red; moderately firm; flesh juicy, briskly subacid; quality above medium. Season very early. Plant a vigorous grower, with healthy and abundant foliage. One of the most promising early varieties.

Splendid.—This variety was grown for a number of years and then discarded, but is being given a further test with a new strain. It is a very productive variety but is soft and not attractive in colour.

In the following table will be found a list of fifty varieties of strawberries arranged in their order of merit or rank, from the average of two to four years' test. Most of these have been tested for four years, namely, 1900, 1901, 1902, 1904. The crop was practically a failure in 1903. Their rank for the year 1904 is also given in the table, as well as other information. In addition to the list of fifty varieties, a short list of twelve follows, representing the best yielding varieties fruiting for one year only. There were 196 named varieties under test this year, and 53 unnamed seedlings. In the tables B. stands for bi-sexual or perfect, while P. stands for pistillate or imperfect :—

MOST productive 50 varieties of Strawberries for an average of from 2 to 4 years.

| Average Rank. | Number of years averaged. | Rank, 1904. | Name. | | Date of full bloom, 1904. | Date of first ripe fruit, 1904. | Date of first picking, 1904. | Date of last picking, 1904. | Number of pickings, 1904. | Weight of 25 average berries, 1904. | Total yield, 1904. | | Average total yield. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Oz. | Lbs. | Oz. | Lbs. | Oz. |
| 1 | 3 | 84 | Mele | P. | May 19 | June 20 | June 18 | July 18 | 11 | 5 | 7 | 6¾ | 24 | 13⅛ |
| 2 | 4 | 9 | Sample | P. | June 4 | " 19 | " 22 | " 18 | 10 | 6½ | 17 | 4¾ | 22 | 13⅛ |
| 3 | 4 | 85 | Buster | P. | " 2 | " 20 | " 22 | " 15 | 9 | 7 | 7 | 4¾ | 22 | 2½ |
| 4 | 4 | 5 | Bisel | P. | " 2 | " 19 | " 22 | " 18 | 10 | 7¼ | 18 | 11½ | 21 | 12 |
| 5 | 4 | 23 | Afton | P. | May 30 | " 17 | " 20 | " 18 | 11 | 5½ | 13 | 5¼ | 21 | 8½ |
| 6 | 4 | 29 | Steven's Early | P. | June 2 | " 17 | " 18 | " 15 | 10 | 6¼ | 12 | 14¼ | 20 | 14 |
| 7 | 4 | 14 | Glen Mary | B. | " 2 | " 19 | " 22 | " 15 | 9 | 7¾ | 15 | 15 | 20 | 14 |
| 8 | 4 | 94 | Daisy | P. | " 6 | " 20 | " 22 | " 15 | 9 | 6 | 6 | 14¾ | 20 | 10 |
| 9 | 4 | 40 | Greenville | P. | May 21 | " 17 | " 20 | " 15 | 10 | 7 | 11 | 5 | 20 | 4½ |
| 10 | 4 | 11 | Daniel Boone | P. | June 2 | " 18 | " 20 | " 18 | 11 | 7 | 16 | 6¾ | 20 | 00 |
| 11 | 4 | 60 | Howard's 41 | P. | May 25 | " 19 | " 22 | " 18 | 10 | 6 | 9 | 3½ | 19 | 12 |
| 12 | 4 | 34 | Enhance | B. | " 30 | " 22 | " 24 | " 18 | 9 | 8 | 11 | 15¼ | 19 | 7¾ |
| 13 | 4 | 54 | Warfield | P. | " 28 | " 17 | " 18 | " 18 | 12 | 5 | 9 | 11½ | 18 | 12 |
| 14 | 2 | 36 | Marie | P. | June 2 | " 17 | " 18 | " 18 | 12 | 7 | 11 | 9¾ | 18 | 3½ |
| 15 | 4 | 12 | Beder Wood | B. | May 29 | " 18 | " 20 | " 15 | 10 | 6 | 16 | 6 | 18 | 2 |
| 16 | 4 | 50 | Carleton | P. | June 2 | " 20 | " 22 | " 18 | 10 | 5½ | 9 | 14 | 17 | 15½ |
| 17 | 3 | 44 | Cole's Seedling | B. | " 5 | " 25 | " 27 | " 18 | 9 | 6½ | 10 | 14½ | 17 | 13½ |
| 18 | 4 | 25 | Barton's Eclipse | P. | " 2 | " 18 | " 20 | " 18 | 11 | 6½ | 13 | 3¾ | 17 | 13½ |
| 19 | 4 | 20 | Hattie Warfield | P. | May 29 | " 16 | " 18 | " 18 | 12 | 5¾ | 14 | 5½ | 17 | 11½ |
| 20 | 4 | 102 | Thompson's Late | P. | June 4 | " 21 | " 22 | " 18 | 9 | 6 | 6 | 8¾ | 17 | 7 |
| 21 | 4 | 110 | Dora | P. | " 2 | " 18 | " 20 | " 18 | 11 | 5½ | 6 | 1½ | 17 | 7 |
| 22 | 4 | 45 | Maggie | P. | " 2 | " 17 | " 18 | " 18 | 12 | 5½ | 10 | 13 | 17 | 5¾ |
| 23 | 4 | 16 | Bubach | P. | " 4 | " 19 | " 22 | " 18 | 12 | 7 | 15 | 10½ | 16 | 12¾ |
| 24 | 4 | 8 | Swindle | P. | May 29 | " 21 | " 22 | " 18 | 11 | 6½ | 17 | 6½ | 16 | 12½ |
| 25 | 4 | 72 | No Name | B. | June 2 | " 20 | " 22 | " 18 | 10 | 5½ | 8 | 1¾ | 16 | 8 |
| 26 | 4 | 7 | Crescent | P. | May 29 | " 18 | " 20 | " 18 | 11 | 5¼ | 17 | 12½ | 16 | 5½ |
| 27 | 4 | 10 | John Little | P. | June 2 | " 19 | " 20 | " 18 | 11 | 5 | 17 | 0¾ | 16 | 4¾ |
| 28 | 4 | 125 | Wonderful | P. | " 2 | " 18 | " 20 | " 15 | 10 | 6¼ | 4 | 14 | 16 | 2¾ |
| 29 | 4 | 96 | Williams | B. | May 28 | " 20 | " 22 | " 15 | 9 | 6 | 6 | 14 | 15 | 14 |
| 30 | 4 | 22 | Clyde | B. | " 30 | " 19 | " 22 | " 18 | 10 | 8 | 13 | 5½ | 15 | 12⅛ |
| 31 | 4 | 78 | Arkansas Traveller | B. | June 4 | " 22 | " 24 | " 18 | 9 | 6½ | 7 | 9½ | 15 | 11 |
| 32 | 4 | 66 | Parker Earle | B. | May 29 | " 16 | " 18 | " 18 | 12 | 6 | 8 | 12¼ | 15 | 7¼ |
| 33 | 4 | 68 | Carrie | P. | June 4 | " 24 | " 27 | " 18 | 9 | 7½ | 8 | 7 | 15 | 7¼ |
| 34 | 4 | 39 | Bomba | P. | May 30 | " 18 | " 20 | " 15 | 9 | 6 | 11 | 5½ | 15 | 3¼ |
| 35 | 4 | 46 | World's Champion | B. | June 5 | " 20 | " 24 | " 18 | 9 | 6½ | 10 | 11½ | 15 | 2 |
| 36 | 4 | 114 | G. H. Caughell | B. | May 25 | " 16 | " 18 | " 15 | 11 | 4½ | 5 | 11¾ | 14 | 12¼ |
| 37 | 4 | 124 | Dr. Arp | P. | " 29 | " 18 | " 20 | " 18 | 11 | ... | 4 | 14¾ | 14 | 9¼ |
| 38 | 4 | 32 | Tennessee Prolific | B. | " 30 | " 19 | " 22 | " 15 | 9 | 7 | 12 | 6¾ | 14 | 6¾ |
| 39 | 4 | 83 | Lovett | B. | June 4 | " 18 | " 20 | " 18 | 10 | 5¼ | 7 | 7 | 13 | 15 |
| 40 | 4 | 113 | Cyclone | P. | " 2 | " 19 | " 22 | " 18 | 9 | 5½ | 5 | 12½ | 13 | 15 |
| 41 | 3 | 31 | Senator Dunlap | B. | May 29 | " 16 | " 18 | " 18 | 12 | 6½ | 12 | 10¾ | 13 | 13¼ |
| 42 | 4 | 89 | Kyle | P. | June 2 | " 20 | " 24 | " 15 | 8 | 5¾ | 7 | 1 | 13 | 6 |
| 43 | 4 | 70 | Enormous | P. | May 27 | " 20 | " 22 | " 15 | 9 | 8¼ | 8 | 2½ | 13 | 4 |
| 44 | 4 | 26 | Anna Forest | P. | June 2 | " 18 | " 20 | " 11 | 9 | 5¼ | 13 | 0¾ | 13 | 3¼ |
| 45 | 4 | 57 | Hood River | P. | " 4 | " 20 | " 22 | " 18 | 11 | 6½ | 9 | 8¾ | 13 | 2¼ |
| 46 | 4 | 6 | Boynton | P. | " 2 | " 17 | " 18 | " 15 | 12 | 4¾ | 18 | 0¼ | 12 | 1⅖ |
| 47 | 4 | 117 | Brandywine | B. | " 4 | " 23 | " 24 | " 18 | 8 | 6¾ | 5 | 9 | 12 | 1⅕ |
| 48 | 4 | 43 | Wm. Belt | B. | " 2 | " 21 | " 22 | " 15 | 8 | 6½ | 11 | 0 | 12 | 7⅕ |
| 49 | 4 | 104 | Satisfaction | B. | " 4 | " 20 | " 22 | " 18 | 10 | 5 | 6 | 6 | 12 | 7¼ |
| 50 | 4 | 64 | Morgan's Favorite | B. | " 2 | " 23 | " 24 | " 15 | 9 | .... | 8 | 13¾ | 12 | 6¾ |

MOST productive 12 varieties fruited for one year.

| Average Rank. | Number of years averaged. | Rank, 1904. | Name. | | Date of full bloom, 1904. | Date of first ripe fruit, 1904. | Date of first picking, 1904. | Date of last picking, 1904. | Number of pickings, 1904. | Weight of 25 average berries, 1904. | Total yield, 1904. | | Average total yield. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Oz. | Lbs. | Oz. | |
| .... | .... | 1 | Pocomoke | B. | June 2 | June 22 | June 24 | July 15 | 9 | 7 | 22 | 2 | ........ |
| .... | .... | 2 | Lyon | P. | " 2 | " 20 | " 22 | " 18 | 11 | 7 | 20 | 13¾ | ........ |
| .... | .... | 3 | Warfield (Kellogg) | P. | May 28 | " 17 | " 18 | " 18 | 12 | 5½ | 19 | 14½ | ........ |
| .... | .... | 4 | Splendid (new strain) | B. | June 2 | " 20 | " 22 | " 18 | 10 | 6 | 19 | 14¼ | ........ |
| .... | .... | 15 | Early Beauty | B. | May 29 | " 15 | " 18 | " 6 | 9 | 5 | 15 | 12½ | ........ |
| .... | .... | 28 | Success | B. | June 4 | " 20 | " 22 | " 18 | 11 | 6½ | 12 | 15 | ........ |
| .... | .... | 30 | Tilgman | P. | " 6 | " 24 | " 27 | " 18 | 9 | .... | 12 | 13 | ........ |
| .... | .... | 56 | Superior | B. | May 25 | " 16 | " 18 | " 8 | 10 | 5 | 9 | 8¾ | ........ |
| .... | .... | 63 | Monitor | B. | June 2 | " 18 | " 20 | " 15 | 10 | 6½ | 9 | 0½ | ........ |
| .... | .... | 71 | Big Bobs | B. | " 4 | " 22 | " 24 | " 15 | 10 | 8 | 8 | 1¾ | ........ |
| .... | .... | 75 | Minute Man | P. | " 2 | " 18 | " 20 | " 18 | 12 | 6 | 7 | 10½ | ........ |
| .... | .... | 82 | Latest | | " 6 | " 24 | " 27 | " 18 | 9 | 7 | 7 | 7½ | ........ |

## FUNGOUS DISEASES.

With the exception of the Black Rot of the grape, fungous diseases were not unusually prevalent this year. Owing doubtless to the almost entire absence of Black Spot of the apple in 1903 in eastern Ontario and the province of Quebec, there was much less spot this year than usual, although some unsprayed orchards were badly affected. In western Ontario, however, the spot was about as bad as usual in unsprayed orchards, while in orchards well sprayed the fruit was clean. As the plum crop was almost a complete failure, the Ripe Rot was not bad, but grapes suffered to such an extent with Black Rot that growers have become alarmed, and for this reason some space is devoted to diseases of the grape in the report this year.

### DISEASES OF THE GRAPE IN ONTARIO VINEYARDS IN 1904.

Knowing that rot was causing serious damage in a number of vineyards in the Niagara peninsula, I took the opportunity on September 13 and 14, of visiting some of them in the hope of learning something that would prove suggestive in fighting the diseases of the grape and of obtaining other information that would be useful to fruit growers regarding the different kinds of rot which were causing loss. On September 13, accompanied by Mr. W. H. Bunting, of St. Catharines, Ont., I visited his vineyard and others in the neighbourhood of St. Catharines. Mr. Bunting had sprayed seven times and his fruit was only slightly injured. He had bagged 1,000 bunches when the grapes were the size of peas in order to find out if infection took place before that time. Most of the bunches thus bagged were perfect, but some had the Black Rot in various stages of development, showing that infection had taken place before the grapes were as large as peas. The Niagara grape was the variety most affected in Mr. Bunting's vineyard. Several vineyards of Concord near Mr. Bunting's were examined, but Black Rot had not worked to any extent in them. Brown Rot was, however, found in one vineyard, but it had not done much injury to the fruit. Another vineyard, probably of about fifteen acres, was visited, consisting principally of Concord, Brighton, Niagara and Moore's Early. Of Niagara and Brighton there was scarcely a sound grape anywhere, and none of the bunches of Concord even with manipulation could be made fit for market. Moore's Early was not affected. This vineyard had not been sprayed.

The infection by the Black Rot as it appeared in the vicinity of St. Catharines was first noticed on the fruit as a round, brownish coloured spot about the size of the head of a pin. This brownish appearance gradually spread over the surface of the berry and by the time one-third of the surface was covered in this way the original brown spot had become paler, showing distinctly the mark of infection. After the whole grape became brown, the tissue gradually shrunk and dried and when thus shrunken the fruit appeared black and prominently and irregularly ridged, the surface being covered by small black pustules. On September 14, I visited the vineyards of Mr. Murray Pettit, Winona, Ont., and other vineyards in that vicinity. No Black Rot was noticed at Winona, but Brown Rot was quite abundant, and while it had not caused such damage as the Black Rot, it had done considerable injury. The leaves of the vines affected with Brown Rot had a velvety or downy appearance underneath. The affected fruit first showed a brownish spot or patch one one side and a shrinking of the tissue. This brownish appearance spread all over the grape and the whole grape eventually shrunk into a hard shrivelled mass. When badly affected the vine looses a large amount of foliage. Powdery mildew was also found in these vineyards.

The Niagara grapes, both in Mr. Pettit's and adjoining vineyards, were affected this year with either a new disease or more probably, as Prof. Selby suggests, a condition caused by either Powdery Mildew or Brown Rot affecting the stem to which the grape is attached. This disease caused a hardening of the grape and gave it a pale, unhealthy colour.

Another disease of the grape which was doing a great deal of injury at Winona was what we took to be the Grape-leaf Blight, a disease which has not received the attention which it deserves. This blight causes the leaves to wither and drop, thus preventing a free circulation of sap and the proper development and maturing of the fruit.

The diseases of the grape can be controlled by thorough spraying, but the work must be done persistently and carefully.

FUNGOUS DISEASES OF THE GRAPE.

Anthracnose: Bird's Eye Rot: Scab (*Sphaceloma Ampelinum*).—This is the only grape disease which has given any trouble at the Central Experimental Farm. It is difficult to control by spraying, but, fortunately, only a few varieties have been affected, Lindley being the worst. This fungus attacks leaves, stems, and fruit, but it is on the fruit where it is most noticed. The disease is apparent in depressed patches extending along the stems, which checks the growth. There are also reddish brown patches on the leaves. The stems of the clusters of grapes are frequently affected, and when the disease occurs there the fruit remains green and eventually withers, making an imperfect bunch. The disease on the fruit occurs in roundish brown depressed spots with a purplish margin, giving somewhat the appearance of a bird's eye. Frequently spots unite and form a large irregular area. This is a very difficult disease to control, and thorough spraying with Bordeaux mixture has not checked it to any extent. Spraying before the buds open; before blossoming; after fruit has set and ten days later with Bordeaux mixture is recommended.

Black Rot (*Laestadia Bidwellii*).—Up to quite recent years this disease was thought to have reached its northern limit, south of lakes Erie and Ontario, but during the last few years in Essex county, and more recently in the Niagara peninsula, it has caused much damage. The appearance of this disease has already been described, but something further must be said regarding it. The spores live over winter on the vines and in the affected grapes, and germinate when growth starts in the spring. The disease attacks the leaves and young shoots, the leaves showing the disease in roundish reddish brown patches, and on the stems it appears in small, long shaped, dark brown, slightly depressed spots, on the surface of which appears the characteristic pustules of the Black Rot. When conditions are favourable, the disease only requires from 8 to 12 days from the time the spore germinates until the mycelium has run its course through the fruit and has produced new spores. Before the grape shrinks much in size the mycelium concentrates, as it were, in small masses underneath the skin, and in these are produced the spores. These masses soon break through the skin and the black pustules with the spores appear. The spores are scattered and they reinfect other fruits and vines. Although it is possible for a new generation of spores to be borne within two weeks, it requires favourable weather conditions for the disease to develop. While early sprayings have in some cases not been found to give the results expected, the life history of the disease shows that it must be wise to endeavour to destroy as many spores as possible at or before the first infection. The first spraying should be made just before blossoming, the second just after the fruit has set, the third and fourth at intervals of about a week—all with ordinary Bordeaux mixture. There should then be three sprayings with Ammoniacal Copper Carbonate or Soda Bordeaux, which will not discolour the fruit to any extent. Although the disease will probably not be eradicated from a vineyard in one season, the more thoroughly the spraying is done the less trouble there should be. It is now sixteen years since it was conclusively shown that Bordeaux mixture would control this disease.

Brown Rot: Downy Mildew: Gray Rot (*Peronospora viticola*).—This is the rot which up to quite recent years proved most injurious in Ontario. The general appearance of this rot as it affects the fruit has already been noticed. Like the Black

Rot, it affects leaves, stems, and fruit. The disease causes slightly depressed patches on the shoots, somewhat like Anthracnose, but are not so deep. The stems, however, are not usually badly affected, but it is the leaves and fruit which suffer most. Unlike the Black Rot, in which the mycelium does not extend far into the tissue of the plant, in the case of Brown Rot once an infection takes place the disease spreads through the tissues of the vine; and when the leaves are affected they turn pale where the disease has been at work, and about this time the under part of the affected part of the leaf becomes downy, indicating the presence of spores and presenting the 'Downy Mildew' stage of the disease. After this the affected parts of the leaves turn brown. As previously stated, the diseased condition of the fruit is indicated by a brown patch which spreads over the whole grape, which gradually withers. The absence of black pustules readily distinguish this at this stage from the Black Rot. Sometimes after the fruit has withered it becomes covered with a white powdery substance, indicating the spores, but these do not always develop. Treatment.—Spray with Bordeaux mixture just before blossoming, after fruit has set, and ten to fourteen days later.

Powdery Mildew (*Uncinula spiralis*).—This disease does not penetrate into the tissue of the plant as the Black and Brown Rot, but grows upon the surface, making it much easier as the Black and Brown Rot, also, it spreads more rapidly in rather dry weather. The mildew grows on the young shoots and upper surface of the leaves and on the fruit, giving them a grayish, powdery appearance easily recognized as being caused by the Powdery Mildew. This disease feeds on the plant by sending small suckers into the plant cells from which it gets food. Spores are produced early in the season and these being scattered about soon infect other leaves or vines and spread the disease. A second crop of spores is produced later in the summer and these carry the disease over the winter. These are enclosed in a hard, roundish case which becomes black during the latter part of the season. Treatment.—This is a very easy disease to treat and yields readily to fungicides. Dry sulphur and sulphur and water have been found effective, but as this disease often accompanies other diseases of the grape, the sprayings with Bordeaux mixture recommended for Black and Brown Rot are preferable and will effectually check it.

Ripe Rot.—A species of ripe rot has affected a few varieties at the Central Experimental Farm, Salem and Peabody being two of the most affected. The fruit is quite plump and juicy up to the last, but about the time of ripening, the fruit turns brownish at the affected part and often bursts.

Grape Leaf Blight (*Cladosporium viticolum*).—A disease noticed in the vineyards at Winona, Ont., is undoubtedly this species. It causes a withering of the leaves somewhat like the Brown Rot, but the fruit is not affected nor has the under surface of the leaf the downy appearance of the Brown Rot. The leaves on the vines at Winona had the burnt appearance which is peculiar to many leaf blights. The patches on the leaves indicating the disease, are large and irregular in outline. These patches become quite dry and will break from the leaf very easily. The spores are borne on the under surface of the leaf on slender filaments and are produced in large numbers during damp weather. This disease lives over the winter in the fallen leaves. It has not received very much attention but it weakens the vines and prevents the full development of the fruit. Spraying the vines, as for Black Rot, should prove quite effectual with this disease.

## COVER CROPS.

*English Horse Beans and Rape.*—In the report for 1903, experiments in the use of the English Horse Bean and Hairy Vetch were described. It was shown that Horse Beans and Hairy Vetch sown in rows 28 inches apart had given very satisfactory results. These were sown in this way because it is sometimes difficult to get a good 'stand' for a cover crop in the autumn by sowing about the middle of July and later, owing to the dry weather which often occurs after seeding, delaying the germination of the seed, and in the north it is very desirable to have the cover crop tall so that it will hold the snow. By sowing the seed in rows it can be sown comparatively early and the soil cultivated between the rows when the plants come up, thus conserving moisture and making sure of a good cover crop. Cultivation may be discontinued about the middle of July or a little later. The Horse Beans sown on June 18, 1903, were from 3 feet 6 inches to 4 feet in height on September 21, and it was estimated that the green crop per acre was 7 tons 733 pounds above ground and 2 tons 852 pounds of roots, or a total of 9 tons 1,585 pounds per acre, containing according to the figures given by Mr. Frank T. Shutt, Chemist of the Experimental Farms, in his report for 1903, 78 pounds of nitrogen as compared with 130 pounds from Mammoth Red Clover, and 147 pounds from Hairy Vetch. These beans stood up well all winter, holding the snow admirably, and by spring were still 2 to 2½ feet in height. A land roller was put on as soon as the soil was in condition to work, and the beans were rolled down. The disc harrow was then used and it was found that they broke up readily; they were then cultivated in with a spring tooth cultivator. Owing to the coarse nature of the stems they were noticed in the soil longer than clover or vetch, but in a comparatively short time they decayed and gave practically no trouble. Horse beans were again sown in drills this year on June 16, and were 3 feet 5 inches in height when frozen. The advantage of Horse Beans is that they winter kill and are easily worked under in the spring, while Hairy Vetch and Clover are more difficult to deal with, and if left until late in the spring will take considerable moisture from the soil. The disadvantage of the Horse Bean is that there is no mat of vegetation close to the soil, and if there should be a winter without snow it might not prove as effective as Red Clover or Hairy Vetch. In order to ensure a mat of vegetation which would cover the ground in winter and which would be dead in the spring, rape was used in one part of the orchard and it is believed that English Horse beans and rape grown together will prove one of the most satisfactory cover crops where they will succeed. The Horse beans will furnish nitrogen and humus and will hold the snow well. The rape will cover the ground, thus protecting the roots, and will also add humus. At Ottawa, Horse beans sown during the last week of June at the rate of one bushel per acre in drills 28 inches apart and cultivated two or three times, and rape sown broadcast between the rows during the latter half of August should furnish a very satsfactory combination. Both English Horse beans and rape are moisture-loving plants and will not succeed as well in dry soils as they will where there is a fair amount of moisture Where the Hairy Vetch is grown for seed, Horse beans sown in drills at the same time as the vetch should prove very useful the following season in holding up the vines, thus insuring a larger crop of seed. At our suggestion, one grower tried it this year and is favourably impressed with this method.

*Hairy Vetch.*—The Hairy Vetch was used quite largely in the orchards at the Central Experimental Farm in 1903, and was sown again this year, both alone and broadcast and also with Horse Beans to form a mat on the ground, and has been found satisfactory for this purpose, but owing to the difficulty of ploughing under, rape would appear to be more suitable. The Hairy Vetch is a very rapid grower and will continue to grow until almost winter, as light frosts have apparently little effect upon it. It forms a thick mat on the ground, making a perfect mulch and an ideal cover for preventing the thawing and freezing of the ground and protecting the roots of the trees. It will not hold the snow as well as the taller plants, but will probably be found as a rule satisfactory enough in that respect. It is quite rich in nitrogen, being more so than the Mammoth Red or Common Red clovers. The great disadvantage of the Hairy Vetch is the difficulty in ploughing it under where it lives over the winter. Sown broadcast, from 30 to 40 lbs. per acre is sufficient to give a good stand under favourable conditions, and 20 lbs. per acre has been found sufficient when sown in rows. It was not winter killed at the Central Experimental Farm last winter and soon began to make rapid growth in the spring. On June 2 it was cut, with the object of mulching the ground with the crop, the plan being to cut at intervals throughout the summer as with Red clover and use each cutting as a mulch. The vetch, however, was killed by the first cutting. It was thus not found satisfactory as a crop for mulching. Mammoth Red and Common Red clover sown broadcast at the rate of 10 or 12 pounds per acre about the middle of July proves very satisfactory as cover crops in those sections, such as eastern Ontario, where they make good growth in the autumn. Ploughed under in the spring, Red clover adds much plant food and humus to the soil, and in orchards where there is usually an abundance of moisture, such as the orchard at the Central Experimental Farm, it has been found quite satisfactory to cut the clover several times during the summer instead of ploughing it under in the spring, leaving the green crop as a mulch on the ground.

## CONSERVATION OF MOISTURE.

As the conservation of moisture is one of the chief reasons for the cultivation of orchards in the summer, any method which will bring about as good results as cultivation without going to the expense and trouble would be very acceptable. It is claimed for the so-called mulch method, by which the grass grown in an orchard in sod is used about the trees to conserve moisture, that the results obtained are quite as satisfactory as with clean cultivation, but it has been found in certain cases that where such good results have been obtained the soil is naturally moist. This year an experiment was planned in conjunction with Mr. F. T. Shutt, Chemist, to determine if there were any crops which would conserve, by the mat they formed on the ground, almost or quite as much moisture as they transpired through their leaves. The extremely cool wet season was unfavourable for this work, but the results of the test will be found in Mr. Shutt's report.

## VEGETABLES.

Experiments with vegetables were continued this year, but the list of varieties was cut down very considerably, as sufficient information has now been obtained of a great many of them to warrant discarding them. Those that are recommended are tested each year for comparison with the newer kinds which are being constantly offered for sale. The season was favourable for all vegetables except those which required much heat, such as melons, peppers, and tomatoes, and the crop of these was much less than usual. Cutworms were very bad and injured the test of pease so much that this season's results are worthless. Bran and Paris green in the proportion of 1 lb. Paris green to 50 lbs. bran has been found to be the best remedy for cutworms yet tried, as if applied in time the cutworms will aparently eat it in preference to living plants.

*Selection of Pease and Beans.*—During the past five years an experiment has been in progress in selecting garden pease to develope, if possible, earlier and more productive strains. The results are very encouraging and the effect of selection in regard to increase of yield and earliness is quite marked in some cases. A similar experiment has been carried on with beans for four years, and more recently with tomatoes and melons. There is a wide field for work of this kind, especially in this climate, where earliness is such an important factor in determining the profits from vegetables.

*Further experiments in growing vegetables in a cheese-cloth inclosure.*—The experiment begun and reported on last year of growing vegetables in a cheesecloth inclosure was continued this year with results confirming those of last year in some respects, while in others owing to the extremely cool, cloudy season the difference in favour of cheesecloth was not so marked, and in some cases vegetables which had done better in 1903 inside than out, this year did better outside than in. Radish, cauliflower, lettuce, beans, and onions were tested this year. It was again found that radish and cauliflower grown inside the inclosure were free of maggots except in an occasional instance in the case of the cauliflower where the plants had evidently been affected in the hot-bed before setting out in the inclosure. This preventative of root maggots should be more widely utilized, especially among amateurs, where these insects are troublesome. Both radish and cauliflower develope very satisfactorily in the inclosure. In 1903 radish was ready for use inside the inclosure three days earlier than outside, this year radishes were two days later than outside, but the radishes remained fit for use nearly a week longer inside than out, the radishes, when they had reached a large size, being still crisp and tender. Whether it would pay commercially or not is still doubtful. The cauliflower outside was practically a failure, inside it was quite satisfactory. Lettuce was ready for use in 1903 in the inclosure two to four days later than outside; this year it was ready two days earlier inside. Beans were ready for use in 1903 in the inclosure three days sooner than outside, and the yield was 14 quarts outside and 11 quarts inside. This year the beans were ready for use inside one to two days later than outside, the yield inside being 58 quarts, while outside it was 53 quarts. There was no apparent difference between the onions planted outside and inside.

The cheesecloth used in 1903 was used again this year, but it tore considerably during the latter part of the season, and gave trouble. Two years is the longest time that this cheesecloth, which cost 5 cents a yard, may be expected to last.

## POTATOES.

The season of 1904 was favourable to the potato crop at the Central Experimental Farm, as the blight did not appear until late, and there was little rot in the field. The yields of 73 varieties are published in the following table, all grown in the same sized plots. The Vermont Gold Coin, which was tested for the first time in 1903, headed the list this year, yielding at the rate of 554 bushels 24 pounds per acre. This is a very promising variety. Between this variety and the lowest yielder, the Early Andes, which only yielded at the rate of 123 bushels 12 pounds per acre, there is a difference of 431 bushels 12 pounds per acre, which is more than three times the average yield per acre for the province of Ontario, striking evidence of the importance of planting only the most productive varieties.

The soil in which the potatoes were planted was good sandy loam, the previous crop being strawberries. The soil was given a heavy dressing of barnyard manure for the strawberries in the spring of 1902, but had not received any since. The land was ploughed in the summer of 1903, and again in the spring of 1904, and thoroughly harrowed with the disc and smoothing harrows shortly before planting. The drills, which were 2½ feet apart, were made with the double mould board plough and were about 4 inches deep. The sets were of good size, having at least three eyes, it having been found that, taking one year with another, this is the best kind to use. There were 66 sets of each variety planted 1 foot apart in a single row. The sets were covered with the hoe to ensure more uniform conditions. Level cultivation was adopted and the potatoes were cultivated four times, and sprayed four times with Bordeaux mixture.

TWELVE BEST YIELDING POTATOES—AVERAGE OF FIVE YEARS, 1900–4.

| Name of Variety. | Season. | Colour. | Quality. | Average Yield per Acre, 1900 to 1904. | |
|---|---|---|---|---|---|
| | | | | Bush. | Lbs. |
| 1. Dr. Maercher | Very late | White | Med. to good | 496 | 19 |
| 2. Late Puritan | Medium | " | Good | 485 | 19 |
| *3. Burnaby Mammoth | " | Pink and white | " | 483 | 34 |
| 4. Money Maker | " | White | " | 482 | 41 |
| 5. Carman No. 1 | Medium | White | " | 459 | 48 |
| 6. Dreer's Standard | " | " | " | 458 | 55 |
| 7. Sabean's Elephant | " | " | " | 454 | 58 |
| 8. Canadian Beauty | " | Pink and white | " | 452 | 46 |
| 9. Rural Blush | Late | Pink | " | 437 | 48 |
| 10. I.X.L | Medium | Pink and white | " | 433 | 50 |
| 11. Pearce | " | Pink and white, | Good | 433 | 24 |
| 12. Clay Rose | " | Pink | Medium | 432 | 58 |

* This variety was first grown under the name of Burnaby Seedling, and then procured under the name of Burnaby Mammoth. The average yield from the older strain for four years, and the new one for one year is 469 bushels 29 lbs.

POTATOES—TEST OF VARIETIES.

| No. | Name of Variety. | Season. | Quality. | Total Yield per Acre. | | Yield Per Acre, Marketable. | | Yield Per Acre of Unmarketable. | | Colour. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Bush. | Lbs. | Bush. | Lbs. | Bush. | Lbs. | |
| 1 | Vermont Gold Coin | Medium | Good | 554 | 24 | 475 | 12 | 79 | 12 | White. |
| 2 | Morgan's Seedling | " | " | 514 | 48 | 413 | 36 | 101 | 12 | Pink and white. |
| 3 | Carman No. 1 (new seed) | " | " | 501 | 36 | 409 | 12 | 92 | 24 | White. |
| 4 | Dr. Maercher | Late | Medium | 501 | 36 | 382 | 48 | 118 | 48 | " |
| 5 | Dooley | Medium | Good | 479 | 36 | 409 | 12 | 70 | 24 | " |
| 6 | Rural Blush | Late | " | 479 | 36 | 391 | 36 | 88 | 0 | Pink. |
| 7 | White Elephant | Medium | " | 466 | 24 | 409 | 12 | 57 | 12 | " and white. |
| 8 | Burnaby Mammoth | " | " | 462 | 0 | 396 | 0 | 66 | 0 | " " |
| 9 | Quick Crop | Early | " | 448 | 48 | 382 | 48 | 66 | 0 | " " |
| 10 | Northern Beauty | " | " | 440 | 0 | 356 | 24 | 83 | 36 | " |
| 11 | Carman No. 3 (new seed) | Late | " | 435 | 36 | 391 | 36 | 44 | 0 | White. |
| 12 | Holborn Abundance | " | Medium | 435 | 36 | 369 | 36 | 66 | 0 | " |
| 13 | Carman No. 1 | Medium | Good | 435 | 36 | 330 | 0 | 105 | 36 | " |
| 14 | American Giant | " | Medium | 431 | 12 | 365 | 12 | 66 | 0 | " |
| 15 | Doherty's Seedling | " | Good | 431 | 12 | 356 | 24 | 74 | 48 | " |
| 16 | Early Carter | Early | " | 426 | 48 | 334 | 24 | 92 | 24 | " |
| 17 | Money Maker | Medium | " | 418 | 0 | 347 | 36 | 70 | 24 | " |
| 18 | Reeve's Rose | Early | " | 404 | 48 | 343 | 12 | 61 | 36 | Pink. |
| 19 | Montana Bluff | Medium | " | 404 | 48 | 334 | 24 | 70 | 24 | White. |
| 20 | Mammoth Pearl | " | " | 400 | 24 | 334 | 24 | 66 | 0 | " |
| 21 | Clark's Pride | | | 400 | 24 | 286 | 0 | 114 | 24 | " |
| 22 | Clay Rose | Late | Medium | 391 | 36 | 338 | 48 | 52 | 48 | Pink. |
| 23 | Crines Lightning | Early | Good | 391 | 36 | 334 | 24 | 57 | 12 | Red, brighter in eye. |
| 24 | Everett | " | " | 387 | 12 | 316 | 48 | 70 | 24 | Pink. |
| 25 | Rose No. 9 | Late | Medium | 382 | 48 | 356 | 24 | 26 | 24 | " |
| 26 | Vick's Extra Early | Early | Good | 378 | 24 | 325 | 36 | 52 | 48 | " and white. |
| 27 | Pearce | Medium | " | 378 | 24 | 321 | 12 | 57 | 12 | " " |
| 28 | Penn Manor | Early | " | 374 | 0 | 334 | 24 | 39 | 36 | " " |
| 29 | Rochester Rose | " | " | 374 | 0 | 281 | 36 | 92 | 24 | " |
| 30 | Napoleon | " | " | 369 | 36 | 272 | 48 | 96 | 48 | " |
| 31 | Canadian Beauty | Medium | " | 365 | 12 | 321 | 12 | 44 | 0 | " and white. |
| 32 | Van Orman's Earliest | Early | | 365 | 12 | 308 | 0 | 57 | 12 | " |
| 33 | Sabean's Elephant | Late | Good | 365 | 12 | 303 | 36 | 61 | 36 | White. |
| 34 | I. X. L. | " | " | 365 | 12 | 294 | 48 | 70 | 24 | Pink and white. |
| 35 | Jubilee | Medium | " | 365 | 12 | 286 | 0 | 79 | 12 | " " |
| 36 | John Bull | | | 360 | 48 | 316 | 48 | 44 | 0 | |
| 37 | Empire State | Medium | Good | 360 | 48 | 299 | 12 | 61 | 36 | White. |
| 38 | Peck's Early | Early | | 360 | 48 | 294 | 48 | 66 | 0 | Pink. |

POTATOES—TEST OF VARIETIES—*Concluded.*

| No. | Name of Variety. | Season. | Quality. | Total Yield per Acre. | | Yield Per Acre, Marketable. | | Yield Per Acre of Unmarketable. | | Colour. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Bush. | Lbs. | Bush. | Lbs. | Bush. | Lbs. | |
| 39 | Dreer's Standard | Late | Good | 356 | 24 | 299 | 12 | 57 | 12 | White. |
| 40 | Flemish Beauty | Medium | " | 347 | 36 | 286 | 0 | 61 | 36 | Bright pink. |
| 41 | Late Puritan | Late | " | 343 | 12 | 290 | 24 | 52 | 48 | White. |
| 42 | Early Rose | Early | " | 343 | 12 | 277 | 12 | 66 | 0 | Pink, |
| 43 | Morgan's White | Medium | | 343 | 12 | 272 | 48 | 70 | 24 | White. |
| 44 | Eureka Extra Early | E. early | | 338 | 48 | 281 | 36 | 57 | 12 | " |
| 45 | Swiss Snowflake | Late | Good | 334 | 24 | 272 | 48 | 61 | 36 | " |
| 46 | Rawdon Rose | Early | | 334 | 24 | 268 | 24 | 66 | 0 | Pink and white. |
| 47 | Early Ohio | E. early | Good | 330 | 0 | 264 | 0 | 66 | 0 | " |
| 48 | Rough Coat Cup | | | 325 | 36 | 220 | 0 | 105 | 36 | " |
| 49 | Early Elkinah | Early | Good | 316 | 48 | 237 | 36 | 79 | 12 | " |
| 50 | Uncle Sam | Medium | " | 312 | 24 | 228 | 48 | 83 | 36 | White. |
| 51 | Nott's Peachblow | Late | | 312 | 24 | 220 | 0 | 92 | 24 | Pale pink, red in eye. |
| 52 | Enormous | " | Good | 308 | 0 | 255 | 12 | 52 | 48 | White. |
| 53 | American Wonder | " | " | 308 | 0 | 246 | 24 | 61 | 36 | " |
| 54 | Wonderful | Medium | | 308 | 0 | 246 | 24 | 101 | 12 | Yellowish. |
| 55 | Vick's No. 9 | | | 299 | 12 | 255 | 12 | 44 | 0 | White. |
| 56 | State of Maine | Late | Good | 299 | 12 | 242 | 0 | 57 | 12 | " |
| 57 | Pingree | Early | | 290 | 24 | 224 | 24 | 66 | 0 | " |
| 58 | General Gordon | " | Good | 290 | 24 | 215 | 36 | 74 | 48 | Pink. |
| 59 | Delaware | Medium | " | 277 | 12 | 242 | 0 | 35 | 12 | White. |
| 60 | Prolific Rose | " | | 272 | 48 | 211 | 12 | 61 | 36 | Pink. |
| 61 | Dublin Prize | | | 268 | 24 | 180 | 24 | 88 | 0 | Yellowish. |
| 62 | Carman No. 3 | Late | Good | 264 | 0 | 215 | 36 | 48 | 24 | White. |
| 63 | Early White Prize | Early | " | 250 | 48 | 176 | 0 | 74 | 48 | " |
| 64 | Country Gentleman | " | | 246 | 24 | 189 | 12 | 57 | 12 | Pink and white. |
| 65 | Early Envoy | " | | 246 | 24 | 189 | 12 | 57 | 12 | " |
| 66 | Irish Cobbler | " | Good | 246 | 24 | 189 | 12 | 57 | 12 | White. |
| 67 | Snowball | E. early | | 246 | 24 | 167 | 12 | 79 | 12 | " |
| 68 | Maule's Thoroughbred | Early | | 233 | 12 | 189 | 12 | 44 | 0 | Pink. |
| 69 | Seedling No. 7 | Late | | 215 | 36 | 193 | 36 | 22 | 0 | Bright pink. |
| 70 | Early St. George | Early | Good | 215 | 36 | 140 | 48 | 74 | 48 | Pink and white. |
| 71 | Cambridge Russet | Medium | " | 206 | 48 | 162 | 48 | 44 | 0 | White. |
| 72 | James Nugget | | | 206 | 48 | 88 | 0 | 118 | 48 | " |
| 73 | Bovee | E. early | Good | 180 | 24 | 105 | 36 | 74 | 48 | Pink and white. |
| 74 | Bliss Triumph | " | " | 127 | 36 | 70 | 24 | 57 | 12 | Red. |
| 75 | Early Andes | " | " | 123 | 12 | 92 | 24 | 30 | 48 | Pink. |

ADDITIONAL VARIETIES OF POTATOES TESTED IN 1904.

The following varieties, some of which were sent for test, and including among their number some of the newer English sorts, were grown in smaller plots this year :—

| Name of Variety. | Number of Sets Planted. | Total Yield Per Acre. | | Yield Per Acre of Marketable. | | Yield Per Acre of Unmarketable. | | Colour. |
|---|---|---|---|---|---|---|---|---|
| | | Bush. | Lbs. | Bush. | Lbs. | Bush. | Lbs. | |
| Ashleaf Kidney Heber Rawlings, Forest, Ont | 33 | 545 | 36 | 448 | 48 | 96 | 48 | White. |
| Dalmeny Beauty | 33 | 519 | 12 | 440 | .. | 79 | 12 | " |
| White Albino | 33 | 501 | 36 | 378 | 27 | 123 | 12 | " |
| Pat's Choice | 33 | 404 | 48 | 334 | 24 | 70 | 24 | Bright pink, red eye. |
| Early Johnston | 33 | 404 | 48 | 308 | .. | 96 | 48 | Pale pink. |
| Kaiser | 33 | 352 | .. | 264 | .. | 88 | .. | White. |
| Woltman | 33 | 352 | .. | 255 | 12 | 96 | 48 | Red. |
| Charles Fidler | 33 | 343 | 12 | 290 | 24 | 52 | 48 | White. |
| Early Sunlight | 33 | 343 | 12 | 264 | .. | 79 | 12 | " |
| Daybreak | 33 | 343 | 12 | 228 | 48 | 114 | 24 | Pink. |
| Empress Queen | 33 | 334 | 24 | 220 | .. | 114 | 24 | White. |
| Hibernia | 33 | 334 | 24 | 184 | 48 | 149 | 36 | Deep pink. |
| Northern Star | 16 | 334 | .. | 211 | 12 | 123 | 12 | White. |
| Evergood | 33 | 308 | .. | 132 | .. | 176 | .. | " |

### *Spraying Potatoes for the Prevention of Blight and Rot.*

Although it has been known for about seventeen years that spraying with Bordeaux mixture will prevent the blight and rot of the potato, only a small proportion of Canadian farmers spray even yet, although the loss is very great nearly every year. This year a comparative test was made between plots sprayed with Bordeaux mixture and Bug Death applied together; Bordeaux mixture and Paris green; Bordeaux mixture made with washing soda instead of lime, and Paris green; Bug Death; and Paris green. Sixteen varieties were used in this test, each occupying one row 33 feet long, the 16 varieties covering just 1-33 of an acre being the area devoted to each test. Only fifteen sorts are reported on, as in one plot one variety had an advantage over the others and it was not included. The soil on the whole was a uniform, rich sandy loam. The potatoes were kept thoroughly cultivated until the vines met and were sprayed five times, namely, on July 2, 13, 25, August 2, 27. The plots sprayed with the Bordeaux-Bug Death mixture received an extra spraying on June 22 with Bug Death dry alone. There were no rotten potatoes in the plot sprayed with the Bordeaux-Bug Death mixture. The potatoes were planted on May 28, and dug on October 6.

TABLE I.—Experiments in Spraying to prevent Blight and Rot of Potatoes.

| Name of Varieties. | Yield per acre, marketable potatoes — Bordeaux mixture and Bug Death. | | Yield per acre, marketable potatoes — Bordeaux mixture and Paris Green. | | Yield per acre, marketable potatoes — Soda Bordeaux and Paris Green. | | Yield per acre, marketable potatoes — Bug Death. | | Yield per acre, marketable potatoes — Paris Green. | | Yield per acre, rotten potatoes — Bordeaux mixture and Paris Green. | | Yield per acre, rotten potatoes — Soda Bordeaux. | | Yield per acre, rotten potatoes—Bug Death. | | Yield per acre, rotten potatoes—Paris Green. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Main Crop Varieties.* | Bush. | Lbs. | Bush. | Lbs. | Bush. | Lbs. | Bush. | Lbs. | Bush. | Lbs. | Bush. | Lbs. | Bush. | Lbs. | Bush. | Lbs. | Bush. | Lbs. |
| Sir Walter Raleigh | 576 | 24 | 488 | 24 | 391 | 36 | 277 | 12 | 281 | 36 | .. | .. | .. | .. | .. | .. | .. | .. |
| Rural Blush | 611 | 36 | 580 | 48 | 413 | 36 | 400 | 24 | 334 | 24 | .. | .. | .. | .. | 35 | 12 | .. | .. |
| Late Puritan | 484 | .. | 352 | .. | 356 | 24 | 422 | 24 | 308 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Dreer's Standard | 308 | .. | 215 | 36 | 268 | 24 | 167 | 12 | 206 | 48 | .. | .. | .. | .. | 70 | 24 | .. | .. |
| Enormous | 382 | 48 | 440 | .. | 387 | 12 | 92 | 24 | 360 | 48 | .. | .. | .. | .. | 136 | 24 | 44 | .. |
| Cambridge Russet | 325 | 36 | 347 | 36 | 290 | 24 | 330 | .. | 237 | 36 | .. | .. | .. | .. | .. | .. | .. | .. |
| I. X. L | 563 | 12 | 444 | 24 | 299 | 12 | 404 | 48 | 360 | 48 | .. | .. | .. | .. | 48 | 24 | 4 | 24 |
| Burnaby Mammoth | 475 | 12 | 365 | 12 | 378 | 24 | 440 | .. | 396 | .. | .. | .. | .. | .. | 13 | 12 | .. | .. |
| Swiss Snowflake | 426 | 48 | 431 | 12 | 426 | 48 | 360 | 48 | 400 | 24 | .. | .. | .. | .. | .. | .. | .. | .. |
| Average | 461 | 31 | 407 | 15 | 356 | 53 | 321 | 41 | 320 | 43 | .. | .. | .. | .. | 33 | 44 | 5 | 23 |
| *Early Varieties.* | | | | | | | | | | | | | | | | | | |
| Rochester Rose | 426 | 48 | 422 | 24 | 431 | 12 | 347 | 36 | 360 | 48 | .. | .. | .. | .. | 83 | 36 | .. | .. |
| Early Rose | 303 | 36 | 382 | 48 | 404 | 48 | 457 | 36 | 426 | 48 | .. | .. | 4 | 24 | .. | .. | .. | .. |
| Lee's Favourite | 233 | 12 | 250 | 48 | 264 | .. | 246 | 24 | 176 | .. | .. | .. | .. | .. | 35 | 12 | .. | .. |
| Early Ohio | 343 | 12 | 255 | 12 | 343 | 12 | 189 | 12 | 233 | 13 | .. | .. | .. | .. | 48 | 24 | .. | .. |
| Irish Cobbler | 299 | 12 | 290 | 24 | 250 | 48 | 356 | 24 | 299 | 12 | .. | .. | .. | .. | .. | .. | .. | .. |
| Flemish Beauty | 413 | 36 | 387 | 12 | 290 | 24 | 167 | 12 | 259 | 36 | .. | .. | .. | .. | 79 | 12 | 8 | 48 |
| Average | 336 | 36 | 331 | 28 | 330 | 44 | 294 | 4 | 292 | 36 | .. | .. | | —44 | 41 | 4 | 1 | 28 |
| Average of all varieties, 1904 | 399 | 3 | 369 | 21 | 343 | 48 | 307 | 52 | 306 | 39 | .. | .. | | —22 | 37 | 24 | 3 | 25 |
| Average of all varieties, 1902 | .. | .. | 310 | 12 | .. | .. | 251 | 6 | 189 | 54 | 15 | 18 | .. | .. | 32 | 24 | 34 | 28 |
| Average of all varieties, 1901 | .. | .. | 333 | 43 | .. | .. | .. | .. | 233 | 11 | .. | .. | .. | .. | .. | .. | 28 | 44 |
| Average for 3 years | .. | .. | 337 | 45 | .. | .. | .. | .. | 243 | 15 | .. | .. | .. | .. | .. | .. | .. | .. |

In the above table the fifteen varieties were divided and the results from spraying the main crop varieties averaged and kept separately from the early ones. This was to show which were influenced most by spraying. It will be seen that the main crop varieties were much more influenced this year than the early, the average greatest increase of the main crop varieties being at the rate of 140 bushels 48 pounds per acre, and of early varieties only 44 bushels per acre, or an average of both of 92 bushels 24 pounds per acre. This great difference was probably due to the fact that this year the blight did not appear until well on in August, when the crop of the early varieties was well advanced. Taking the average of the years 1901, 1902 and 1904, the increase in crop from the use of Bordeaux mixture has been 94 bushels 30 pounds per acre.

In 1902 there was an average increase from the use of Bug Death over Paris Green of 61 bushels per acre, but in 1904 there was practically no increase. There was more rot in the plots treated with Bug Death in 1904 than in those where Paris Green was used, which is difficult to account for as the soil was of a uniform character. In 1902 the amount of rot was about the same in both plots.

TABLE II.

| Mixtures used, 1904. | Cost of Materials and Application per acre. | Yield per acre Marketable Potatoes, average of 15 varieties. | | Increase in Crop per acre over Potatoes Sprayed with Paris Green only. | | Increase in value of Crop per acre at 40 cents per bushel. | Net Loss or Gain per acre after deducting cost of materials and application. |
|---|---|---|---|---|---|---|---|
| | | Bush. | Lbs. | Bush. | Lbs. | $ cts. | $ cts. |
| Plot 1.—Bordeaux Mixture and Bug Death—<br>Formula—6 lbs. bluestone, 4 lbs. lime, 40 galls. water, 12 oz. Bug Death............<br>Sprayed July 13, 25, Aug. 2, 27.........<br>22 11/16 lbs. per acre dry, June 22.. .......<br>33 lbs. per acre dry, July 2............. | 99 lbs. bluestone at 6 cts............ $ 5 94<br>1⅓ bush. lime at 22 cts.............. 0 29<br>154 11/16 lbs. Bug Death at 7 cts....... 10 83<br>Total cost ............ ... $ 17 06 | 399 | 3 | 92 | 24 | 36 96 | 21 86 gain. |
| Plot 2.—Bordeaux Mixture and Paris Green—<br>Formula—6 lbs. bluestone, 4 lbs. lime, 8 oz. Paris Green, 40 galls. water ..............<br>Sprayed July 2, 13, 25, Aug. 2, 27.. ..... | 118⅚ lbs. bluestone at 6 cts.......... $ 7 13<br>9 9/10 lbs. Paris green at 19 cts........ 1 88<br>1⅗ bush. lime at 22 cts... .......... 0 35<br>Total cost ............... $ 9 36 | 369 | 21 | 62 | 42 | 25 08 | 17 68 gain |
| Plot 3.—Soda Bordeaux and Paris Green—<br>Formula—6 lbs. bluestone, 7½ lbs. washing soda, 8 oz. Paris green, 40 galls. water...... | 118⅚ lbs. bluestone at 6 cts ......... $ 7 13<br>148½ lbs. washing soda at 2 cts ...... 2 97<br>9 9/10 lbs. Paris green at 19 cts........ 1 88<br>Total cost .............. $ 11 98 | 343 | 48 | 37 | 9 | 14 86 | 4 44 gain. |
| Plot 4.—Bug Death—<br>Formula—22 11/16 lbs. per acre, June 22..............<br>33 lbs. per acre, July 2.......... .. ...<br>24¾ lbs. per acre, July 13, 22, Aug. 2, 27. | 80 7/16 lbs. Bug Death at 7 cts........ $ 5 63 | 307 | 52 | 1 | 13 | 0 49 | 3 18 loss. |
| Plot 5.—Paris Green—<br>Formula—8 oz. Paris green to 40 galls. water ........ | 10 5/16 lbs. Paris green at 19 cts....... $ 1 96 | 306 | 39 | .............. | | .............. | .............. |

The foregoing table shows that the Bordeaux-Bug Death mixture used in the manner described gave a net increase of $21.86 per acre in the value of the potato crop, a difference in favour of this combination over ordinary Bordeaux mixture and Paris green of $4.18. The cost of applying the different mixtures in this test is not given in the table, as the expense of spraying small plots is larger proportionately than it would be by the acre. The cost of applying the Bordeaux-Bug Death mixture was greater than the Bordeaux mixture and Paris green on account of the extra spraying on June 22, hence the difference in favour of the Bordeaux-mixture and Bug Death is really less than the table indicates, the estimated cost per acre of applying the Bug Death dry on June 22, being $1.10. The probable reason of the greater increase of yield from the Bordeaux-Bug Death mixture is that the Bug Death adheres well to the foliage and when applied with Bordeaux mixture would cause it to adhere better also.

## TOMATOES—TEST OF VARIETIES.

The season of 1904 was a very unfavourable one for tomatoes, owing to so much cool, cloudy weather, and there was only about one-third of the usual crop. There were 62 varieties tested. The seed was sown in the hot-beds on March 31, and the plants pricked out into strawberry boxes on May 2, and kept in a cold frame until June 6, when they were planted in the opn air. They were planted four feet apart each way, and five plants of each variety were used . The soil was a light sandy loam which had been manured the previous season. The soil was kept cultivated until the plants covered the ground. The Sparks' Earliana which has been among the best early ripening kinds for the past four years, did not do quite so well this year, although it is still considered the best early tomato tested, being smoother than other kinds. If the Nolte's Earliest were a little smoother it would compare very favourably with Sparks' Earliana, and this year has yielded much better.

TOMATOES—TWELVE BEST YIELDING VARIETIES, 1904.

| Name of Variety. | Date of First Ripe Fruit. | | Yield of Ripe Fruit to Aug. 13, 1904. | | Total Yield of Ripe Fruit, all pickings—5 Plants. | | Total Yield of Ripe Fruit per Plant. | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | | Lbs. | Oz. | Lbs. | Oz. | Lbs. | Oz. | |
| Early Bird | Aug. | 4 | 1 | .. | 69 | 12 | 13 | 15 | Below medium size, smooth, purplish pink. |
| Nolte's Earliest | July | 22 | 4 | 2 | 58 | 2 | 11 | 10 | Medium size, wrinkled, scarlet. |
| Democrat | Aug. | 1 | .. | 8 | 50 | .. | 10 | .. | Medium size, wrinkled, purplish pink. |
| Turner's Hybrid | " | 4 | 1 | 8 | 45 | 12 | 9 | 2 | Large, smooth to slightly wrinkled, purplish pink. |
| Extra Early Red | July | 26 | 1 | 12 | 44 | 8 | 8 | 14 | Below medium size, smooth, scarlet. |
| Acme | Aug. | 3 | 1 | .. | 37 | 8 | 7 | 8 | Medium size, smooth, purplish pink. |
| Canada Victor | July | 26 | .. | 12 | 36 | .. | 7 | 3 | Medium size, wrinkled, scarlet. |
| Rosedale | " | 26 | 2 | 15 | 35 | 3 | 7 | 1 | Medium size, scarlet. |
| Thorburn's Long Keeper | Aug. | 4 | 1 | .. | 34 | 4 | 6 | 14 | Below medium size, regular, smooth, purplish pink. |
| Sparks' Earliana | July | 29 | 1 | 8 | 33 | .. | 6 | 10 | Medium size, half wrinkled to smooth, scarlet. |
| Bond's Early Minnesota | " | 29 | 1 | 12 | 32 | 8 | 6 | 8 | Below medium size, smooth, purplish pink. |
| Thorburn's Earliest | Aug. | 1 | 1 | 8 | 32 | 8 | 6 | 8 | Medium size, wrinkled, scarlet. |

TOMATOES—SIX EARLIEST VARIETIES, 1904.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Maule's Earliest | July | 27 | 5 | 5 | 26 | 9 | 5 | 5 | Medium size, wrinkled, scarlet. |
| Nolte's Earliest | " | 22 | 4 | 2 | 58 | 2 | 11 | 10 | " " |
| Early Leader | " | 26 | 3 | 15½ | 29 | 15½ | 6 | .. | Below medium size, half wrinkled, scarlet. |
| Chalk's Early Jewel | " | 24 | 3 | 8 | 19 | 2 | 3 | 13 | Medium size, smooth, scarlet. |
| New Extra Early | " | 27 | 3 | 4 | 25 | 4 | 5 | 1 | |
| Conqueror | " | 27 | 2 | 14 | 19 | 6 | 3 | 14 | Medium size, wrinkled to smooth, scarlet. |

The varieties of tomatoes which have averaged best for a number of years and which are recommended for general planting are:—*Early*, Sparks' Earliana. ***Main Crop,*** Brinton's Best, Trophy, Matchless (scarlet), and Burpee's Climax, and Autocrat (purplish pink).

An experiment with a certain method of pruning tomatoes was tried this year with gratifying results. When the plants in the hot-beds had six strong leaves developed, which was on May 23, the tops were nipped off and the plants given more room, being placed 5½ inches apart. The object of pinching off the top of the plant was to cause new shoots to develop at the axils of the leaves in order to have six branches bearing early tomatoes instead of the one cluster usually found on the top of the plant. These were planted out on June 6, alongside other plants unpruned. On June 22, half of the pruned plants were again pruned, all laterals being taken out and the six main branches only being left, the other plants were left to grow at will, and it was found that they produced the most ripe fruit, though not the largest early crop. This system of pruning is very promising. The further advanced the axillary shoots are when the plants are set out the larger the early crop is likely to be. In the experiment this year the plants were not started nearly early enough to get the best results. The experiment was suggested by Mr. J. S. Littooy, Everett, Washington Territory, who has been pruning tomatoes in this way for some time in Washington, with gratifying results, where they have difficulty in ripening tomatoes.

TOMATOES—EXPERIMENT IN PRUNING.

| Name of Variety. | Date of First Ripe Fruit. | Ripe Fruit First Three Pickings. | Total Yield of Ripe Fruit. | |
|---|---|---|---|---|
| | | Lbs. | Lbs. | Oz. |
| Spark's Earliana— | | | | |
| Unpruned | July 29 | 9 | 84 | |
| Pruned once | Aug. 13 | 6 | 137 | 10 |
| Pruned twice | " 12 | 18 | 132 | 13 |
| Matchless— | | | | |
| Unpruned | Aug. 4 | ............ | 29 | |
| Pruned once | " 29 | ............ | 73 | 8 |
| Pruned twice | " 29 | ............ | 62 | |

## TOBACCO—TEST OF VARIETIES.

Tobacco is tested every year at the Central Experimental Farm on account of the importance of the crop. This year fifty-one varieties were grown, or at least tobacco under fifty-one different names, as it is probable that a number of them were synonyms. Twenty plants of each variety were tested, but seven kinds were grown on larger areas. The season was favourable to the tobacco crop, as although it was cool the plants grew well, and by September 9, when they were cut, the plants were nearly as mature on the whole as they usually get here. The seed was sown in hot-beds on April 4, and the plants pricked out into a cold frame on May 21, and planted in the field on June 6, in rows 3 x 3½ feet apart.

| Name of Variety. | Condition when cut. | Yield of dry leaves from 20 plants. Lbs. | Oz. | Yield of dry leaves per acre. Lbs. | Oz. |
|---|---|---|---|---|---|
| Connecticut Seed Leaf | Nearly mature | 13 | 12 | 2,852 | 2 |
| Pennsylvania Seed Leaf | " | 8 | 9 | 1,776 | 2 |
| Cuban Seed Leaf | " | 7 | 12 | 1,607 | 9 |
| Havana Seed Leaf | " | 7 | 9 | 1,568 | 11 |
| Lancaster Co. Broad Leaf | " | 7 | 7 | 1,542 | 12 |
| Bonanza | " | 7 | 4 | 1,503 | 14 |
| Lack's | " | 7 | 1 | 1,465 | 0 |
| Gold Leaf | " | 6 | 13 | 1,413 | 0 |
| Honduras | " | 6 | 5 | 1,309 | 6 |
| Flannagan | " | 6 | 3 | 1,283 | 7 |
| White Burley | " | 6 | 0 | 1,244 | 9 |
| Warne | " | 5 | 14¾ | 1,228 | 6 |
| Maryland | Mature | 5 | 13 | 1,205 | 11 |
| Kentucky Burley | Nearly mature | 5 | 12 | 1,192 | 11 |
| Big Havana | " | 5 | 10 | 1,166 | 12 |
| Oronoka White Stem | " | 5 | 10 | 1,166 | 12 |
| Sumatra | " | 5 | 9 | 1,153 | 13 |
| Sterling | Mature | 5 | 8 | 1,140 | 14 |
| Comstock Spanish | Nearly mature | 5 | 8 | 1,140 | 14 |
| Bradley's Broad Leaf | " | 5 | 8 | 1,140 | 14 |
| Zimmer's Spanish | " | 5 | 7 | 1,127 | 14 |
| N. C. Bright Yellow | " | 5 | 7 | 1,127 | 14 |
| Conqueror | " | 5 | 3 | 1,076 | 0 |
| Hester | " | 5 | 1 | 1,050 | 2 |
| Persian Muscatelle | Mature | 5 | 1 | 1,050 | 2 |
| Small Red Canadian | " | 5 | 1 | 1,050 | 2 |
| Gold Finder | Nearly mature | 5 | 0 | 1,037 | 2 |
| Virginia One Sucker | Mature | 4 | 15½ | 1,030 | 11 |
| Virginia Oak Hill | Nearly mature | 4 | 15 | 1,024 | 3 |
| Safrano | Mature | 4 | 13½ | 1,004 | 12 |
| Yellow Pryor | Nearly mature | 4 | 13 | 998 | 4 |
| Large Havana | " | 4 | 12 | 985 | 5 |
| Little Oronoka | " | 4 | 6 | 907 | 8 |
| Yellow Mammoth | " | 4 | 5 | 894 | 9 |
| Oronoka Yellow | " | 4 | 3 | 868 | 10 |
| Hyco | " | 4 | 1 | 842 | 11 |
| Long Leaf Gooch | Mature | 4 | 0 | 829 | 12 |
| Sweet Oronoka | " | 3 | 9 | 738 | 15 |
| Granville Co. Yellow | Nearly mature | 3 | 9 | 738 | 15 |
| Primus | " | 3 | 8½ | 732 | 7 |
| Eastern Pride | " | 3 | 8 | 726 | 0 |
| Improved White Burley | " | 3 | 7 | 713 | 0 |
| Choice Havana | " | 3 | 4 | 674 | 2 |
| Turkish | Mature | 3 | 3 | 661 | 3 |
| Havana | " | 3 | 2 | 648 | 3 |
| Evans | " | 3 | 0 | 622 | 5 |
| Climax | Nearly mature | 2 | 15½ | 615 | 13 |
| Persian Rose | Mature | 2 | 11 | 557 | 7 |
| Small Havana | " | 2 | 9 | 531 | 8 |
| Cannelle | " | 2 | 5 | 479 | 11 |
| Vuelta de Abajo | " | 2 | 5 | 479 | 11 |
| Porto Rico | " | 2 | 4 | 466 | 11 |
| Cannelle Good Canadian | " | 2 | 3 | 453 | 12 |

## FOREST BELTS.

The forest belts at the Central Experimental Farm extend along its northern and western boundaries, the belt on the western boundary being 165 feet wide, and that on the northern boundary 65 feet wide. Their total length is nearly 1¾ miles. The number of trees growing in these belts, including those in a separate plantation of evergreens, is about 23,100.

One of the principal objects for which the forest belts were planted was to obtain information relating to the growth of the best timber trees, when grown on different soils at different distances apart, in blocks of single species, and in mixed plantations.

The distances chosen at first were 5 by 5 ft., 5 by 10 ft., and 10 by 10 ft. apart. In addition to obtaining information on the growth of the trees, another object of planting the belts was to find what influence they would have on the crops in the adjoining fields, both favourable and unfavourable. It was expected also that these belts would add much to the appearance of the landscape. It was hoped that other useful information regarding timber trees would also be obtained.

The first planting was done in the autumn of 1887, just seventeen years ago, and the rapid growth which most of the trees have made should be some inducement to farmers and others to plant trees.

Although the soil was not in all cases suitable for the trees which were planted in it, being very poor in some places and badly drained, at first in others, these various conditions have enabled us to note the kinds of soils which certain species will thrive in or those in which they will not do well.

It has been found that the trees which were planted 5 by 5 feet apart, the closest distance, used at first, are making the best trees from a forestry standpoint, as the side branches are killed much sooner. The trees planted 5 by 5 feet apart are more protected from storms than those further apart, and hence the tops are less injured. They are also a little taller in most cases, but are not so great in diameter as those 10 by 10 feet apart. During the first years of growth there is a great advantage in having the trees close, as in order to get thrifty growth the soil should not become hard, nor should the trees be almost smothered with weeds or grass, and to get these good conditions it is necessary to cultivate at first, and the further the trees are apart the longer one will have to cultivate, thus making the expense greater.

Until the last three years the trees in the mixed plantation were making the most satisfactory growth, and are yet making better growth than some of the clumps composed of single species, but the rapid growing kinds are developing so fast in the mixed belt that they are overshadowing some of the more valuable trees, and those which cannot endure much shade are being killed. To some extent this overshadowing is prevented by shearing the side branches and letting in more light. In nature, the proper proportion of fast and slow growing, shade-enduring and light-needing trees is gradually adjusted as the trees develop, but in artificial planting, it is very difficult to arrange them in proper proportion where a number of species are used. The fewer kinds that are employed the easier it becomes.

In some of the clumps of single species the disadvantage of not having two or more kinds mixed is quite as apparent as the disadvantage of having so many kinds mixed in the mixed belt. Ash, Butternut, Black Walnut, and Elm, which have thin foliage, do not kill the sod, and the growth on this account is checked. If other heavy foliaged kinds, such as Larch, Spruce, Pine, or Box Elder had been mixed with these the results would have been, almost certainly, much better.

Beginning in 1899 and continuing at intervals since, some plantations have been made with trees and shrubs at much closer distances apart, the largest proportion being shrubs which are used for under-growth and which grow rapidly at first, but do not reach a great height. In these plantings the trees and shrubs are but 2½ feet apart. It is too soon yet to report fully on this experiment, but the results already obtained go to show that this method, if properly carried out, has some important advantages over wider planting, one of the principal being the saving of cultivation. It is possible that 3 feet apart would be as satisfactory or more satisfactory a distance than 2½ feet. The chief shrubs used as undergrowth were Rosemary Willow (*Salix rosmarinifolia*), Alder Buckthorn (*Rhamnus Frangula*), Sand Cherry (*Prunus pumila*), and Nine-bark (*Neillia opulifolia*). The last has been found the most satisfactory, as it grows rapidly even in sod and has dense foliage.

Every year measurements are taken in the forest belts at the Central Experimental Farm, both of the annual growth in height and in diameter, and tables are published from time to time in this report, the last one appearing in 1901. In the following table will be found the measurements of the principal species of trees in the belts up to this autumn. In most cases the published figures are the averages of three average trees, but in a few instances six trees are averaged.

## Growth of Trees in the Forest Belts at the Central Experimental Farm.

| Name of Species. | Character of Soil. | When Planted. | Distance Apart. | Age or Height when Planted. | Average Height, 1900. | | Average Height, 1901. | | Average Height, 1902. | | Average Height, 1903. | | Average Height, 1904. | | Average Diameter 4′ 6″ from ground, 1904. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Feet. | Years. | ft. | in. | ft. | in. | ft. | in. | ft. | in. | ft. | in. | in. |
| Black Walnut—Juglans nigra | Low sandy loam | 1888 | 5× 5 | 1 | 11 | 6 | 12 | .. | 12 | 9 | 13 | .. | 13 | 6 | 2¼ |
| " " | " | 1888 | 10×10 | 1 | 7 | .. | 7 | 11 | 8 | 5 | 8 | 11 | 9 | 3 | 1¾ |
| " " | Sandy loam with small stones | 1889 | 5× 5 | 2 | 16 | 4 | 17 | 7 | 18 | 8 | 19 | 6 | 20 | 1 | 3¼ |
| " " | " " | 1889 | 10×10 | 2 | 12 | 3 | 13 | 4 | 14 | 2 | 14 | 7 | 15 | 2 | 3⅛ |
| " " | Clay loam | 1888 | 10× 5 | 1 | 14 | 1 | 15 | 4 | 16 | 2 | 16 | 10 | 17 | 8 | 3¼ |
| Butternut—Juglans cinerea | Low sandy loam | 1889 | 5× 5 | 1 | 11 | 7 | 11 | 11 | 12 | .. | 12 | .. | 12 | 2 | 2⅛ |
| " " | " | 1888 | 10×10 | 1 | 10 | 1 | 10 | 6 | 10 | 6 | 10 | 8 | 10 | 10 | 1⅞ |
| Silver-leaved Maple—Acer dasycarpum | Light sandy loam | 1889 | 5× 5 | 3 | 27 | 3 | 28 | .. | 28 | 5 | 28 | 7 | 28 | 10 | 2¾ |
| " " | " | 1889 | 10×10 | 3 | 24 | 8 | 25 | 1 | 25 | 8 | 25 | 5 | 25 | 8 | 4⅓ |
| European White Birch—Betula alba | " | 1889 | 5× 5 | 3 | 34 | 8 | 35 | 9 | Dead. | | .. | .. | .. | .. | .. |
| " " | " | 1889 | 10×10 | 3 | 37 | 3 | 38 | 7 | 39 | 5 | Dead. | | .. | .. | .. |
| Canoe Birch—Betula papyrifera | " | 1889 | 5× 5 | 3 | 31 | .. | 32 | 7 | 33 | 1 | 33 | 5 | 34 | 3 | 4 |
| " " | " | 1889 | 10×10 | 3 | 31 | 1 | 32 | 8 | 34 | 1 | 34 | 9 | 35 | 1 | 5½ |
| Yellow Birch—Betula lutea | " | 1889 | 5× 5 | 3 | 21 | 10 | 23 | .. | 23 | 9 | 24 | 1 | 24 | 2 | 3 |
| " " | " | 1889 | 10×10 | 3 | 21 | 8 | 23 | 6 | 24 | 3 | 24 | 9 | 25 | 6 | 4⅓ |
| White Elm—Ulmus americana | Sandy loam | 1889 | 5× 5 | 3 | 17 | 3 | 18 | 1 | 18 | 11 | 19 | 9 | 20 | 2 | 2½ |
| " " | " | 1889 | 10×10 | 3 | 18 | 9 | 19 | 8 | 20 | 9 | 21 | 4 | 22 | 4 | 4⅓ |
| Black Ash—Fraxinus sambucifolia | Black muck | 1889 | 5× 5 | 2 | 18 | 2 | 18 | 10 | 19 | 4 | 19 | 9 | 20 | 5 | 2½ |
| " " | Low sandy loam | 1889 | 10×10 | 2 | 11 | 11 | 12 | 5 | N'rly dead | | .. | .. | .. | .. | .. |
| Green Ash—Fraxinus viridis | Black muck | 1889 | 5× 5 | 3 | 20 | 10 | 22 | 8 | 24 | .. | 25 | 1 | 26 | 10 | 3¼ |
| " " | Low sandy loam | 1889 | 10×10 | 3 | 17 | 2 | 18 | 5 | 19 | 8 | 21 | .. | 21 | 6 | 3¾ |
| Red Ash—Fraxinus pubescens | Black muck | 1889 | 5× 5 | 2 | 22 | 8 | 24 | 4 | 26 | .. | 26 | 11 | 28 | 8 | 3⅓ |
| " " | Light sandy loam | 1889 | 10×10 | 2 | 17 | 2 | 18 | 10 | 20 | 3 | 21 | 4 | 22 | 11 | 3⅜ |
| White Ash—Fraxinus americana | Black muck | 1889 | 5× 5 | 3 | 24 | 1 | 24 | 8 | 25 | 7 | 26 | 1 | 26 | 7 | 2¼ |
| " " | Light sandy loam | 1889 | 10×10 | 3 | 23 | 10 | 25 | 9 | 26 | 9 | 27 | 7 | 28 | .. | 3⅜ |
| Black Cherry—Prunus serotina | Light sandy loam and gravel | 1889 | 5× 5 | 3 | 18 | 11 | 19 | 11 | 21 | 2 | 22 | 1 | 23 | 2 | 2⅞ |
| " " | " " | 1889 | 10×10 | 3 | 24 | 4 | 26 | 7 | 29 | .. | 30 | 3 | 32 | 1 | 4⅝ |
| Box Elder—Acer Negundo | Light sandy loam | 1889 | 5× 5 | 2 | 25 | 2 | 25 | 7 | 25 | 8 | 26 | 1 | 26 | 6 | 3¼ |
| | | | | in. | | | | | | | | | | | |
| Scotch Pine—Pinus sylvestris | Sandy loam with gravel | 1888 | 5× 5 | 18 | 23 | 6 | 24 | 9 | 26 | 9 | 28 | .. | 28 | 3 | 4⅛ |
| " " | " | 1888 | 10×10 | 18 | 21 | 2 | 22 | 7 | 22 | 9 | 24 | 2 | 24 | 4 | 5⅜ |
| " " | Low sandy loam with gravel | 1888 | 5× 5 | 18 | 22 | 9 | 24 | 2 | 25 | 8 | 26 | 10 | 27 | 9 | 3⅜ |
| " " | Low sandy loam | 1888 | 10×10 | 18 | 21 | 10 | 23 | .. | 24 | 3 | 25 | 5 | 26 | 6 | 5⅜ |
| " " | Light sandy loam | 1888 | 10× 5 | 18 | 24 | 5 | 25 | 9 | 27 | 2 | 28 | 7 | 29 | 4 | 8⅛ |
| " " | Clay loam | 1888 | 10× 5 | 18 | 20 | 9 | 22 | 2 | 22 | 10 | 23 | 7 | 24 | 8 | 6 |
| " " | Light sandy loam and gravel | 1888 | 10× 5 | 18 | 23 | 5 | 25 | 2 | 25 | 7 | 26 | 11 | 27 | 9 | 6⅞ |
| " " | " " | 1887 | 3× 3 | 9 | 24 | 4 | 26 | .. | 27 | .. | 28 | 4 | 29 | 4 | 3⅔ |

GROWTH of Trees in the Forest Belts at the Central Experimental Farm—*Concluded.*

| Name of Species. | Character of Soil. | When Planted. | Distance Apart. | Age or Height when Planted. | Average Height, 1900. | Average Height, 1901. | Average Height, 1902. | Average Height, 1903. | Average Height, 1904. | Average Diameter 4′ 6″ from ground, 1904. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Feet. | in. | ft. in. | ft. in. | ft. in. | ft. in. | ft. in. | In. |
| **Austrian Pine—Pinus austriaca** | Light sandy loam | 1889 | 5 × 5 | 18 | 17 10 | 19 9 | 21 9 | 23 4 | 24 10 | $4\frac{5}{8}$ |
| " " | " | 1889 | 10 × 10 | 18 | 18 1 | 19 9 | 20 10 | 22 4 | 23 6 | $6\frac{1}{3}$ |
| " " | " | 1888 | 10 × 5 | 15 | 17 5 | 19 7 | 21 1 | 22 2 | 23 3 | $5\frac{3}{4}$ |
| " " | Clay loam | 1888 | 10 × 5 | 15 | 17 .. | 18 11 | 20 10 | 22 4 | 23 7 | $5\frac{1}{2}$ |
| " " | Light sandy loam and gravel. | 1888 | 10 × 5 | 15 | 19 6 | 21 6 | 23 1 | 24 5 | 25 7 | 6 |
| " " | " " | 1887 | 3 × 3 | 15 | 18 .. | 19 8 | 20 11 | 22 5 | 23 7 | $3\frac{5}{8}$ |
| **White Spruce—Picea alba** | Light sandy loam | 1889 | 5 × 5 | 15 | 13 2 | 14 2 | 15 1 | 15 7 | 16 5 | $2\frac{1}{2}$ |
| " " | " | 1889 | 10 × 10 | 15 | 14 .. | 14 10 | 15 6 | 16 6 | 17 8 | $3\frac{1}{2}$ |
| **Norway Spruce—Picea excelsa** | " | 1889 | 5 × 5 | 18 | 15 11 | 17 2 | 18 7 | 19 1 | 20 1 | 3 |
| " " | " | 1889 | 10 × 10 | 18 | 20 1 | 22 .. | 23 3 | 24 9 | 25 5 | $4\frac{1}{3}$ |
| " " | " | 1888 | 10 × 5 | 15 | 23 4 | 25 7 | 27 4 | 29 3 | 30 4 | 5 |
| " " | Clay loam | 1888 | 10 × 5 | 15 | 23 11 | 25 11 | 27 7 | 29 11 | 30 11 | 6 |
| **American Arbor-vitæ—Thuya occidentalis** | Low sandy loam and black muck | 1889 | 5 × 5 | 18 | 15 .. | 16 5 | 17 2 | 18 2 | 18 11 | $3\frac{1}{4}$ |
| " " | Low sandy loam | 1889 | 10 × 10 | 18 | 13 9 | 14 10 | 15 6 | 16 1 | 17 3 | $3\frac{1}{8}$ |
| | | | | feet. | | | | | | |
| **European Larch—Larix europæa** | " | 1888 | 5 × 5 | 2 | 26 10 | 28 .. | 28 11 | 30 4 | 31 10 | 4 |
| " " | " | 1888 | 10 × 10 | 2 | 27 6 | 28 5 | 28 9 | 29 7 | 31 2 | $5\frac{3}{8}$ |
| **White Pine—Pinus Strobus** | Light sandy loam with gravel | 1889 | 5 × 5 | 8 to 10 in. | 22 9 | 24 6 | 26 1 | 26 10 | 28 11 | $4\frac{3}{8}$ |
| " " | " " | 1889 | 10 × 10 | 8 to 10 in. | 21 .. | 22 7 | 24 5 | 26 .. | 27 9 | $6\frac{1}{3}$ |

NOTE:—The low sandy soil in which the Black Walnut and Butternut are growing appears quite unsuitable and the trees are almost at a standstill. The light sandy soil in which some of the White Spruce are is not very suitable nor is the sandy loam where the White Elm are growing. **These trees have all made much better growth in other soils.**

## ARBORETUM AND BOTANIC GARDEN.

Notwithstanding the severe winter of 1903-4 there were not many more trees and shrubs winter killed than usual, owing to the deep snow which protected the roots and the lower part of the trunk, but the killing back of the trees was severer than in other years. Further additions were made to the collection of trees and shrubs and to the herbaceous perennials. Of trees and shrubs 343 specimens representing 291 species and varieties were added, making the total number of species and varieties of trees and shrubs alive 3,132 when winter set in. The addition to the collection of herbaceous perennials was not large this year, but there are over 400 species and varieties available for planting next spring. A bulletin on herbaceous perennials is being prepared.

In the following table will be found a list of the genera of trees and shrubs in the Arboretum, with the number of species and varieties of each genus alive in the autumn of 1904.

| No. of species and varieties alive in Arboretum, 1904. | Name of Genus. | No. of species and varieties alive in Arboretum, 1904. | Name of Genus. |
|---|---|---|---|
| 4 | Acanthopanax. | 50 | Clematis—Virgin's Bower. |
| 122 | Acer—Maple. | 4 | Clethra—Sweet Pepperbush. |
| 2 | Actinidia. | 1 | Cocculus. |
| 38 | Æsculus—Horse Chestnut—Buckeye. | 10 | Colutea. |
| 3 | Akebia. | 38 | Cornus—Dogwood. |
| 33 | Alnus—Alder. | 16 | Corylus—Hazel-nut, Filbert. |
| 8 | Amelanchier—June-berry. | 18 | Cotoneaster. |
| 17 | Amorpha—False Indigo. | 116 | Crataegus—Hawthorn. |
| 1 | Andrachne. | 26 | Cytisus—Broom. |
| 3 | Andromeda. | 4 | Daphne. |
| 1 | Aphananthe. | 1 | Decumaria. |
| 5 | Aralia. | 29 | Deutzia. |
| 1 | Aralidium. | 31 | Diervilla—Weigela. |
| 1 | Arctostaphylos. | 2 | Diospyros—Persimmon. |
| 2 | Aristolochia—Birthwort. | 9 | Elaeagnus—Olive. |
| 5 | Artemisia—Southernwood. | 1 | Ephedra. |
| 1 | Asimina—North American Papaw. | 5 | Erica—Heath. |
| 1 | Atrophaxis. | 29 | Euonymus—Spindle Tree. |
| 1 | Baccharis—Groundsel-tree. | 1 | Exochorda. |
| 75 | Berberis—Barberry. | 7 | Fagus—Beech. |
| 1 | Berchemia. | 1 | Fatsia. |
| 42 | Betula—Birch. | 1 | Fendlera. |
| 1 | Broussonetia—Paper Mulberry. | 6 | Fontanesia. |
| 4 | Buddleia. | 1 | Forestiera. |
| 1 | Bupleurum. | 10 | Forsythia—Golden Bell. |
| 1 | Bruckenthalia. | 86 | Fraxinus—Ash. |
| 1 | Buxus—Box. | 6 | Genista—Green-weed. |
| 1 | Caesalpina. | 1 | Grewia. |
| 1 | Calluna—Heather. | 10 | Gleditschia—Honey Locust. |
| 2 | Calycanthus—Carolina Allspice. | 2 | Gymnocladus—Kentucky Coffee Tree. |
| 26 | Caragana—Siberian Pea Tree. | 2 | Halesia—Silver-bell Tree. |
| 14 | Carpinus—Hornbeam. | 2 | Halimodendron. |
| 1 | Cassandra. | 2 | Hamamelis—Witch Hazel. |
| 3 | Carya—Hickory. | 1 | Hedysarum. |
| 5 | Castanea—Chestnut. | 2 | Hippophae—Sea Buckthorn. |
| 11 | Catalpa. | 8 | Hydrangea. |
| 4 | Ceanothus—New Jersey Tea. | 9 | Hypericum—St. John's Wort. |
| 3 | Celastrus—Shrubby Bitter-Sweet. | 6 | Ilex—Holly. |
| 5 | Celtis—Hackberry. | 1 | Itea. |
| 1 | Cephalanthus—Button Bush. | 1 | Indigofera. |
| 1 | Cercidiphyllum—Katsura Tree. | 1 | Jamesia. |
| 1 | Cercis—Redbud. | 19 | Juglans—Walnut, Butternut. |
| 1 | Cercocarpus. | 1 | Kalmia—American Laurel. |
| 1 | Chionanthus—Fringe-Tree. | 2 | Kerria. |
| 2 | Cladrastis—Yellow-wood. | 1 | Kolreuteria. |

| No. of species and varieties alive in Arboretum, 1904. | Name of Genus. |
|---|---|
| 1 | Laburnum. |
| 1 | Ledum—Labrador Tea. |
| 3 | Lespedeza. |
| 2 | Leucothoe. |
| 24 | Ligustrum—Privet. |
| 1 | Lindera—Wild Allspice. |
| 2 | Liriodendron—Tulip Tree. |
| 107 | Lonicera—Honeysuckle. |
| 9 | Lycium—Matrimony Vine. |
| 1 | Lyonia. |
| 3 | Magnolia. |
| 1 | Menispermum—Moonseed. |
| 14 | Morus—Mulberry. |
| 5 | Myrica—Bayberry. |
| 1 | Nandina |
| 2 | Myricaria. |
| 7 | Neillia—Ninebark. |
| 1 | Nemopanthus—Mountain Holly. |
| 1 | Neviusia. |
| 1 | Nuttallia. |
| 1 | Nyssa—Pepperidge—Sour Gum. |
| 2 | Ostrya—Hop Hornbeam—Iron-wood. |
| 1 | Ononis. |
| 1 | Ostryopsis. |
| 1 | Oxydendron—Sorrel Tree—Sour Wood. |
| 1 | Pachysandra. |
| 2 | Paeonia—Paony. |
| 1 | Paliurus—Christ Thorn. |
| 1 | Parrotia. |
| 1 | Peraphyllum. |
| 1 | Periploca. |
| 3 | Phellodendron. |
| 62 | Philadelphus—Mock Orange—Syringa. |
| 5 | Photinia. |
| 1 | Pirrasma. |
| 9 | Platanus—Plane Tree—Buttonwood. |
| 51 | Populus—Poplar. |
| 5 | Potentilla—Cinque-foil. |
| 138 | Prunus—Almond, Peach, Apricot Plum, Cherry. |
| 8 | Ptelea—Wafer Ash. |
| 3 | Pterocarya. |
| 1 | Pterostyrax. |
| 217 | Pyrus—Pear, Apple, Mountain Ash, Quince, Medlar. |
| 98 | Quercus—Oak. |
| 27 | Rhamnus—Buckthorn. |
| 6 | Rhododendron. |
| 1 | Rhodotypos. |
| 14 | Rhus—Sumach. |
| 57 | Ribes—Currant, Gooseberry. |
| 26 | Robinia—Locust-tree. |
| 82 | Rosa—Rose. |
| 36 | Rubus—Raspberry, Blackberry, Dewberry. |
| 157 | Salix—Willow. |
| 41 | Sambucus—Elder. |
| 1 | Schizandra. |
| 1 | Securinega. |
| 6 | Sophora. |
| 85 | Spiræa—Meadow-Sweet. |
| 5 | Staphylea—Bladder-Nut. |
| 2 | Stephanandra. |
| 2 | Styrax. |
| 13 | Symphoricarpus—Snowberry. |
| 1 | Symplocos. |
| 162 | Syringa—Lilac. |
| 8 | Tamarix—Tamarisk. |
| 2 | Tecoma—Trumpet Flower. |
| 37 | Tilia—Linden, Basswood. |
| 92 | Ulmus—Elm. |
| 2 | Vaccinium—Cranberry, Blueberry, Bilberry. Huckleberry. |
| 29 | Viburnum—Arrow-wood. |
| 1 | Vitex. |
| 32 | Vitis—Grape, Virginian Creeper, Ivy. |
| 9 | Wistaria. |
| 1 | Xanthorrhiza—Shrub—Yellow-root. |
| 1 | Xanthoxylum—Prickly Ash. |
| 4 | Yucca. |
| 4 | Zelkowa. |
| | CONIFERS. |
| 36 | Abies—Fir. |
| 2 | Cedrus—Cedar. |
| 40 | Cupressus—Cypress. |
| 4 | Ginkgo—Maiden-hair Tree. |
| 66 | Juniperus—Juniper. |
| 7 | Larix—Larch—Tamarack. |
| 75 | Picea—Spruce. |
| 45 | Pinus—Pine. |
| 1 | Pseudolarix. |
| 3 | Pseudotsuga. |
| 2 | Taxodium—Bald Cypress. |
| 12 | Taxus—Yew. |
| 67 | Thuya—Arbor Vitae. |
| 5 | Tsuga—Hemlock. |
| 3,132 | Total number of species and varieties alive autumn of 1904. |
| 180 | Genera. |

# REPORT OF THE CHEMIST.

(Frank T. Shutt, M.A., F.I.C., F.S.C., F.R.S.C.)

Ottawa, December 1, 1904.

Dr. Wm. Saunders,
Director, Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to submit herewith the eighteenth annual report of the Chemical Division of the Experimental Farms.

Though much of a new and interesting character will be found in the results here presented, the investigations undertaken during the past season have for the most part been similar in nature to those of former years. More or less assistance has been rendered in all the branches of agriculture and, as far as possible, the more important problems affecting the farming interests of the various provinces of the Dominion have received attention and study.

In addition to the work here recorded, we have examind a large number of samples of an agricultural nature received from farmers.

Help also of a direct character has been given the individual through correspondence—an important branch of the work of the division.

Addresses have been delivered at several of the larger agricultural conventions in Ontario and Quebec, the following titles indicating the character of the matters discussed:—

'The Economic Maintenance of Soil Fertility.'

'The Importance of Clover as a Source of Humus and Nitrogen.'

'The Control of Soil Moisture in Orchards.'

'The "Cover" Crop and Cultivation; their Relative Importance in the Management of Orchard Soils.'

'The composition of Concentrated Feed Stuffs as sold in Canada.'

'The Factors which Control the Moisture Content of Butter.'

'The Changes in Honey on Storage in a Damp Atmosphere.'

*Tour in British Columbia.*—At the special request of the Provincial Government, two months were spent in visiting the more important agricultural areas of British Columbia. An account of this interesting and instructive tour will be found at the conclusion of the accompanying report.

*Soils.*—A number of virgin soils from British Columbia have been submitted to careful analysis. These include representative samples from Kingcome Inlet, Cape Scott, Balfour and Kualt. A soil from New Liskeard (New Ontario) and one from the Peace River district have also been examined and are now reported upon.

In addition to these, we have received a large number of soils from farmers all over the Dominion. These have not received complete analysis—and consequently do not find a place in this report. From a preliminary examination and the determination of certain elements of fertility we have endeavoured to draw conclusions regarding the rational treatment of these soils, and these particulars we trust have proved of value to those sending the soils.

*Control of Soil Moisture.*—Further experiments have been conducted, in the orchards of the experimental farms at Ottawa and Nappan. The results are well in accord with those of our former researches and at the same time serve to emphasize certain important features in soil management which had not hitherto been investigated.

*Fodders and Feeding Stuffs.*—During the past three seasons an investigation has been carried on with the object of determining the amount of dry matter, protein, &c., as produced per acre by Indian corn sown in hills and drills, respectively. This work is now reported upon.

Analysis of Rape ensilage and ensilage of mixed Rape and Corn are given and the values of these new succulent fodders discussed.

A considerable number of milling products, meat meals, and stock foods have been examined during the past year. These analyses now constitute an important branch of our work, owing to the many new products and condimental foods being constantly put upon the market.

*Materials of Fertilizing Value.*—These include samples of wood-ashes, ashes from muck, &c., &c., received from farmers in various parts of Canada. The results obtained on the more important of these are here given and briefly discussed.

*Sugar Beets.*—We have determined the amounts of plant food withdrawn from the soil by this crop as grown for factory purposes. The results show the nitrogen, phosphoric acid, potash, and lime contained in the roots, crowns and leaves, respectively, in the beet at three stages of growth, and may serve as a guide in the rational manuring of this crop.

The richness and purity of the varieties, Vilmorins' Improved, Klein Wanzleben and Très Riche—probably the three best for factory purposes—as grown on the several Experimental Farms of the Dominion, have been ascertained and tabulated.

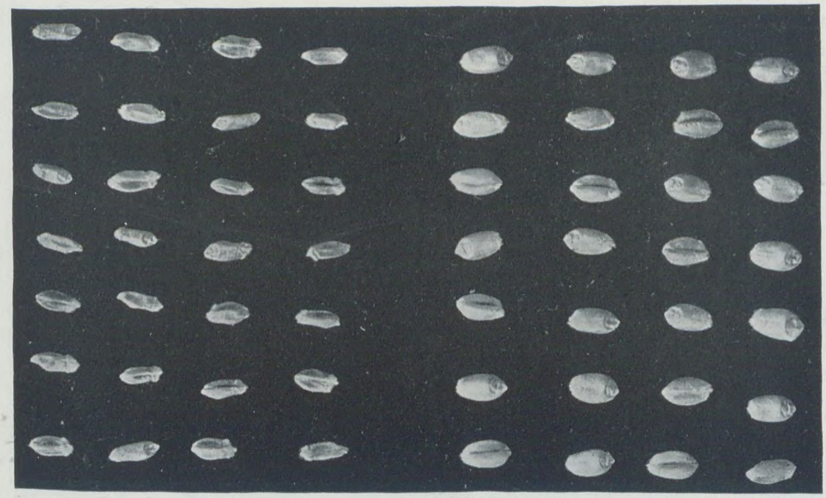
*Roots.*—A continuance into the inquiry respecting the amounts of dry matter and sugar furnished by the different classes of farm roots has been made. The data will be found of interest and value to all farmers growing roots for feeding purposes.

*The Effect of Rust on the Straw and Grain of Wheat.*—This research was undertaken by reason of the prevalence of rust in the wheat fields of certain districts in Manitoba. It has shown clearly that the rust arrests development of the wheat plant, resulting more particularly in a straw of greater feeding value than that of the normally mature wheat, and in a very much shrivelled kernel, slightly richer in albuminoids than in the plump grain from rust-free wheat.

*Well Waters from Farm Homesteads.*—Analyses have been made, from the hygienic standpoint, of about 100 samples of well waters from farms, creameries and cheese factories, and reports in detail sent to those forwarding the waters. The tabulated results here given are accompanied by a very brief conclusion as to the quality of the supply. Those desiring to avail themselves of the privilege extended by the experimental farms in this matter should write for a copy of the instructions which it is necessary to closely follow in the collection and shipment of water for analysis.

Intimately connected with the matter of a good water supply is that of an effective drainage system. We have accordingly given an account of the Septic Tank, which, we consider, practically solves the problem of the safe disposal of the sewage of the rural home.

*Correspondence.*—The letters directed to this division from November 30, 1903, to December 1, 1904, in addition to those referred to us by the other departments of the farm, numbered 1,284; those sent out, 1,251.

(By Frank T. Shutt.)

KERNELS OF RUSTED WHEAT. KERNELS OF RUST-FREE WHEAT.

*Samples Received for Analysis.*—Subjoined will be found, in classified form, an enumeration of the samples received from farmers for analysis.

SAMPLES received for Examination and Report.

November 30, 1903, to December 1, 1904:

| Samples. | British Columbia. | North-west Territories. | Manitoba. | Ontario. | Quebec. | New Brunswick. | Nova Scotia. | Prince Edward Island. | Total. | Number still awaiting examination. |
|---|---|---|---|---|---|---|---|---|---|---|
| Soils | 16 | 23 | .... | 139 | 5 | 1 | 68 | 1 | 253 | 38 |
| Muds, mucks and marls | 2 | ...... | .... | 2 | 3 | 1 | 6 | 2 | 16 | 11 |
| Manure and fertilizers | 2 | ...... | ...... | 7 | 5 | 1 | 5 | 1 | 21 | 5 |
| Forage plants and fodders | 2 | 8 | 8 | 65 | 8 | 4 | 10 | 3 | 108 | 2 |
| Well waters | 7 | 20 | 3 | 31 | 15 | 15 | 7 | 2 | 100 | ..... |
| Miscellaneous, including dairy products, fungicides and insecticides | 12 | 1 | 2 | 69 | 10 | 2 | 5 | 2 | 103 | 26 |
| | 41 | 52 | 13 | 313 | 46 | 24 | 101 | 11 | 601 | 82 |

*Acknowledgments.*—It is again my pleasure to publicly record my sincere thanks to Mr. A. T. Charron, M.A., Assistant Chemist, and Mr. H. W. Charlton, B.A.Sc., Second Assistant Chemist, who have so well and faithfully performed the tasks allotted to them during the past year. The work of the Chemical Division has very materially increased in all its branches, and necessarily a very large portion of it falls upon these gentlemen. In this work they have manifested an enthusiastic interest, performing their duties with skill and industry. It is for this hearty co-operation that my thanks are particularly due.

I also desire to tender my thanks to Mr. J. F. Watson, who has again performed to my perfect satisfaction the large amount of clerical work in connection with the division.

I have the honour to be, sir,
Your obedient servant,

FRANK T. SHUTT,
*Chemist, Dominion Experimental Farms.*

## SOIL INVESTIGATIONS.

### BRITISH COLUMBIA.

*Cape Scott, Vancouver Island.*—This sample was forwarded by Mr. J. R. Anderson, Deputy Minister of Agriculture, Victoria, B.C., who furnished the following information: 'A virgin soil with a depth of 2 to 4 feet, underlaid by a hardpan. This soil is representative of nearly all the soil on the north-east end of Vancouver Island, except on some small river bottoms. It is lightly timbered with hemlock, cedar, pine, and the soil is covered with moss.'

*Surface Soil.*—Judging from its appearance, this is very largely vegetable matter and might be rightly classed as peat, or more properly speaking, swamp muck. Though rich in nitrogen, such soils do not contain this element in a readily assimilable form. The chief disadvantages of soils of this character for farm crops, however, generally lie in the very small proportions of sand and clay they contain and their deficiency in the mineral constituents of plant food—lime, phosphoric acid and potash and, further, their acid or sour character also renders them unfavourable for many crops.

*Analysis of (air-dried) Soil.*

| | |
|---|---|
| Moisture | 5·26 |
| Organic and volatile matter | 81·55 |
| Insoluble residue (clay and sand) | 10·65 |
| Oxide of iron and alumina | 2·38 |
| Lime | ·48 |
| Magnesia | ·16 |
| Potash | ·06 |
| Phosphoric acid | ·09 |
| | 100·63 |
| Nitrogen, in organic matter | 1·65 |

The soil as received was strongly acid, and on drying by exposure became extremely hard and refractory.

The above data are in close accord with those we have obtained from swamp or black mucks collected in various parts of the Dominion, and clearly indicate that the remarks already made regarding their characteristics and faults are strictly applicable to the soil under consideration.

The general treatment for their reclamation and improvement may be outlined as follows:—

*Drainage.*—This should be as thorough as possible. The removal of all free or stagnant water results in the aeration of the soil, the correction of its sourness and the improvement of its mechanical condition by causing it to become more firm or compact.

*Admixture with Subsoil.*—Whenever the depth of the surface soil will allow the plough to reach the subsoil, there should be a certain admixture of the underlying stratum with the muck. This will serve to improve the latter, both mechanically and chemically. Where this plan is not feasible by reason of the great depth of the surface soil it would be advisable to dress heavily with sand or clay, or better, a mixture of both. Unfortunately, the expense of this latter plan prevents its general adoption.

*Fertilizers.*—Muck soils, as already remarked, are rich in humus and nitrogen; nevertheless, for a season or two until the soil 'sweetens' and nitrification ensues, dressings of barnyard manure will be found of value in encouraging growth by applying immediately available nitrogen.

The chief requirements of such soils are, however, the mineral constituents of plant food. If wood ashes are obtainable no better fertilizer could be recommended, as they supply lime, potash and phosphoric acid. An application of 50 to 80 bushels per acre, harrowed in, should have a marked effect upon the crop. A dressing of lime, simply, will also be of great value (say, 40 bushels per acre), though it should, if possible, be supplemented by potash and phosphoric acid in one or other of their forms. Marl, a natural deposit of carbonate of lime, frequently found in connection and underlying peat or muck, is very useful for such soils as we are considering. A heavy dressing of 'gas lime' has been found valuable for such soil. Basic (Thomas) slag will, I believe, be found very useful for such soils. It presents phosphoric acid associated with lime in an alkaline form, and, therefore, particularly adapted for sour, peaty soils. It might be tried at the rate of 300 to 500 lbs. per acre, together with 100 to 200 lbs. of muriate of potash.

In all this work it should be the aim not to bury the fertilizer, but to keep it in the surface few inches of the soil. It will naturally and of its own accord tend to sink.

*Crops.*—There are few crops that will give lucrative yields on muck soils unless the latter received some treatment as already outlined. Probably Timothy succeeds best of all on the crude muck. Neither roots nor cereals can be considered as naturally adapted to such soils, but several may be grown with profit after the lacking mineral elements have been supplied. Potatoes, mangels, oats and Indian corn have all done fairly well under such improved conditions.

*Subsoil.*—This is of the nature of a 'hard pan,' consisting chiefly of compacted sand. It, nevertheless, contains some organic matter and nitrogen, as is shown by the following partial analysis.

*Analysis of (air-dried) Subsoil.*

| | |
|---|---|
| Moisture | 2·99 |
| Organic and volatile matter | 11·07 |
| Sand and other rock matter | 85·04 |
| | 100·00 |
| Nitrogen | ·123 |

This subsoil is not, unfortunately, rich in lime or phosphoric acid, but this should not prevent its judicious admixture with the surface soil wherever possible, for such would undoubtedly enhance the crop-producing power of the latter.

*Kingcome Inlet, B.C.*—A dark-gray loam of granular texture, in which the comparatively large amount of organic matter is intimately incorporated with the silt and fine sand which form the mineral basis of the soil. Laboratory trials go to show that the mechanical or physical condition of this soil is excellent and that it would be suitable for the majority of farm crops.

Our correspondent, in forwarding the soil, furnishes the following particulars : 'This is representative of the soil in this valley. The soil has been dyked and cultivated for seven years. Occassionally, perhaps once a year, the tide will overflow the dyke. It is underdrained with cedar drains and the water does not lie on the land. The climate here is decidedly wet, for the rainfall is a heavy one, but there is no record kept. Please advise me as to the best fertilizer to use.'

*Analysis of (air-dried) Soil.*

| | |
|---|---|
| Moisture | 1·70 |
| Organic and volatile matter | 10·43 |
| Insoluble matter (sand, &c.) | 73·82 |
| Oxide of iron and alumina | 13·15 |
| Lime | ·25 |
| Magnesia | ? |
| Potash | ·64 |
| Phosphoric acid | ·26 |
| | 100·25 |

| | |
|---|---|
| Nitrogen | ·369 |
| Available potash | ·0188 |
| " phosphoric acid | ·0185 |
| " lime | ·088 |

The foregoing results are indicative of great crop producing power The soil contains an abundance of organic matter rich in nitrogen and the mineral elements of plant food—and especially potash—are for the most part present in amounts equal to those in many of our finest and most fertile soils. It may further be stated that the percentages of potash and phosphoric acid in an 'available' condition are considerably above the average.

What perhaps might be termed a weakness of this soil is its small lime content. This fact, in conjunction with the slight, but distinct acid reaction of the soil, leads me to suggest an application of lime, wood-ashes or basic slag as most probably the treatment which above all would give increased crop yields. It is essential, however, that the drainage be made as effective as possible.

Lime might be applied at the rate of 25 to 40 bushels per acre; wood-ashes, 35 to 50 bushels, and basic slag, 300 to 500 pounds per acre. The latter fertilizer, owing to its alkalinity, would, I think, on this soil be a more suitable form in which to furnish lime and phosphoric acid than superphosphate, which is an acid form of phosphoric acid. From the standpoint of economy, it might be advisable to give lime a trial before investing in the more expensive basic slag.

Special examination was made for salt, as it was stated that the tide occasionally overflowed the land, but the amount found, 0·023 per cent, was so small that its presence could not be considered as at all injurious to crops.

*Kualt, on Shuswap Lake, near Salmon Arm.*—'Virgin' soil from the south side of mountain (Notch Hill) with a lake on the east side of it. It is somewhat elevated, but can be irrigated if necessary.

This is a light-grey sandy loam, and having the appearance of being deficient in humus.

*Analysis of (air-dried) Soil.*

| | |
|---|---|
| Moisture | 1·32 |
| Organic and volatile matter | 3·57 |
| Insoluble residue (chiefly sand) | 88·96 |
| Oxide or iron and alumina | 5·30 |
| Lime | ·27 |
| Magnesia | ·22 |
| Potash | ·15 |
| Phosphoric acid | ·82 |
| | 100·61 |
| Nitrogen | ·051 |
| Available phosphoric acid | ·268 |
| Available potash | ·011 |

The data makes it evident that the want here is organic matter (humus) and its concomitant nitrogen, and we have again to advise the growth and ploughing under of green crops (preferably clover or some other legume) to supplement the available supply of farm manures.

Probably the application of immediately available nitrogen (as in nitrate of soda) will be necessary to induce a vigorous growth until the soil, by the means just advocated, becomes richer in this element.

The soil appears to be remarkably rich in phosphoric acid, and analysis further shows that a considerable proportion is available for plant growth. Judging, therefore, from the present results, an application of a phosphatic fertilizer would not be profitable.

Though the available potash is not very low, the 'total' potash is considerably less than that in average productive soils. It is probable, therefore, that in time potash fertilizers would prove useful.

The lime-content is by no means large and we should, therefore, expect that applications of this element from time to time would be beneficial.

*Balfour, 17 miles east of Nelson, West Kootenay, B.C.*—'A bench soil, naturally drained, as yet uncropped and unmanured, from 6 to 10 inches deep and overlying a subsoil of white sand, which again rests on gravel. The sample is stated to be representative of at least 1,200 acres.'

The sample forwarded had been taken *in situ* to a depth of 14 inches. The upper 6 inches were considered as representing the surface soil and accordingly the soil to that depth was separated and prepared for analysis. Speaking generally, from an inspection, the soil would be considered as extremely light and sandy and poor in humus, especially below four inches. It had a distinctly acid reaction. The nature of the vegetation on the soil—chiefly mosses—afforded further evidence as to the need of aeration and neutralization.

In a letter to Mr. J. R. Anderson, Deputy Minister of Agriculture, Victoria, B.C., (through whom the soil was submitted) the farmer says: 'The oats and corn that I sowed last spring did not amount to anything, but I am told that all it requires is working. It is said here that the first year or two very little of anything will grow, but that afterwards—when it had become sweet—the soil will give good returns.'

*Analysis of (air-dried) Soil.*

| | Per cent. |
|---|---|
| Moisture | 1·04 |
| Volatile and organic matter | 3·15 |
| Insoluble matter (sand, &c.) | 84·27 |
| Oxide of iron and alumina | 9·94 |
| Lime | ·47 |
| Magnesia | ·39 |
| Potash | ·21 |
| Phosphoric acid | ·60 |
| | 100·07 |
| Nitrogen | ·045 |
| Available potash | ·008 |
| Available phosphoric acid | ·075 |
| Available lime | ·033 |

The analytical data support the deduction made from the appearance of this soil as to its poverty in organic matter and nitrogen. In both these constituents the percentages are considerably below those in soils of average productiveness, pointing to the desirability of organic manures for the improvement of the soil, both chemically and physically. Green manures, obtained preferably through the growth of one or other of the legumes, are advised in order to supplement the store of farmyard manure. Nitrogen for immediate crop use may be supplied by small and repeated dressings of nitrate of soda or sulphate of ammonia during the early part of the growing season.

Our results would go to show that it is very well supplied with phosphoric acid. Both the 'total' and 'available' are considerably above the average and we should not, therefore, expect a phosphatic fertilizer to be necessary.

The possibilities are strong that the soil will respond to applications of lime and potash. For this, no better fertilizer could be found than wood ashes. If such are not obtainable, potash may be used in the form of kainit or of muriate of potash, and lime—or some compound of lime—as marl or gas lime, as circumstances allow, employed.

### PEACE RIVER DISTRICT.

This soil was collected by Mr. James M. Macoun, of the Geological Survey of Canada, during his exploration in the Peace River district in 1903. The analysis was made in order to obtain chemical evidence as to the quality of the land, the results to accompany the report of Mr. Macoun on the agricultural possibilities of that district.

The samples (soil and subsoil) were taken near Saskatoon on Serviceberry lake at the west end of the Grande prairie, Lat. 55° 15′, Long. 119° 11′.

*Surface Soil.*—A heavy clay loam, but containing a small percentage of fine sand. Black or very dark brownish-black, from presence of humus (vegetable matter). As received, in the air-dried condition, it was in lumps and powder, the former, while not readily friable, could not be considered refractory. It had all the appearance of a fertile loam, and one that would prove suitable for the majority of farm crops, provided it were deep enough.*

It was found to have a very slightly acid reaction. Tested for 'alkali,' only traces of common salt were found, though careful search for injurious sodium and magnesium compounds was made. A qualitative examination for lime, showed that the soil was by no means deficient in this element. A partial analysis of the air-dried sample furnished the following data:—

| | Per cent. |
|---|---|
| Moisture | 3·44 |
| Organic and volatile matter | 11·82 |
| Nitrogen | ·471 |

We have in these results ample and emphatic evidence of the richness of this soil in humus compounds and nitrogen, equalling in these respects much of the fertile prairie soil of Manitoba and the North-west Territories. Time has not allowed any determination of the potash and phosphoric acid, but judging from past experience with soils of a similar humus and nitrogen content, this soil in all probability is well suppled wth these consttuents.

*Subsoil.*—This, as received, was in hard, exceedingly refractory lumps, of a greyish colour. Though in appearance and texture it was of an undesirable nature for mixing with the surface soil, analysis showed it to contain notable amounts of organic matter and nitrogen. The data are as follows:—

| | Per cent. |
|---|---|
| Moisture | 3·42 |
| Organic and volatile matter | 8·01 |
| Nitrogen | ·174 |

The general deductions that I am enabled to make from this preliminary examination are that the soil is by no means wanting in the elements of fertility, the chief drawback being its reported shallowness. With good drainage, careful culture—particularly avoiding all working of the soil when wet—and favourable climatic conditions, it should prove a strong, productive soil, quite capable of yielding remunerative crops.

---

* Mr. Macoun states that the surface soil is but 3 or 4 inches thick, resting without any gradual transition on the heavy plastic subsoil of clay.

ONTARIO.

*New Liskeard, Nipissing District.*—A yellowish-red, coarse-grained, sandy loam, showing a fair amount of root fibre and underlaid by clay at a depth of from 6 inches to 2 feet. This soil, our correspondent states, has never been cropped, manured or burnt over and is covered with 'spruce, cedar, red pine, and cyprus.' 'Possibly the area covered by this soil is 20 square miles.'

From an inspection of the soil one would judge it to be deficient in humus and apt, in seasons of drought, to rapidly dry out.

*Analysis of (air-dried) Soil.*

| | Per cent. |
|---|---|
| Moisture | 1·45 |
| Organic and volatile matter | 4·57 |
| Insoluble matter (sand, &c.) | 84·97 |
| Oxide of iron and alumina | 7.74 |
| Lime | ·36 |
| Magnesia | ·55 |
| Potash | ·10 |
| Phosphoric acid | ·10 |
| Undetermined | ·16 |
| | 100·00 |
| Nitrogen | ·072 |

These results indicate that in all the essential elements of plant food—nitrogen, phosphoric acid, potash and lime—this soil is considerably below the average of our productive virgin soils.

Whether it will prove profitable to work such a soil as a farm is certainly doubtful, but that can only be definitely determined by actual trial. The possibilities, however, are that it would yield a larger return in timber, if carefully husbanded and managed according to the priniciples of forestry. Such soils as the one under consideration may, of course, be improved, and made to give fairly good yields if the requisite amount of plant food be supplied. They are responsive and under favourable climatic conditions with a sufficiency of manure are to a certain degree suitable for potatoes, hay and oats, and perhaps a few other crops. But it must be remembered that soils such as the one under consideration rapidly deteriorate when worked (owing to loss of humus) unless continually replenished with organic matter from one source or another. It seems, therefore, desirable, if employed agriculturally, to use them largely for grazing or to adopt such a rotation as will every few years give the soil a crop of clover or some other legume, and thus keep up the store of humus and nitrogen.

Shallow ploughing should be adopted for a number of years, in order to make practicable the enrichment of the upper few inches of the surface soil. The drainage is possibly good, but if not, it should be made so. The turning under of clover or pease, in addition to the application of such barnyard manure as is available cannot be too strongly recommended, and wood-ashes or a mixed fertilizer containing phosphoric acid and potash, could no doubt be used to advantage to supply the necessary mineral elements.

## FERTILIZERS AND AMENDMENTS.

### WOOD ASHES FROM SAW-MILLS AT PORT MOODY, B.C.

We have in a former publication (see p. 156, Report, 1901) endeavoured to correct the impression prevalent in parts of British Columbia that there is but little fertilizing value in the ash of the soft woods—Douglas fir, cedar, &c.—grown in that province, and we have ventured the opinion from the examination of many soils, both on Vancouver Island and on the mainland, that the application of such ashes would be found to give a good return, more particularly on the sandy and peaty loams. It is of interest, therefore, to insert the following analysis of a sample of such ashes recently made in the Farm laboratory.

The correspondent forwarding the ashes says: 'The sample of ash is from the sawmill at Port Moody. There are many tons lying out in the yard and thought to be useless. We in this vicinity, as fruit-growers and gardeners, wish to know what fertilizing value it may have. It is principally the ash from slabs of fir, with some cedar taken from booms out of the salt water. You will confer a great favour on us here by your earliest reply.'

*Analysis of Ashes.*

| | |
|---|---|
| Moisture | ·82 |
| Potash | 1·91 |
| Phosphoric acid | 1·76 |
| Carbonate of lime | 36·55 |

Though not equal, as regards potash, to hard wood ashes, I should certainly consider these ashes as a valuable fertilizer, especially in conjunction with farm manures or clover turned under. In addition to the potash and phosphoric acid they contain, there is a notable amount of carbonate of lime present—and this fact alone would make the ashes valuable for the soils already referred to. The probability is, from what our correspondent says regarding the storage of these ashes, that they are partially leached and have thus lost a considerable proportion of their most important element—potash. We are inclined to think that with a little care and protection, such ashes should contain at least between 3 per cent and 4 per cent of potash. The use of wood ashes may be specially recommended for all classes of fruits, for vegetables and other leafy crops, and for the encouragement of vigorous growth in clover.

## LEACHED WOOD ASHES.

Occasionally we are in receipt of inquiries regarding the value of leached wood ashes. This value, we have pointed out, will be dependant upon the extent to which leaching has occurred. In the following data we present the results obtained from a sample of such ashes, and they go to show the disastrous effect of exposure as regards the potash content.

*Analysis.*

| | |
|---|---|
| Moisture | 2·18 |
| Charcoal (loss on ignition) | 26·59 |
| Mineral matter (soluble in acid) | 54·92 |
| " " (insoluble in acid) | 16·31 |
| | 100·00 |
| Potash, soluble in water | ·24 |

It is evident that these ashes have been very thoroughly leached, and are of very little value as far as potash is concerned. There will, of course, be a certain amount of phosphoric acid present, probably between 1 per cent and 2 per cent. The greater part of the mineral matter 'soluble in acid' is lime, or, rather, carbonate of lime. For land needing lime, such ashes would be useful, and the price that the farmer or fruit grower should give for them should be estimated entirely from that point of view.

This sample was forwarded from 'an old ashery near St. Catharines, Ont., that has not been disturbed for many years.' We think this is an extreme case of leaching, but it certainly furnishes a marked illustration of the loss that ashes may suffer through want of proper protection from rain. In former samples of leached ashes examined in the Farm laboratory, we have usually found between 2 per cent and 4 per cent potash.

### ASH OF ROCK MAPLE.

A sample of ash from rock maple, forwarded by Mr. James L. Matheson, Dundas, P.E.I., furnished the following data:—

*Analysis.*

| | Per cent. |
|---|---|
| Moisture | ·24 |
| Organic and volatile matter (chiefly charcoal) | 12·68 |
| Insoluble residue (clay and sand) | 1·32 |
| Potash | 12·46 |
| Lime | 42·46 |
| Phosphoric acid | 2·95 |

Our correspondent, in forwarding these ashes, says:—'These were obtained from the Rock maple and are much lighter in colour than those usually seen here. We are interested to know how they compare in fertilizing value with ordinary hardwood ashes.'

Good samples of commercial wood ashes will contain, as a rule, from 5 per cent to 6 per cent potash, and from 1·5 per cent to 2 per cent phosphoric acid. It is thus seen that the sample under consideration is much superior, as regards its most valuable element, potash.

We have frequently in our publications called attention to the fertilizing value of wood ashes, especially as a source of potash. Without unnecessarily repeating what has been said as to the composition of ashes and the crops for which they are best suited, it may be advantageous to point out that while the commercial value of ashes will depend upon the potash and phosphoric acid content, the manurial value will be considerably higher. The presence of a large amount of lime, the mild alkalinity of the ash, the particular combinations in which two elements of plant food are held, are all, undoubtedly, factors that enhance the value of wood ashes as a fertilizer. In other words, the benefits derived from their use include, in addition to the supplying of mineral plant food, the correction of sourness, the conversion of injurious iron compounds into harmless forms, the encouragement of nitrification, and the general improvement of the tilth of the soil. It has frequently been noticed that soil to which ashes have been applied is much better able to resist the injurious effect of a protracted drought than adjoining land which has not been so treated.

### ASHES FROM MUCK.

Two samples of ashes obtained by the burning of muck in heaps, were forwarded by Mr. James Hopgood, West Cape, P.E.I., who writes: 'These ashes were made by piling soft wood stumps and covering over with partially dried-out muck. The bulk of the ashes is like No. 1, dark-grey and heavy. There is, however, a fair proportion of No. 2, which is light in character and almost white. Do you think it is worth while to go to any expense in making these ashes?'

*Analysis.*

| | No. 1. | No. 2. |
|---|---|---|
| Moisture | ·77 | 3·02 |
| Insoluble matter (clay, sand, &c.) | 77·83 | 73·55 |
| Oxide of iron and alumina | 7·46 | 3·89 |
| Lime | 6·40 | 7·00 |
| Potash | ·30 | ·51 |
| Phosphoric acid | ·39 | ·57 |

In No. 1, there is a very large proportion of sand; in No. 2, the chief constituent is silica—also valueless as plant food.

Though undoubtedly possessing a certain fertilizing value, both these ashes are decidedly inferior to wood ashes. The potash and phosphoric acid are not present in amounts larger than those found in most fertile soils, but they are possibly in a more available condition. The lime would prove beneficial for certain soils, but we do not think the data warrant any great expense in obtaining the ashes. No. 2, is the much more valuable ash, as will be evident from the larger percentages of potash and phosphoric acid.

The most valuable fertilizing constituent of muck is nitrogen, and the next in importance is the organic matter. Both of these are lost in burning the muck, and for this reason we counsel composting by one or other of the methods outlined in our report for 1903.

### ASHES FROM CARBIDE WORKS.

These so-called 'ashes' are described as 'the residue from the manufacture of the carbide' and were forwarded from the carbide factory at St. Catharines, Ont. They are not to be confused with the residue from the acetylene gas machine, (resulting from the action of water on carbide), which as we have repeatedly stated, is practically slacked lime. In the formation of carbide in the electrical furnace, the outside portion of the mixture is but imperfectly acted upon and it is this, we conclude, separated from the carbide, that constitutes these 'ashes.'

| *Analysis.* | Per cent. |
|---|---|
| Moisture | 11·51 |
| Loss on ignition (carbon and coke) | 13·88 |
| Residue, insoluble in acid | 5·86 |
| Oxide of iron and alumina | 3·50 |
| Lime (present partly as carbonate) | 46·53 |
| Potash | ·12 |
| Phosphoric acid | slight traces. |
| Nitrogen | 1·02 |

As regards the mineral constituents of plant food, it is evident that this material can have no agricultural value, save for the lime it possesses. Phosphoric acid is absent, or practically so, and the potash is present in an amount less than that found in most fertile soils. Such ashes, however, are undoubtedly of value as an amendment for soils deficient in lime or requiring lime to correct sourness or improve their tilth.

The nitrogen is 1 per cent., or 20 lbs. per ton, and the question naturally presents itself as to its availability for plant use. To obtain information regarding this matter certain experiments were made, with the following results:—

1. Ten (10) grams of ashes, to which were added 500 cc. of water, were distilled with magnesia. This resulted in obtaining ·11 per cent nitrogen. This shows that practically 10 per cent of the total nitrogen present exists in the form of ammonia salts, or in such a combination that under the conditions of the experiment ammonium compounds are formed. Distillation with water only gave ·075 per cent nitrogen.

2. Ten (10) grams of the material were digested in the cold with 200 cc. water for two hours and filtered. 100 cc. of the filtrate were distilled after being made strongly alkaline with magnesia, but no ammonia was obtained. This proves that no part of the nitrogen exists either as free ammonia or as ammonium salts.

3. Two (2) grams were extracted in the cold with dilute sulphuric acid, filtered and filtrate made alkaline and distilled. Nitrogen amounting to 0·94 per cent was obtained.

4. Hydrogen was passed over the ashes (5 grams) in a red-hot tube. The gas was conducted into diulte sulphuric acid, which was subsequently made alkaline and distilled. Nitrogen amounting to 0·72 per cent was obtained. Unfortunately the furnace at our disposal for this class of work is not very satisfactory as regards obtaining high temperatures, and it is probably owing to this fact that this experiment did not result in a larger percentage of nitrogen.

However, there seems to be no doubt that the nitrogen of the fresh material exists very largely, if not entirely, as calcium nitride. By paragraph 2, it will be seen that the absence of ammonium salts was proven.

On keeping the ashes, as in a bottle, it was found that a considerable amount of ammonia developed.

As to how soon such nitrogen might become available to plants we cannot at present say, but from the fact that ammonia is so readily formed in the presence of moisture, there seems a strong probability that this material may be found of some value as a nitrogenous fertilizer.

## ASHES FROM INCINERATOR.

These are the product of the crematory or incinerator at Montreal. In forwarding them for analysis, the Hon. J. A. Ouimet writes : 'These ashes are from burnt garbage, &c. It is a matter of some importance for farmers and others in the neighbourhood to know what fertilizing value they may possess.'

As received, this sample consisted of fine ash mixed with a large proportion of cinders and clinkers, among which were observed many pieces of glass, crockery and unburnt coal. A few fragments of burnt bone were also noticed.

| *Analysis.* | Per cent. |
|---|---|
| Moisture | ·45 |
| Insoluble mineral matter | 75·83 |
| Lime | 3·80 |
| Phosphoric acid | 1·08 |
| Potash | ·44 |

A mechanical separation gave 66 per cent cinders, &c., and 34 per cent fine ash.

The fertilizing value of these ashes, it will be seen, is extremely small, being represented practically by the phosphoric acid, which the analysis shows to be in the neighbourhood of 1 per cent. We cannot, therefore, regard this waste product as of any importance from the manurial standpoint. It might, however, be used to advantage on heavy, plastic clays. Upon such, ashes of this character have an ameliorating effect by lightening and mellowing and otherwise beneficially affecting the mechanical condition of the soil.

## CALCAREOUS DEPOSITS FROM BRITISH COLUMBIA.

Deposits of tufa-like appearance, with a semi-crystalline, more or less honey-comb structure, occur not infrequently in various parts of the country in or adjacent to the so-called dry belt of British Columbia. As a rule this material is reported as found in the valleys or canyons, apparently issuing from the hillside as a plastic mass, covering possibly a considerable area, and subsequently hardening by simple exposure. From an examination of one of the deposits made by the writer in the Nicola valley last summer, it is evidently formed by the evaporation of waters or springs highly charged with carbonate of lime, held in solution by carbonic acid. One correspondent writing respecting this deposit, says: 'As the growth of the vegetation in the immediate vicinity of the deposit is very vigorous, the material must be of some importance as a fertilizer.'

At the request of Mr. J. R. Anderson, Deputy Minister of Agriculture, Victoria, B.C., we have analysed specimens collected at Enderby, Okanagan Mission, Nicola Lake and East Kootenay. There was a strong similarity between these samples; with the exception of the one from Okanagan, it would have been difficult to distinguish them the one from the other.

ANALYSIS of Calcareous Deposits.

| Locality. | Carbonate of Lime. | Insoluble Matter (Clay). | Oxide of Iron and Alumina. | Organic Matter, Magnesia, &c. |
|---|---|---|---|---|
| | p. c. | p. c. | p. c. | p. c. |
| Enderby | 94·14 | ·61 | ·60 | 4·65 |
| Nicola Lake | 95·71 | ·63 | ·86 | 3·00 |
| East Kootenay | 95·33 | ·35 | ·65 | 3·67 |
| Okanagan Mission | 70·75 | 3·40 | 18·93 | 6·92 |

They are all essentially carbonate of lime, the first three mentioned in the table being very similar in composition, and of excellent quality.

As this material is usually extremely hard, it would seem that in order to make it effective agriculturally, it would be necessary to crush or grind it to a powder. But most probably the best plan would be to burn it. The resulting lime would, I think, be found very serviceable, especially on the strong clay soils, as about Enderby and Armstrong. It would be valuable to low-lying and mucky soils, which as a rule are excessively rich in organic matter and nitrogen, but deficient in mineral matter constituents.

It is of interest to note that the analysis of a second sample of the Enderby deposit, forwarded after being burnt and allowed to air-slake, gave 90·23 per cent slaked lime and 1·33 per cent oxide of iron and alumina. Its quality was such that it could be well used for making concrete, and for other building purposes.

BONE FROM WHALE.

This sample consisted of two pieces of rib bone, dry and bleached by exposure. It was forwarded from East Leicester, N.S., and accompanied by the information that there were about 20 tons of the bones procurable in the locality at a cost of $10 per ton. Our correspondent, with others, was anxious to learn how they compared with the ordinary bone meal on the market.

*Analysis.*

| | |
|---|---|
| Moisture | 7·41 |
| Organic and volatile matter* (gelatine, fat, &c.) | 35·95 |
| Mineral matter (phosphate of lime, &c.) | 56·64 |
| | 100·00 |
| Phosphoric acid (equivalent to 47·33 per cent phosphate of lime) | 21·68 |
| Nitrogen | 2·98 |

Reference to the last issue of the bulletin on Commercial Fertilizers (Inland Revenue Department) shows that the bone meals upon the Canadian market contain between 2·7 per cent and 4·7 per cent nitrogen, and from 19·0 per cent to 26·0 per cent

* Containing 14·35 per cent fat.

phosphoric acid. We may safely conclude, therefore, that as regards these essential elements, this bone does not differ in any marked degree from the bone meal generally sold, the price of which is in the neighbourhood of $25 per ton.

It has not, however, the same agricultural value of bone meal, for two reasons: its unground condition and the presence of a considerable quantity of fat. The degree of fineness and the proportion of fat in a very large measure control the rapidity with which the bone is decomposed in the soil and its plant food liberated in available form; the finer the bone and the freer from fat, the more valuable it is from the standpoint of a fertilizer.

In the event of its being impracticable to have the bones ground or treated for conversion into superphosphate, it is suggested that the bones be broken and crushed, composted with barnyard manure, wood ashes or with alkali, according to one or other of the methods outlined for the reduction of bones on the farm and described in our report for 1895. Unbroken and untreated, the bones would be of very little immediate value as a fertilizer—they would probably remain for years in the soil with but little decomposition.

## THE CONTROL OF SOIL MOISTURE.

Among the several factors that go towards successful orcharding three may be mentioned which are intimately connected: (1) the control of the soil's moisture at different seasons of the year, (2) the maintenance or increase of the fertility of the soil and its mechanical improvement, and, (3) the furnishing of 'cover' to protect the roots of the trees during the winter. By cultivation, followed by the growth of a cover crop, all these objects may be attained, but as soils and climatic conditions throughout the country are not the same, it will be evident that the plan—as regards periods to be under cultivation and under crop—best adapted to one locality may require modification before giving equally good results in another.

In order to test various modifications of this system as regards soil treatment, and to obtain information as to the fertilizing value of certain new crops or new combination of crops, experiments were begun a number of years ago on the Experimental Farm, Ottawa. The results of these investigations have appeared in the annual reports of the farms. In continuing this work during the past season, we have carried on experiments at Ottawa and at Nappan, N.S., the information sought being solely with regard to the control of the soil's moisture.

### *Experiments at the Experimental Farm, Ottawa, Ont.*

Two series of experiments were instituted; the first, to ascertain the comparative effect of cultivation and mulching on the soil's moisture; the second, to learn the relative amounts of water withdrawn by certain crops sown broadcast and in drills, respectively—in the case of the drill-sown crop the cultivation was carried on between the rows as long as practicable.

*Series I.*—Consisted of 5 plots, A, B and C, adjoining one another; D and E also adjoining one another, but in a different part of the orchard from the first three named. The soil of one plot (A) was to be kept in 'clean culture' throughout the season and its moisture content, compared with that of a soil carrying a growing crop of Hairy Vetch, uncut (plot B), of a soil with Hairy Vetch cut and mulched (plots C and D), and of a soil with a crop of mixed clover and Timothy (E) cut and used as mulch.

Plot A was ploughed May 6, cultivated June 10, 25, July 25.

Plot B had been sown in 1903, with Hairy Vetch, which before the close of the season had practically covered the ground. The vetch survived the winter well and during the early part of the present (1904) season produced an excellent, though somewhat patchy, growth. Towards the end of July the crop began to die and it was cut August 5, to be saved for seed.

Plots C and D differed from B only in the cutting and mulching of the Hairy Vetch. The crop was cut June 2 and left on the ground. From an observation made shortly after the cutting, it was thought that the vetch would not produce any aftermath, and that it would not long survive the cutting. This proved to be the case. The vetch rapidly died and its place was taken by a growth of Foxtail, &c. These facts are indicative of the unsuitability of Hairy Vetch if it is desired to mulch. Further, the data of these two plots as regards the effect of mulching on the moisture content must not in any sense be considered conclusive.

Plot E was in clover and Timothy, sown 1903. Throughout the season it gave but a 'thin stand,' the clover gradually disappearing. The dates of cutting are May 28, June 29, July 21, and August 17. The cut herbage was all allowed to remain as a mulch, but being very light acted poorly in that capacity.

The samples were collected every two weeks from May 9 to August 28, and were taken to a depth of 14 inches.

It will be noticed that at the outset the percentage of moisture in Plot A is considerably lower than that of the other plots of the series. Four days previous to the collection of the sample this plot had been ploughed but not disked or harrowed. This neglect resulted in a most serious drying out of the soil. When soil, and especially that which has been in sod, is left in ridges, the air freely circulates about and through it, with the effect just noted. If moisture is to be conserved it is essential that the ploughing be followed immediately by the disc and smoothing harrows. It is only thus that a fine earth mulch will be formed and evaporation checked. Although there was a very fair rainfall—one above the average, indeed—for May, this plot did not equal the others by several percentages until June 6, so seriously had its soil been dried out. There is in the results of this plot during May an important lesson alike for the farmer and the orchardist.

From the fact already referred to, that the growth of Plot B was not as uniform as could be wished, it may not be wise to discuss the details too closely. We had hoped inferences might be drawn from its data as to the relative amount of moisture withdrawn from the soil by Hairy Vetch or conserved by the shade of its foliage. As the summer may be described as both cool and wet, and as the soil was in places not entirely covered with foliage, we only feel justified in saying that the data do not indicate any great exhaustion by the Hairy Vetch of the soil moisture. Probably the loss which would otherwise ensue from the setting up of capillarity is prevented by the shade furnished by the crop, the heavy foliage, undoubtedly, would act beneficially and effectively as a mulch.

On Plot C, the crop (Hairy Vetch) was cut on June 2, and the crop left on the ground. There was not, however, a sufficiency to cover the plot and we find that as the summer advanced, moisture to some extent was lost through capillarity being established. Consequently, in July the soil of this plot was drier than that of either A or B.

The growth on Plot D was very scanty, resulting in an exceedingly thin mulch when cut, and we have, therefore, in the data, evidence of the drying out through capillarity and evaporation, especially in the latter part of June and during July.

The results of Plot E are similar in trend to those just considered, though showing a still further exhaustion of soil moisture. This was undoubtedly due to the stronger growth on Plot E, which of course, means more soil moisture lost through transpiration. Our results in 1902 and 1903 showed most emphatically the great draft made by a sod on the soil's moisture and the reduction to 4·7 per cent (July 18) was most assuredly chiefly due to the same cause, the large amount of transpiring surface.

SERIES I.—CONSERVATION of Soil Moisture—C. E. F., Ottawa, Ont., 1904

| Date of Collection. | Rainfall. | Plot A. — (Cultivated.) | | | Plot B. — (Hairy Vetch—Uncut.) | | | Plot C. — (Hairy Vetch—Mulched.) | | | Plot D. — (Hairy Vetch—Mulched.) | | | Plot E. — (Clover and Timothy Mixture—Mulched.) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Water. | | | Water. | | | Water. | | | Water. | | | Water. | | |
| | | Per cent. | Per acre. | | Per cent. | Per acre. | | Per cent. | Per acre. | | Per cent. | Per acre. | | Per cent. | Per acre. | |
| | | | Tons. | Lbs. | | Tons. | Lbs. | | Tons. | Lbs. | | Tons. | Lbs. | | Tons. | Lbs. |
| May 9 | *3·97 | 8·56 | 189 | 1,002 | 12·45 | 310 | 1,973 | 10·74 | 243 | 1,139 | 12·81 | 297 | 823 | 11·51 | 263 | 608 |
| " 23 | 1·97 | 11·98 | 275 | 1,037 | 12·37 | 285 | 1,508 | 14·55 | 344 | 1,494 | 13·02 | 303 | 34 | 13·92 | 327 | 700 |
| June 6 | 2·95 | 13·58 | 318 | 196 | 13·23 | 308 | 1,299 | 13·78 | 323 | 1,063 | 12·24 | 282 | 550 | 13·71 | 321 | 1,253 |
| " 20 | ·59 | 10·83 | 245 | 1,717 | 10·24 | 230 | 1,873 | 12·48 | 288 | 1,315 | 8·88 | 197 | 553 | 6·60 | 143 | 90 |
| July 4 | 1·41 | 14·18 | 334 | 946 | 16·07 | 387 | 1.183 | 12·80 | 296 | 1,144 | 7·06 | 153 | 1,544 | 7·44 | 162 | 1,428 |
| " 18 | ·86 | 15·29 | 364 | 1,586 | 14·17 | 334 | 400 | 11·36 | 259 | 876 | 8·94 | 198 | 1,480 | 4·70 | 99 | 1,669 |
| Aug. 1 | 1·81 | 17·18 | 419 | 1,846 | 14·88 | 353 | 1,745 | 13·54 | 317 | 29 | 12·38 | 286 | 34 | 11·08 | 252 | 482 |
| " 15 | ·40 | 13·53 | 316 | 1,487 | 10·52 | 237 | 1,987 | 8·49 | 187 | 1,616 | 6·26 | 135 | 474 | 7·90 | 173 | 1,274 |
| " 29 | 2·40 | 14·39 | 340 | 522 | 12·53 | 289 | 1,959 | 12·72 | 295 | 567 | 10·35 | 233 | 1,407 | 10·59 | 239 | 1,530 |

* From April 1 to May 9.

SERIES II.—CONSERVATION of Soil Moisture—C. E. F., Ottawa, Ont., 1904.

| Date of Collection. | Rainfall. | PLOT M. (Buckwheat, broadcast.) | | | PLOT N. (Peas, in Drills.) | | | PLOT O. (Hairy Vetch, broadcast.) | | | PLOT P. (Hairy Vetch, in Drills.) | | | PLOT Q. (Soja Beans, in Drills.) | | | PLOT R. (Horse Beans, in Drills.) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Water. | | | Water. | | | Water. | | | Water. | | | Water. | | | Water. | | |
| | | Per cent | Per acre. | | Per cent | Per acre. | | Per cent | Per acre. | | Per cent | Per acre. | | Per cent | Per acre. | | Per cent | Per acre. | |
| | | | Tons. | Lbs. | | Tons. | Lbs. | | Tons. | Lbs. | | Tons. | Lbs. | | Tons. | Lbs. | | Tons. | Lbs. |
| July 4 | *1·41 | 11·20 | 258 | 1,630 | 8·86 | 199 | 969 | 8·42 | 188 | 1,334 | 11·77 | 273 | 1,488 | 11·91 | 277 | 881 | 11·45 | 265 | 678 |
| " 18 | ·86 | 10·75 | 247 | 331 | 8·30 | 135 | 1,469 | 7·78 | 173 | 243 | 11·24 | 259 | 1,645 | 11·11 | 256 | 951 | 11·14 | 257 | 504 |
| Aug. 1 | 1·81 | 10·81 | 248 | 1,421 | 10·45 | 239 | 922 | 10·19 | 232 | 1,654 | 13·31 | 315 | 2 | 13·51 | 320 | 1,068 | 12·77 | 300 | 813 |
| " 15 | ·40 | 4·31 | 92 | 852 | 5·08 | 109 | 1,644 | 4·95 | 106 | 1,731 | 9·48 | 214 | 1,812 | 11·56 | 268 | 443 | 8·70 | 190 | 124 |
| " 29 | 2·40 | 11·60 | 269 | 543 | 8·90 | 200 | 948 | 7·58 | 168 | 601 | 12·80 | 301 | 443 | 10·20 | 233 | 163 | 10·06 | 230 | 988 |
| Sept. 12 | 1·40 | 11·80 | 274 | 1,070 | 9·42 | 213 | 808 | 9·02 | 203 | 888 | 13·82 | 329 | 137 | 12·12 | 283 | 14 | 10·43 | 238 | 1,899 |
| " 26 | 2·71 | 12·97 | 305 | 1,625 | 12·30 | 287 | 1,599 | 12·08 | 281 | 1,889 | 14·29 | 342 | 251 | 14·66 | 358 | 729 | 15·31 | 365 | 113 |
| Oct. 10 | 3·00 | 11·37 | 263 | 495 | 10·39 | 237 | 1,854 | 10·38 | 237 | 1,365 | 13·51 | 320 | 1,068 | 14·11 | 337 | 216 | 11·92 | 277 | 1,410 |

*From June 20 to July 4.

*Series II.*—The purpose in establishing this series of plots (M, N, O, P, Q, R,) was to ascertain the relative degree to which certain crops reduced the soil's moisture by their growth and, further, to gain information regarding the soil's moisture content when the same crop is sown broadcast and in drills. With respect to this latter feature it may be pointed out that the broadcasted crop may be supposed to conserve moisture by shading the soil; while with the crops growing in drills, cultivation may be practiced with the same object. We wished to learn which of these was the most effective.

The investigation was carried on between July 4 and October 10, the collection of samples being made fortnightly to a depth of 14 inches.

The crops (see table) were sown on June 27, and the cultivations of those sown in drills were made on July 16 and 27, and August 12.

Unfortunately, owing to the initial moisture contents of Plots N and O being considerably less than that of the others, we are unable to compare the percentages throughout the series. By comparing the losses or gains of one plot with those of another, however, some idea may be gained as to the relative effect on the soil's moisture by the different methods under trial, and it is this plan we shall follow in considering the data of this series.

Reference has already been made to the nature of the season. It will be noticed from the tabulated data that with the exception of the fortnight ending August 15, no period (of two weeks) passed without an ample precipitation. This fact renders the results, from the standpoint we are considering them, of much less value than if the summer had been dry and warm. The results of this heavy rainfall, for instance, increased the moisture of all the plots between July 18 and August 1, though at that time they were carrying vigorously growing crops.

Between August 1 and 15, slightly less than half an inch of rain fell, and it might, therefore, prove instructive to make a comparison of the plots on that date. The losses between July 4 and August 15 were as follows:—

Plot M.—With a good crop of buckwheat the loss was 6·89 per cent, or 166 tons per acre.

Plot N.—This was in pease, but the growth was not very good, much of the land being occupied by weeds. The loss was 3·78 per cent, or 90 tons per acre.

Plot O.—Hairy Vetch, broadcast, good growth. The loss was 3·47 per cent., or 82 tons per acre.

Plot P.—Hairy Vetch, in drills, and cultivated between rows. The loss was 2·29 per cent, or 59 tons per acre.

Plot Q.—Soja Beans, in drills, and cultivated, not a heavy growth. The loss was only 0·39 per cent, or 9 tons per acre.

Plot R.—Horse Beans, in drills, and cultivated. The loss was 2·75 per cent, or 75 tons per acre.

Without reading too much into these results we may safely conclude that the buckwheat extracted the most moisture, and this conclusion, as regards the effect of a grain crop in drying out the soil, received confirmation by the data obtained from the growth of a crop of oats as instanced in the Nappan experiments, hereafter to be discussed.

Comparing the effect of Hairy Vetch broadcast and in drills, there is a notable difference in favour of the latter method when it is desired to minimize the loss of moisture.

With Soja Beans, in drills, the loss had been insignificant, though during the succeeding fortnight, August 15-29, the moisture fell off a little, probably owing to increase in foliage. On this plot, however, the moisture content was remarkably constant throughout the whole period of the experiment.

With the exception of the remarkable and unaccountable loss of moisture in the plot with Horse Beans, the results of August 15 clearly indicate that much moisture may be saved by sowing the crops in drills and cultivating between the rows from time to time throughout the summer months.

CONSERVATION of Soil Moisture, Nappan, N. S., 1904.

| Date of Collection. | Rainfall. | Plot 1. Water. Per cent. | Plot 1. Water. Per acre. | | Plot 2. Water. Per cent. | Plot 2. Water. Per acre. | | Plot 3. Water. Per cent. | Plot 3. Water. Per acre. | | Plot 4. Water. Per cent. | Plot 4. Water. Per acre. | | Plot 5. Water. Per cent. | Plot 5. Water. Per acre. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Inches. | | Tons. | Lbs. | | Tons. | Lbs. | | Tons. | Lbs. | | Tons. | Lbs. | | Tons. | Lbs. |
| May 12 | *3·09 | 18·41 | 406 | 1,417 | 20·00 | 450 | 1,231 | 18·09 | 398 | 155 | 20·83 | 475 | 1,350 | 18·93 | 420 | 1,757 |
| " 26 | 1·50 | 17·21 | 374 | 1,375 | 18·02 | 396 | 398 | 18·43 | 407 | 500 | 21·21 | 484 | 1,165 | 18·97 | 421 | 1,952 |
| June 9 | ·97 | 12·52 | 257 | 1,931 | 17·84 | 391 | 642 | 19·24 | 429 | 826 | 20·31 | 459 | 1,904 | 14·04 | 294 | 799 |
| " 23 | 1·60 | 10·46 | 210 | 1,125 | 17·40 | 379 | 1,391 | 17·71 | 387 | 1,832 | 20·46 | 463 | 1,292 | 11·65 | 237 | 1,352 |
| July 7 | ·03 | 9·06 | 179 | 1,144 | 16·70 | 361 | 715 | 17·46 | 381 | 563 | 19·14 | 426 | 1.304 | 11 22 | 227 | 1,590 |
| " 21 | ·46 | 7·46 | 145 | 606 | 13·43 | 279 | 1,247 | 16·35 | 352 | 609 | 20·54 | 465 | 1,855 | 12·06 | 247 | 376 |
| Aug. 4 | 1·05 | 8·23 | 161 | 1,292 | 9·49 | 188 | 1,977 | 15·10 | 320 | 1,159 | 18·11 | 398 | 1,230 | 10·36 | 208 | 633 |
| " 18 | 1·15 | 9·80 | 195 | 1,666 | 10·30 | 212 | 1,091 | 15·71 | 335 | 1,887 | 20·26 | 457 | 1,924 | 13·66 | 285 | 341 |
| Sept. 6 | 3·55 | 17·79 | 390 | 95 | 16·99 | 368 | 1,835 | 20·13 | 454 | 566 | 24·04 | 570 | 895 | 20·22 | 456 | 1,657 |
| " 20 | 1·26 | 14·91 | 315 | 1,677 | 16·31 | 351 | 549 | 17·99 | 395 | 789 | 18·09 | 398 | 155 | 19·87 | 446 | 1,921 |
| Oct. 31 | 6·94 | 21·33 | 488 | 1,413 | 19 77 | 444 | 313 | 21·42 | 491 | 662 | 26·02 | 633 | 1,913 | 19·71 | 442 | 669 |

* Total amount of rainfall from April 9 to May 12.

*Experiments at Experimental Farm, Nappan, N.S.*

As already stated, the treatment of an orchard soil, with respect to the control of its moisture-content, will naturally be largely regulated by the climatic conditions likely to prevail in the district. Thus, we find that the practice in the Niagara district and west, in regard to the time of ploughing under the cover crop, &c., differs, and rightly so, from that in vogue in eastern Ontario and Quebec. Recognizing this, the value of data from experiments similar to those carried on in the orchards at Ottawa for some years past, but obtained in the various fruit-growing areas of the Dominion, will be obvious. With this in mind, a series of experiments was conducted during the past season on the Experimental Farm, Nappan, N.S. The work in connection therewith at Nappan was conducted by Mr. W. S. Blair, the Horticulturist, who in his report is giving full details regarding the plots, their treatment and the results obtained; the moisture determinations were made in the farm laboratory, Ottawa. These latter are given in the subjoined table, being expressed as percentages and as tons per acre to a depth of 14 inches of soil. We purpose merely to utilize these data here in so far as they may furnish information relating to the effect of crops in general and clean cultivation on the soil's moisture-content.

Plots adjoining one another on soil of uniform character, clay on clay subsoil.

Plot 1.—Seeded to Winter Rye and Clover in autumn of 1903. Rye harvested August 3, 1904, crop standing 55 inches. Clover made but poor growth and was not entirely covering the ground when the season closed.

Plot 2.—Seeded to Crimson Clover in 1903, which was winter killed. Ploughed May 26, 1904, worked and seeded with oats June 20.

Plot 3.—Seeded to Crimson Clover, 1903, which was winter killed. Ploughed May 13, worked and cultivated May 29, June 20 and 29. Seeded to Alfalfa July 7, which made a strong growth, 12 inches high, before the close of the season.

Plot 4.—Seeded to Crimson Clover in 1903, which was winter killed. Ploughed May 13, 1904, disked and harrowed May 29, June 20 and 29, July 7, 13, 25. Crimson Clover sown July 25. This made excellent growth.

Plot 5.—Seeded to Oats, Mammoth Red and Alsike Clovers and Timothy, in spring of 1903. It made excellent growth and was cut for green feed. In 1904 the growth of clover was good; it was cut and fed June 23. A matt of growth 5 to 8 inches remained at the close of the season.

## THE EFFECT OF GROWING RYE ON THE MOISTURE-CONTENT OF THE SOIL

The most striking results are those from plot 1, which, as we have seen, carried a crop of rye until August 3. At the outset (May 12) the moisture-content of this soil did not differ widely from that of the others of the series. Very shortly after this date, however, this soil (No. 1) began to lose moisture, so that by June 9, in spite of the fact that 2½ inches of rain had fallen during the first month of the experiment the water-content was reduced 5·89 per cent (from 18·41 to 12·52 per cent)—equivalent to a loss of, practically, 150 tons from the first fourteen inches of soil per acre. This was, of course, due chiefly to the large amount of water used by the growing rye on this plot, but a part of this water was no doubt lost through capillarity being established (the soil not being stirred) and subsequent evaporation.

On June 23 the percentage of moisture in this soil was further reduced to 10·46, while the soils of plots 2, 3 and 4 (at this time in clean cultivation) practically maintained their initial percentages. By July 9, though an inch of rain had fallen during the preceding fortnight, the soil of this plot (No. 1) had lost another 1·5 per cent of water. The moisture-content on July 21 showed a still further reduction; it was now but 7·46 per cent, practically one-half of that in soils of plots 2 and 3, and but one-third of that of plot 4. The comparison between the moisture-content of soils in crop and under cultivation during this season of the year (May 12 to July 21), *i.e.* between the results from plots 1 and 2, makes it evident that there was lost from the soil bearing the crop, practically 90 tons per acre *more* water (equivalent to 9 inches of rain) than from the soil under cultivation. It is during this period that the fruit tree makes its growth. For this, as well as for the development of its fruit, it is essential that there should be a sufficiency of soil moisture at this time in the orchard soil, and our present results indicate most clearly how the trees may be robbed of this moisture by a growing crop of grain. The condemnation of this practice of taking a grain crop from the orchard is most certainly emphasized by the results of this investigation.

### THE EFFECT ON THE MOISTURE-CONTENT BY VARYING PERIODS OF CULTIVATION.

By reference to the brief description of the plots 2, 3 and 4, it will be observed that their respective treatment differs in the length of time during which cultivation was continued. With plot No. 2 this period was from May 26 to June 20; with No. 3, from May 13 to July 7, and with No. 4, from May 13 to July 25.

During the month of June, as might be expected, the moisture-content of all three plots is fairly constant; the cultivation evidently was effective in preventing the drying out of the soil, which we have seen was so marked at this period in plot No. 1.

After June 20 cultivation ceased, however, on plot 2, and immediately the soil began to lose moisture. This loss became greater and greater as the season advanced, owing to the increased demands of the crop (sown June 20). On August 18 this soil showed 5 per cent less moisture than plot 3 and 10 per cent less than plot 4. Towards the end of August heavy rains set in which served to equalize the moisture-content of all the plots.

From the fact that plot No. 3 was cultivated till July 7, we find the percentage of moisture in this soil fell but little to that date, the decline from the beginning of the experiment being from merely 18·09 per cent to 17·45 per cent. As the Alfalfa on this plot (sown July 7) grew, soil moisture was utilized and the percentage correspondingly reduced.

The results of plot No. 4 are in accord with those of Nos. 2 and 3: that is, they furnish additional evidence regarding the effect of cultivation in conserving moisture. The water present in this soil, cultivated to July 25, was practically unchanged till the first week of August, when it fell about 2 per cent.

We may safely conclude from a consideration of these three plots (2, 3 and 4), that the later the cultivation is continued the less falling off in soil moisture will there be as the season advances. These results may also serve to remind us that cultivation should not be continued into the autumn, or late growth will be stimulated and the due ripening of the wood prevented before winter sets in.

In plot No. 5, we have an example of a soil bearing a crop (principally clover) throughout the season. The reduction in moisture-content during the month of June was almost equal to that of plot 1, carrying a crop of Winter rye. The cutting of this plot (No. 5) on June 23, undoubtedly checked this loss of moisture, but it did not altogether prevent it, as evident by the data of August 4, which showed that the moisture at that date had been reduced to 10·36 per cent—practically 8 per cent less than that of plot 4.

## INOCULATION FOR THE GROWTH OF LEGUMES.

We have received during the past two months numerous inquiries from all parts of Canada on this subject. This re-awakened interest in the matter of inoculation is undoubtedly due to the wide publicity given to the new cultures now being prepared and distributed by the Bureau of Plant Industry, Washington, D.C., U.S. A beautifully illustrated article in *Scribners* monthly for October, setting forth in popular language the claims made for these cultures and the results that have been obtained, is particularly answerable for the present demand for inoculating material. It has become necessary, therefore, to make a brief statement as to what has been done in this important research by the Experimental Farms and our present position as regards the necessity or desirability of generally distributing the cultures.

1. For many years we carried on experiments, both in pots and in the field, with cultures of nitrogen-assimilating bacteria, prepared in Germany, publishing the results in the Experimental Farms reports (1897-8-9). In certain instances it was found that the cultures favoured the growth of legumes, clover, beans, &c., but there was not sufficient evidence to justify us in recommending them for general use. The cultures were found particularly susceptible to light and heat, and under the best conditions of preservation their vitality could only be guaranteed for six weeks from the date of their preparation. It was felt that the matter was still in the experimental stage, and for the reasons just stated it was not desirable to make any general distribution of the cultures.

Since these experiments were made, the preparation of the cultures, known as Nitragin, has been discontinued, owing, we presume, to lack of sufficient demand for the preparations.

Last spring we were kindly supplied by the authorities at Washington with samples of their new cultures for Red clover and Alfalfa. It is claimed for these cultures that by reason of the method employed in their preparation and the mode in which they are sent out, they are more potent and more stable than the cultures formerly made in Germany. We experimented with these preparations, using pots filled with sterilized soil. The directions issued with the cultures were carefully followed. While it is true that nodules were found on many of the plants growing in the inoculated pots, these nodules were few and of small size and no general increase in the weight of the crop was to be observed as a result of the use of the cultures. Further, as nodules developed on plants in two of the control (uninoculated) pots, we were unable to decide if the cultures had been effective or not. It is certainly to be regretted that the results this year have not been more satisfactory, but at present, from our own experience we cannot report very favourably. Further trials will be made next season, both in pots and in the field, and the results made known in due course.

The attention of farmers may be drawn to the fact that effective inoculation for clover and Alfalfa may be obtained by the use of a certain amount of the soil from fields growing good crops of these plants. This method has proved most successful. Such soil is not difficult to obtain in all the provinces save, perhaps, Manitoba and the North-west Territories. Directions for using such soils have from time to time been issued by us.

For many years past, as is well known, particular attention has been paid by us to the system of soil enrichment by the growth of legumes and to the various means that could be taken to obtain a vigorous growth of the crop. In this connection I should like to add that our experience and observation have shown that the necessity of inoculation is not so great as was at one time thought. We are led to believe that the existence of the bacteria that serve to fix the nitrogen in the legume is by no means restricted to small or isolated areas. We have found—at all events in Ontario and the eastern provinces—that failures in the past to obtain a good catch of clover have been due rather to deficiency of moisture, or unsuitable mechanical condition of the soil, or insufficient drainage, than to the absence of nitrogen-assimilating germs. The general—though probably not universal presence of root nodules on the clover in Ontario and the east lead us to believe that special means for inoculation have not been necessary save, perhaps, in exceptional instances in the aforementioned provinces. It was due to these facts, we consider, that there has been no general demand for inoculating material.

In my recent tour through British Columbia, I found these organisms present upon every root of clover examined, and I took especial care to obtain information upon this matter in all the agricultural districts I visited. The same stands true alike for the irrigated soils of the dry belt (Nicola and Okanagan valleys), as well as for the lower Fraser and the coast soils and those of Vancouver Island. The luxurious crops of clover observable in British Columbia almost everywhere this year convinced me that inoculation was not generally necessary in this province.

My impression is that the severity of the winter, lack of sufficient moisture, and an uncongenial condition of the soil, or poor seed, will be found to militate more against successful clover growing than any supposed lack of the nodule bacteria, though I would not say that artificial inoculation would not be advantageous in certain districts.

It would seem from certain inquiries received lately from farmers that there is an impression abroad that the benefit to be derived from the nitrogen-fixing bacteria can be obtained directly from inoculation of the soil, *i.e.,* without the agency of the clover crop. This is, of course, erroneous. It is only through the growth of the clover (or other legume) and the subsequent decay in the soil of its roots (or whole plant) that the soil is enriched in humus and nitrogen. It is obvious, therefore, that where clover grows luxuriantly inoculation is unnecessary. We feel safe in saying that the roots of such clover will be found plentifully supplied with nodules.

## FODDERS AND FEEDING STUFFS.

### FODDER CORN, AS GROWN IN HILLS AND DRILLS.

The feeding value of the corn crop at various stages of growth was determined in the Farm Laboratories in 1896 and the results published in the report of the Chemical Division for that year. Amongst other interesting facts brought out by that research, it was shown that there was a very large increase of nutrients to be obtained simply by allowing the corn to come to the 'glazing' condition before cutting for the silo or for curing in the field as a fodder. This condition or stage of growth is not reached when the corn is sown broadcast, and hence the method of planting in hills or drills was strongly recommended. The question has since arisen : Which produces the greater weight per acre of real cattle food, corn planted in hills or drills ?

To obtain information on this point the investigation now discussed was begun in 1901 and continued during the seasons 1902 and 1903. We have consequently three years' data from which deductions may be made. Two varieties of Dent corn, Selected Leaming and Mammoth Cuban, and a similar number of Flint varieties—the Longfellow and Canada White—were chosen and planted in hills and drills respectively, this part of the investigation being conducted on the experimental plots of the Experimental Farm at Ottawa.* When the respective corn had reached the 'glazing' stage, or as near as the season would permit to that condition, it was cut, the weight per acre ascertained and samples taken for analysis.

The analytical data in detail are given at the close of this article, and are of considerable value in showing the variations in composition that may occur from various causes from year to year in the same variety, and in throwing light upon several other matters of equal interest connected with the growth of the plant. For the purpose of our present inquiry, however, the problem will be much simplified if we consider merely the averages obtained from these results.

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*The drills were 35 inches apart, with 6 to 8 inches between the plants. The hills were also 35 inches apart, with an average of four to five kernels in a hill.

*Composition of Corn Fodder (fresh material)—Four Varieties, Average of 3 Years.*

| | Hills. | Drills. |
|---|---|---|
| Water | 80·81 | 79·05 |
| Dry matter | 19·19 | 20·95 |
| | 100·00 | 100·00 |
| *Crude protein | 1·55 | 1·50 |
| Fat | ·08 | ·07 |
| Carbo--hydrates (nitrogen-free extract) | 11·04 | 12·31 |
| Fibre | 5·38 | 5·91 |
| Ash | 1·14 | 1·15 |
| *Nitrogenous substances— | | |
| Albuminoids | 6·96 | 6·29 |
| Non-albuminoids | 1·28 | 6·29 |

*Fresh Material.*—Compared weight for weight, the fodder produced in drills contains slightly more dry matter, the increase being in the carbo-hydrates (starch, &c.) and the fibre.

In the more important nutrient, crude protein, the fodder from the hills is very slightly the richer, and this relation holds good on further analysis of the nitrogenous bodies, the percentage of albuminoids or true flesh formers being somewhat lower in the corn grown in drills. These differences, with the exception of that relating to the dry matter, are, however, exceedingly small and cannot in themselves be considered of any great significance from the feeding value standpoint.

*Composition of Corn Fodder (dry matter)—Four Varieties, Average of 3 Years.*

| | Hills. | Drills. |
|---|---|---|
| *Crude protein | 8·24 | 7·22 |
| Fat | ·42 | ·35 |
| Carbo-hydrates (nitrogen-free extract) | 57·64 | 59·43 |
| Fibre | 27·76 | 27·40 |
| Ash | 5·94 | 5·60 |
| *Nitrogenous substances— | | |
| Albuminoids | 6·96 | 6·29 |
| Non-albuminoids | 1·28 | ·93 |

*Dry Matter.*—The only difference worthy of special notice here is the percentage of protein, which is somewhat higher in the case of the hill-grown corn. This, as might be expected, is accompanied by a correspondingly lower percentage of carbo-hydrates. In albuminoids (the more valuable part of the crude protein), the dry matter of the fodder from the hills is about three-quarters of a per cent (·75 per cent) the richer.

In summing up the data of the investigation so far discussed, it seems justifiable to conclude that the fodder from the corn planted in drills is slightly the more valuable by reason of its larger proportion of dry matter, but that in albuminoids (the true flesh formers) the hill-grown fodder is a little the richer.

We may now consider the data of the yields per acre and thus arrive at an answer to the question which was the occasion and incentive of this investigation.

*Yield and Weight of Nutrients per Acre—Four Varieties, Average of 3 Years.*

| | Hills. Tons. | Hills. Lbs. | Drills. Tons. | Drills. Lbs. |
|---|---|---|---|---|
| Weight of crop | 18 | 146 | 19 | 162 |
| Dry matter | 3 | 1,123 | 4 | 60 |
| *Crude protein | .. | 564 | .. | 583 |
| Fat | .. | 28 | .. | 30 |
| Carbo-hydrates (nitrogen-free extract) | 2 | 74 | 2 | 732 |
| Fibre | 1 | 30 | 1 | 254 |
| *Nitrogenous substances— | | | | |
| Albuminoids | .. | 488 | .. | 507 |
| Non-albuminoids | .. | 76 | .. | 76 |

First, in regard to yields, the average obtained from the crops of three successive seasons was one ton more per acre from the corn planted in drills. This increase in yield means 937 lbs. more of dry matter per acre, composed of 19 lbs. protein (albuminoids), 658 lbs. carbo-hydrates, 2 lbs. fat, 224 lbs. fibre and 34 lbs. ash.

In spite, therefore, of the slightly higher feeding value of the dry matter of the hill-grown corn (due to its containing more protein), more real cattle food was obtained per acre from the corn in drills, by reason of the latter giving a larger yield of fodder containing a higher percentage of dry matter.

We do not wish to exaggerate the differences here indicated in favour of planting in drills. Though significant, they are by no means large, and it is quite possible that with other varieties of corn they might be considerably modified. The general impression among those who have planted in both ways is that hill-grown corn produced the larger number of ears, and the analysis bears out this contention; the larger yield obtained from the drills, however, more than offsets this advantage.

*Dent and Flint Varieties.*—It will be remembered that two Dent and two Flint varieties were employed in this research, consequently the data obtained may serve to make a comparison between Dent and Flint corn as regards yield of fodder and the relative value of that fodder.

COMPOSITION of Corn Fodder, Dents and Flints, two Varieties of each from Drills and Hills, Average of 3 Years.

| Constituents. | Fresh Material. | | Dry Matter. | |
|---|---|---|---|---|
| | Dents. | Flints. | Dents. | Flints. |
| Water | 80·22 | 79·64 | | |
| Dry matter | 19·78 | 20·36 | | |
| Crude protein | 1·41 | 1·63 | 7·23 | 8·12 |
| Fat | 0·78 | 0·09 | 0·35 | 0·44 |
| Carbo-hydrates | 11·54 | 11·91 | 58·19 | 58·99 |
| Fibre | 5·64 | 5·56 | 28·43 | 26·72 |
| Ash | 1.12 | 1·16 | 5·73 | 5·73 |
| Nitrogenous substances, Albuminoids | 1·24 | 1·41 | 6·35 | 6·91 |
| Non-albuminoids | 0·17 | 0·22 | 0·88 | 1·21 |

The fodder (fresh material) of the Flint varieties, compared weight for weight with that from the Dents, is seen to contain the larger amount of dry matter. The difference is not a large one, but the superiority of the 'Flint' fodder is still further emphasized by the fact that its dry matter is richer in albuminoids and possesses less fibre.

In the second table, to be found on page 168, we present the data of the yields and weights of nutrients per acre from the Flint and Dent varieties examined.

*Indian Corn as grown in Hills and Drills. Composition of fresh material and water-free substance.*

| Variety. | Hills or Drills. | Date of Sowing. | Date of Collection. | Fresh Material. | | | | | | | | Water-free Substance. | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Water. | Fat. | Fibre. | Nitrogen—free extract. | Protein. Crude. | Protein. Albuminoids. | Protein. Non-albuminoids. | Ash. | Fat. | Fibre. | Nitrogen—free extract. | Protein. Crude. | Protein. Albuminoids. | Protein. Non-albuminoids. | Ash. |
| | | | | p.c. | p.c. | p.c. | p.c. | p.c. | p.c. | p.c. | p.c. | p.c. | p.c. | p.c. | p.c. | p.c. | p.c. | p.c. |
| Selected Leaming..... | Drills.. | May 28, 1901. | Sept. 21, 1901. | 77·34 | 0·04 | 6·83 | 13·41 | 1·28 | 1·23 | 0·05 | 1·10 | 0·16 | 30·15 | 59·15 | 5·67 | 5·43 | 0·24 | 4·87 |
| " ..... | Hills... | " 28, 1901. | " 21, 1901. | 82·05 | 0·06 | 4·77 | 10·99 | 1·26 | 1·23 | 0·03 | 0·87 | 0·35 | 26·60 | 61·17 | 7·04 | 6·83 | 0·21 | 4·84 |
| " ..... | Drills.. | " 27, 1902.. | " 24, 1902. | 80·43 | 0·14 | 5·72 | 10·44 | 1·81 | 1·39 | 0·42 | 1·46 | 0·71 | 29·25 | 53·36 | 9·27 | 7·09 | 2·18 | 7·41 |
| " ..... | Hills... | " 27, 1902.. | " 24, 1902. | 84·14 | 0·06 | 4·67 | 8·22 | 1·62 | 1·34 | 0·28 | 1·29 | 0·35 | 29·47 | 51·85 | 10 21 | 8·44 | 1·77 | 8·12 |
| " ..... | Drills.. | " 27, 1903.. | " 24, 1903. | 81·08 | 0·05 | 4·31 | 12·39 | 1·28 | 1·16 | 0·12 | 0·89 | 0·25 | 22·77 | 65·42 | 6·79 | 6·14 | 0·65 | 4·77 |
| " ..... | Hills... | " 27, 1903.. | " 24, 1903. | 81·27 | 0·09 | 4·69 | 11·41 | 1·46 | 1·29 | 0·17 | 1·08 | 0·49 | 25·02 | 60·89 | 7·81 | 6·89 | 0·92 | 5·79 |
| Mammoth Cuban..... | Drills.. | " 28, 1901.. | " 21, 1901. | 77·31 | 0·02 | 8·04 | 12·49 | 1·04 | 1·01 | 0·03 | 1·10 | 0·08 | 35·45 | 55·03 | 4·60 | 4·46 | 0·14 | 4·84 |
| " ..... | Hills.. | " 28, 1901.. | " 21, 1901. | 80·13 | 0·01 | 7·35 | 10·22 | 1·10 | 1·05 | 0·05 | 1 19 | 0·04 | 37·00 | 51·46 | 5·55 | 5·30 | 0·25 | 6·01 |
| " ..... | Drills.. | " 27, 1902.. | " 24, 1902. | 79·00 | 0·07 | 6·33 | 11·51 | 1 75 | 1·48 | 0·27 | 1·34 | 0·33 | 30·15 | 54·82 | 8·33 | 7·03 | 1·30 | 6·37 |
| " ..... | Hills... | " 27, 1902.. | " 24, 1902. | 80·40 | 0·08 | 5·60 | 11·04 | 1·66 | 1·37 | 0·29 | 1·22 | 0·40 | 28·59 | 56·31 | 8·54 | 6·99 | 1·55 | 6·16 |
| " ..... | Drills.. | " 27, 1903.. | " 24, 1903. | 79·09 | 0·09 | 4·58 | 14·08 | 1·21 | 1·05 | 0·16 | 0·95 | 0·41 | 21·91 | 67·37 | 5 79 | 5·01 | 0·78 | 4·52 |
| " ..... | Hills... | " 27, 1903.. | " 24, 1903. | 80·42 | 0·11 | 4·87 | 12·03 | 1·56 | 1·29 | 0·27 | 1·01 | 0·56 | 24·89 | 61·43 | 7·96 | 6·58 | 1·38 | 5·16 |
| Longfellow.......... | Drills.. | " 28, 1901.. | " 21, 1901. | 73·58 | 0·18 | 9·88 | 13 42 | 1·69 | 1·60 | 0·09 | 1·25 | 0·67 | 37·39 | 50·81 | 6·39 | 6·06 | 0·33 | 4·74 |
| " .......... | Hills... | " 28, 1901.. | " 21, 1901. | 79·40 | 0·09 | 6·31 | 11·56 | 1·56 | 1·46 | 0·10 | 1·10 | 0·42 | 30·62 | 56·04 | 7·57 | 7·09 | 0·48 | 5·35 |
| " .......... | Drills.. | " 27, 1902.. | " 24, 1902. | 79·19 | 0·04 | 5·70 | 11·42 | 1·94 | 1·52 | 0·42 | 1·71 | 0·18 | 27·41 | 54·87 | 9·33 | 7·31 | 2 02 | 8·21 |
| " .......... | Hills... | " 27, 1902.. | " 24, 1902. | 80·48 | 0·08 | 5·52 | 10·58 | 1·90 | 1·42 | 0·48 | 1·44 | 0·40 | 28·28 | 54·19 | 9·75 | 7·27 | 2·48 | 7·38 |
| " .......... | Drills.. | " 27, 1903.. | " 24, 1003. | 80·11 | 0·08 | 3·81 | 13·59 | 1·52 | 1·31 | 0·21 | 0·89 | 0·39 | 19·15 | 68·33 | 7·65 | 6·59 | 1·06 | 4·48 |
| " .......... | Hills... | " 27, 1903.. | " 24, 1903. | 79·34 | 0·21 | 4·65 | 12·99 | 1·82 | 1·57 | 0·25 | 0·99 | 1·03 | 22·49 | 62·88 | 8·83 | 7·58 | 1·25 | 4·77 |
| Canada White ....... | Drills.. | " 28, 1901.. | " 21, 1901. | 79·00 | 0·13 | 5·84 | 12·10 | 1·78 | 1·63 | 0·15 | 1·15 | 0·62 | 27·80 | 57·62 | 8·49 | 7·75 | 0·74 | 5·47 |
| " ....... | Hills... | " 28, 1901.. | " 21, 1901. | 75·76 | 0·01 | 8·28 | 12·82 | 1·69 | 1·61 | 0·08 | 1·44 | 0·03 | 34·16 | 52·83 | 7·03 | 6·64 | 0·39 | 5·95 |
| " ....... | Drills.. | " 27, 1902.. | " 24, 1902. | 80·41 | 0·04 | 5·35 | 11·48 | 1·52 | 1·24 | 0·28 | 1·20 | 0·18 | 27·29 | 58·59 | 7·74 | 6·34 | 1·40 | 6·20 |
| " ....... | Hills... | " 27, 1902.. | " 24, 1902. | 81·65 | 0·08 | 4·57 | 10·92 | 1·62 | 1·26 | 0·36 | 1·16 | 0·45 | 24·90 | 59·53 | 8·85 | 6·85 | 2·00 | 6·27 |
| Sanford ............ | Drills.. | " 27, 1903.. | " 24, 1903. | 82·15 | 0·05 | 3·59 | 12·24 | 1·19 | 1·13 | 0·06 | 0·78 | 0·30 | 20·11 | 68·60 | 6·64 | 6·31 | 0·33 | 4·35 |
| " ............ | Hills... | " 27, 1903.. | " 24, 1903. | 84·70 | 0·09 | 3·24 | 9·80 | 1·32 | 1·07 | 0·25 | 0·85 | 0·57 | 21·16 | 64·14 | 8·60 | 7·02 | 1·58 | 5·53 |

INDIAN CORN as grown in Hills and Drills. Yield and Weight of Nutrients per Acre.

| Variety. | Hills or Drills. | Date of Sowing. | Date of Collection. | Weight of Crop. | | Dry Matter. | Fat. | Fibre. | Nitrogen—free extract. | Protein. Crude. | Protein. Alluminoids. | Protein. Non-Alluminoids. | Ash. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Tons. | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. |
| Selected Leaming. | Drills .. | May 28, 1901 | Sept. 21, '01 | 22 | .. | 9,970 | 18 | 3,005 | 5,900 | 563 | 541 | 22 | 484 |
| " " . | Hills... | " " | " " | 23 | 860 | 8,411 | 28 | 2,235 | 5,150 | 590 | 576 | 14 | 408 |
| " " . | Drills .. | May 27, 1902 | Sept. 24, '02 | 23 | 1,300 | 9,257 | 68 | 2,706 | 4,937 | 856 | 657 | 199 | 690 |
| " " . | Hills... | " " | " " | 17 | 930 | 5,548 | 21 | 1,634 | 2,875 | 567 | 469 | 98 | 451 |
| " " . | Drills .. | May 27, 1903 | Sept. 24, '03 | 17 | 1,970 | 6,806 | 18 | 1,550 | 4,453 | 460 | 417 | 43 | 320 |
| " " . | Hills... | " " | " " | 16 | 10 | 5,996 | 29 | 1,501 | 3,453 | 467 | 413 | 54 | 346 |
| Mammoth Cuban. | Drills .. | May 28, 1901 | Sept. 21, '01 | 19 | 940 | 8,836 | 8 | 3,131 | 4,864 | 405 | 393 | 12 | 428 |
| " " . | Hills... | " " | " " | 26 | 140 | 10,360 | 5 | 3,832 | 5,328 | 574 | 547 | 27 | 621 |
| " " . | Drills .. | May 27, 1902 | Sept. 24, '02 | 22 | 1,320 | 9,517 | 32 | 2,869 | 5,216 | 793 | 671 | 122 | 607 |
| " " . | Hills... | " " | " " | 17 | 1,640 | 6,986 | 29 | 1,996 | 3,934 | 592 | 488 | 104 | 435 |
| " " . | Drills .. | May 27, 1903 | Sept, 24, '03 | 19 | 1,600 | 8,280 | 36 | 1,814 | 5,575 | 479 | 416 | 63 | 376 |
| " " . | Hills... | " " | " " | 19 | 775 | 7,592 | 43 | 1,888 | 4,601 | 605 | 500 | 105 | 465 |
| Longfellow....... | Drills .. | May 28, 1901 | Sept. 21, '01 | 15 | 360 | 8,021 | 55 | 2,999 | 4,074 | 513 | 486 | 27 | 380 |
| " ....... | Hills... | " " | " " | 20 | 40 | 8,248 | 36 | 2,527 | 4,620 | 625 | 585 | 40 | 440 |
| " ....... | Drills .. | May 27, 1902 | Sept. 24, '02 | 22 | 1,320 | 9,432 | 18 | 2,583 | 5,177 | 879 | 689 | 190 | 775 |
| " ....... | Hills... | " " | " " | 17 | 1,640 | 6,957 | 29 | 1,967 | 3,771 | 677 | 506 | 171 | 513 |
| " ....... | Drills .. | May 27, 1903 | Sept. 24, '03 | 15 | 1,240 | 6,214 | 25 | 1,190 | 4,246 | 475 | 409 | 66 | 278 |
| " ....... | Hills... | " " | " " | 14 | 1,260 | 6,045 | 61 | 1,361 | 3,800 | 533 | 459 | 74 | 290 |
| Canada White.... | Drills .. | May 28, 1901 | Sept. 21, '01 | 18 | 1,840 | 7,946 | 49 | 2,210 | 4,578 | 674 | 617 | 57 | 435 |
| " " .... | Hills... | " " | " " | 17 | 100 | 8,266 | 3 | 2,824 | 4,372 | 576 | 549 | 27 | 491 |
| " " .... | Drills .. | May 27, 1902 | Sept. 24, '02 | 17 | 760 | 6,809 | 14 | 1,860 | 3,990 | 528 | 431 | 97 | 417 |
| " " .... | Hills... | " " | " " | 18 | 1,400 | 6,863 | 30 | 1,709 | 4,084 | 606 | 471 | 135 | 434 |
| Sanford .......... | Drills .. | May 27, 1903 | Sept. 24, '03 | 15 | 1,570 | 5,636 | 16 | 1,133 | 3,865 | 376 | 357 | 19 | 246 |
| " .......... | Hills... | " " | " " | 13 | 1,500 | 4,208 | 25 | 891 | 2,695 | 363 | 294 | 69 | 234 |

CORN FODDER, Dents and Flints—Two Varieties of each from Drills and Hills—Yield and Weights of Nutrients per Acre.

| — | Dents. | | Flints. | |
|---|---|---|---|---|
| | Tons. | Lbs. | Tons. | Lbs. |
| Yield of crop...... | 20 | 961 | 17 | 585 |
| Dry matter...... | 4 | 129 | 3 | 1,053 |
| Crude protein...... | ........ | 580 | ........ | 569 |
| Fat...... | ........ | 28 | ........ | 30 |
| Carbo-hydrates...... | 2 | 707 | 2 | 107 |
| Fibre...... | 1 | 346 | ........ | 1,938 |
| Ash...... | ........ | 469 | ........ | 411 |
| Nitrogenous substances— | | | | |
| Albuminoids...... | ........ | 508 | ........ | 488 |
| Non-albuminoids...... | ........ | 72 | ........ | 81 |

Notwithstanding the better quality of the dry matter furnished by the Flint corns, the Dent varieties must certainly be considered as easily first from the standpoint of the value of the fodder produced per acre. Thus, the Dents gave an increase in yield of 3 tons 376 lbs., containing 1,076 lbs. of dry matter over the product of the Flint varieties. This increase in dry matter is chiefly in carbo-hydrates (600 lbs.) and fibre (400 lbs.), but also possesses a notable amount (20 lbs.) of the more valuable albuminoids.

### RAPE, RAPE ENSILAGE, RAPE AND CORN ENSILAGE.

Rape is better known and more widely grown in Canada to-day than ever before, so that now it occupies an important position among the succulent forage crops.* Its use, so far, has been in the fresh condition, being consumed either on the field by the stock (sheep, swine and steers), or cut and used as a soiling crop. On account of its leaves crumbling to powder on drying, rape cannot be cured as hay, and by reason of its large percentage of water, it was considered unsuitable for ensiling. This latter, however, has been disproved by the experiments of Mr. Grisdale, the Agriculturist, who during the past season made ensilage solely of rape and also a mixture of corn and rape, both being found at the end of six months sound and very palatable to cattle. These ensilages were used in a feeding experiment by the Agriculturist, and the results obtained will be found in his report for the current year.

To supplement these results and to learn what changes might take place by the ensiling of the rape, certain analyses have been made. These analyses, further, allow us to compare the composition of fresh rape, rape ensilage, and an ensilage composed of half rape and half corn.

RAPE, Rape Ensilage and Rape and Corn Ensilage. (Results on the fresh material.)

| Constituents. | Rape as put in the silo, Oct. 6, 1903. | Rape Ensilage, Mar. 18, '04. | Rape and Corn Ensilage, ½ Rape, ½ Corn, Mar. 18, '04. |
|---|---|---|---|
| | p.c. | p.c. | p.c. |
| Water | 86·05 | 78·19 | 79·66 |
| Crude protein | 1·91 | 2·67 | 2·18 |
| Fat | 0·16 | 0·84 | 0·37 |
| Carbo-hydrates | 8·11 | 12·93 | 10·40 |
| Fibre | 2·33 | 2·00 | 5·29 |
| Ash | 1·44 | 3·37 | 2·10 |
| Nitrogenous compounds (crude protein)— | | | |
| Albuminoids | 1·30 | 1·36 | 1·04 |
| Non-albuminoids | 0·61 | 1·31 | 1·14 |

First, comparing rape with rape ensilage, we notice that ensiling the crop has resulted in a large loss of water, increasing the percentage of total dry matter from 13·95 to 21·81. Weight for weight, then, we should expect the rape ensilage to have a considerably higher feeding value. This, of course, is not to be interpreted as meaning that the rape increases in value in the silo, that a given weight of green rape gives an equal weight of ensilage with an increased percentage of dry matter, for such is not the case. The fermentation that ensues in the silo necessarily means loss in certain of the nutrients (especially the carbo-hydrates); this is true of all ensiled crops. But, comparing equal weights of green rape and rape ensilage, the latter is the much more valuable. This will be further apparent by continuing the comparison of the two analyses. In crude protein the ensilage is considerably the richer. This gain,

*For an account of the food value of this crop, see the article, 'The Chemistry of Rape,' in report of this Division for 1900. Bulletin No. 42 (Experimental Farm Series) furnishes information respecting its culture and use.

however, is more apparent than real, for by reference to the percentage of albuminoids —the part of the crude protein which has by far the greater feeding value—it is seen that it is practically identical with that of the rape. From this fact we may infer that in muscle-forming constituents the rape and its ensilage are of about the same value.

In carbo-hydrates (starch, &c.)—heat-producing constituents—the ensilage contains about one-third more, and it is in this, principally, that the greater feeding value of the ensilage lies. The fibre is almost the same in both. In fat the ensilage is higher, making it the more valuable. Lastly, as regards ash or mineral matter, the percentage in the ensilage is almost three times that in the fresh material. This does not arise, of course, from any creation of ash, but from the disappearance through decomposition of the organic constituents, leaving a higher percentage of the mineral matter.

The comparison of the rape ensilage with the rape and corn ensilage makes clear, from the chemical standpoint, the superiority of the former. In all the more valuable nutrients the rape ensilage is the richer; in fibre—the constituent of least value—the presence of the corn increases the amount in the mixed ensilage.

The average composition of corn ensilage may now be given for the purpose of comparison with the foregoing analysis of the rape and mixed ensilage.

*Analysis of Corn Ensilage.*

| | |
|---|---|
| Water | 79·1 |
| Crude protein | 1·7 |
| Fat | ·8 |
| Carbo-hydrates | 11·0 |
| Fibre | 6·0 |
| Ash | 1·4 |
| | 100·00 |

The corn ensilage, it is evident, is less valuable than either rape ensilage or that from rape and corn, in that it contains less crude protein. The difference is, of course, more marked between the rape ensilage and corn ensilage than between that of the mixed crops and the ensiled corn, but the difference is one of degree rather than of kind—the addition of corn increases proportionately the percentage of fibre while reducing that of the crude protein in the product. To sum up these considerations, there seems no doubt but that in both the rape and mixed ensilages we have a succulent feed of a more nutritious character than in an ensilage from corn alone, and this chiefly by reason of the nitrogenous character of rape and its low fibre content.

A consideration of the data calculated on a water-free basis, in other words, of the composition of the dry matter of the several materials, throws some light upon the nature and direction of the changes that take place on ensiling the rape.

RAPE, Rape Ensilage, Rape and Corn Ensilage. (Results on the water-free substance.)

| Constituents. | Rape as put in the silo. | Rape Ensilage. | Rape and Corn Ensilage, ½ Rape ½ Corn. |
|---|---|---|---|
| | p.c. | p.c. | p.c. |
| Crude protein | 13·72 | 12·25 | 10·75 |
| Fat | 1·14 | 3·86 | 1·84 |
| Carbo-hydrates | 58·14 | 49·27 | 51·05 |
| Fibre | 16·70 | 19·18 | 26·02 |
| Ash | 10·30 | 15·44 | 10·34 |
| Nitrogenous compounds— | | | |
| Albuminoids | 9·35 | 6·22 | 5·10 |
| Non-albuminoids | 4·37 | 6·03 | 5·65 |

The increase in the non-albuminoids and the concomitant decrease in the albuminoids that has followed upon ensiling the rape marks the most important change in the composition of the dry matter of the rape. This in conjunction with the destruction of a part of the carbo-hydrates necessarily increases the percentages of the fibre and ash. The changes are such as might have been expected and indicate a certain deterioration in the silo of the dry matter of the rape.

ROOTS.

Five years ago (1900) we began the study, from the chemical standpoint, of the relative feeding values of the more important farm roots. This work has been continued every season since that time. It has been instrumental in showing that as regards the percentages of dry matter and sugar, the two chief nutrients in determining the feeding value of roots, considerable differences may, and frequently do, exist between mangels, carrots, turnips, &c.; and, further, that between varieties of the same class similar differences may often be found. Of course, no two roots from the same seed and growing side by side are exactly alike in composition, but in this research a sufficient number of roots has been taken to practically eliminate the factors of size and individualism. It may also be remarked that in the endeavour to arrive at a knowledge of the various factors influencing the composition of these roots, the soil factor has, as far as possible, been also eliminated by growing the roots under experiment on ground of a very uniform character. The relative richness of the soil need not, therefore, be taken into account when comparing the roots of the same season with one another.

*Influence of Inherited Qualities.*—Differences of a well marked, and, to a certain degree, constant character undoubtedly exist between the varieties of a class. Thus, for instance, in mangels, for five years in succession, with varying seasonal and soil conditions, the 'Gate Post' has invariably proved itself richer in dry matter and sugar than the Giant Yellow Globe. We must conclude that such differences are due to inherited qualities.

DRY Matter and Sugar in Gate Post and Giant Yellow Globe Mangels.

| — | 1900. | | 1901. | | 1902. | | 1903. | | 1904. | | Average of 5 Years, 1900–04. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dry Matter. | Sugar in Juice. | Dry Matter. | Sugar in Juice. | Dry Matter. | Sugar in Juice. | Dry Matter. | Sugar in Juice. | Dry Matter. | Sugar in Matter. | Dry Matter. | Sugar in Juice. |
| | p.c. | p.c. | p.c. | p.c. | p.c. | p.c. | p.c. | p.c. | p.c. | p.c. | p.c. | p.c. |
| Gate Post ........... | 11·14 | 6·15 | 9·41 | 4·15 | 13·90 | 9·39 | 12·93 | 7·38 | 12·64 | 7·62 | 12·00 | 6·94 |
| Giant Yellow Globe... | 8·19 | 2·64 | 9·10 | 4·08 | 10·24 | 5·24 | 10·89 | 6·17 | 9·24 | 5·26 | 9·53 | 4·68 |

These results show that the 'breed' factor is an important one. They open up a most interesting field for work in the improvement of roots—one which undoubtedly offers an opportunity for obtaining results of practical value to the farmer. The Vilmorins of Paris have already achieved a marked success in this research in the production of the so-called 'Sugar Mangels,' a cross between the sugar beet and the mangel. This root is far superior in feeding qualities to the ordinary mangels, and at the same time gives a very satisfactory tonnage to the acre.

*Influence of Season.*—The above table, further, may serve to illustrate the effect of the season upon the composition of the root. It would not be altogether correct to ascribe the differences observable from year to year, entirely to climatic causes, but there can be no doubt that the percentage of sugar (the most valuable nutrient) is particularly influenced by the character of the season. It would seem from our observations that heavy rains and low temperatures in the late summer months had an injurious effect upon the sugar content of the root. From investigation with sugar beets it seems evident that ideal climatic conditions for sugar production include a comparatively low mean summer temperature, certainly not higher than 70° F., an evenly distributed but not excessive rainfall during May, June, July and August, and warm and moderately dry weather during September and October.

ANALYSIS of Roots, C. E. F., Ottawa, 1904.

| Variety. | Seeds Purchased from. | Water. | Dry Matter. | Sugar in Juice. | Average Weight of one Root. | |
|---|---|---|---|---|---|---|
| | | p.c. | p.c. | p.c. | Lbs. | Ozs. |
| Mangels— | | | | | | |
| Half Long Sugar Rosy | Vilmorin, Paris, France | 86·52 | 13·48 | 8·70 | 2 | 2 |
| Giant Sugar Mangel | Rennie, Toronto | 86·08 | 13·92 | 9·18 | 1 | 15 |
| Half Long Sugar White | Vilmorin, Paris, France | 89·20 | 10·80 | 5·45 | 1 | 14 |
| Giant Sugar White | Graham Bros., Ottawa | 88·94 | 11·06 | 5·06 | 4 | 7 |
| Giant Sugar Rosy | Rennie, Toronto | 87·90 | 12·10 | 7·00 | 3 | 13 |
| Gate Post Yellow | Bruce & Co., Hamilton | 87·36 | 12·64 | 7·62 | 2 | 6 |
| Gate Post Red | " " | 88·53 | 11 47 | 6·56 | 2 | 14 |
| Giant Yellow Globe | Rennie, Toronto | 90·76 | 9·24 | 5·26 | 2 | 13 |
| Mammoth Long Red | " " | 87·45 | 12·55 | 6·65 | 2 | 10 |
| Giant Yellow Intermediate | " " | 90·36 | 9·64 | 4·75 | 2 | 5 |
| Carrots— | | | | | | |
| Guérande or Oxheart | | 89·47 | 10·53 | 3·44 | 1 | 6 |
| Improved Short White | Steele, Briggs & Co., Toronto | 89·59 | 10·41 | 3·00 | 1 | 6 |
| Half Long Chantenay | Ewing & Co., Montreal | 88·94 | 11·06 | 3·63 | 1 | 2 |
| Turnips— | | | | | | |
| Selected Purple Top | Steele, Briggs & Co., Toronto | 89·17 | 10·83 | 2·73 | 3 | 11 |
| Good Luck Swede | " " | 89·33 | 10·67 | 1·11 | 3 | 4 |
| New Century | Graham Bros., Ottawa | 88·08 | 11·92 | 2·51 | 3 | 11 |
| Skirvings | Kenneth McDonald, Ottawa. | 88·14 | 11·86 | 2·11 | 3 | 1 |
| Sugar Beets | | | | | | |
| Wanzleben | Berlin Sugar Works | 77·88 | 22·12 | 15·40 | 1 | 4 |

*Mangels.*—Ten varieties of mangels were examined. The lowest percentage of dry matter was 9·24; the highest, 13.92; the difference is 4·68 per cent, or practically 33 per cent of the total dry matter. In sugar, the percentages vary from 4·75 to 9·18, or a difference of 4·43 per cent, equivalent to 49 per cent of the total sugar.

The 'Sugar Mangels,' the first six given in the table, as in past years, are characterized (with one exception) by an excellent dry matter and sugar content. These are followed by the variety known as Gate Post, including the Mammoth Long Red which is probably the same mangel under another name. The Giant Yellow Globe and Giant Yellow Intermediate close the list with less dry matter, though showing a very fair proportion of sugar.

*Carrots.*—The Ox-heart and Improved Short White have given results practically identical as regards dry matter, and very close as regards sugar. The Half Long Chantenay is somewhat richer than these in both respects.

It will be observed that, taken as a class, carrots do not furnish the same amount of dry matter as mangels, and fall considerably below the latter in respect to sugar content.

*Turnips and Swedes.*—Four varieties were analysed. Of these, the New Century stands highest, both in respect to dry matter and sugar, closely followed by Skirvings.

The Good Luck Swede, though practically equal to the Selected Purple Top in dry matter, possesses a very much lower proportion of sugar. Though comparing very favourably as a class with carrots in dry matter, they are not quite so rich in sugar.

*Sugar Beets.*—An example of the Klein Wanzleben, grown for feeding purposes, is added in order to show the vast differences in composition that exist between sugar beets and the ordinary field roots

LINSEED OR OIL CAKE.

A sample of oil cake, manufactured by the Canada Linseed Oil Mills, Montreal, and sold as the 'Maple Leaf' brand, has been submitted to analysis. It is stated as being made by the 'old process'—hydraulic method.

The following data were obtained :—

*Analysis.*

| | Per cent. |
|---|---|
| Moisture | 11·29 |
| Protein | 32·00 |
| Fat or oil | 6·38 |
| Carbo-hydrates | 36·81 |
| Fibre | 8·25 |
| Ash | 5·27 |
| | 100·00 |

Oil cake is widely recognized as a 'concentrate' of great value, both from its high protein content and its large percentage of oil. It is, therefore, unnecessary to say more than that the above figures are in close accord with those obtained in the Farm Laboratories from samples of unadulterated, good quality 'old process' linseed cake.

GLUTEN FEED.

The various by-products of the corn starch factory have been discussed in considerable detail in former publications and their relative feeding values pointed out. At first these products were sold separately, and inspection only was needed to determine, approximately, the nature and value of the material offered for sale. This is scarcely possible now, for all the by-products (with the exception of the germ) are mixed together and sold as Gluten Feed. This should not be confounded with Gluten Meal, which was formerly upon the market and contained about 35 per cent protein and from 8 to 11 per cent fat. It is stated that Gluten Feed is by some being sold as Gluten Meal; this, of course, is distinctly fraudulent. Gluten Meal has, we believe, entirely disappeared from the market, but whether such be the case or not, it is desirable that farmers should know that Gluten Feed is the product now offered them, and that it will contain 10 to 13 per cent less protein and 6 to 8 per cent less fat than the Gluten Meal they were accustomed to use.*

Thus, we may place side by side analysis made of Gluten Meal two years ago and of Gluten Feed received a few weeks ago, both being from the Edwardsburg Starch Co.:

*Since writing the above, and just as this report is going to press, we have received a letter from the Edwardsburg Starch Co. stating that they have a true 'Gluten Meal' upon the market.

| | Gluten Meal. Per cent. | Gluten Feed. Per cent. |
|---|---|---|
| Moisture | 5·25 | 3·68 |
| Protein | 36·38 | 23·00 |
| Fat or oil | 11·05 | 2·83 |
| Carbo-hydrates | 43·83 | 63·79 |
| Fibre | 1·54 | 5·75 |
| Ash | 1·55 | ·95 |
| | 100·00 | 100·00 |

The difference between these two in feeding value is at once apparent. The Gluten Meal was sold at $25 to $30 per ton, and the price of the Gluten Feed this year was about $22 per ton. We have no hesitation in saying that the Gluten Meal was much the better value at these prices.

### COTTON-SEED MEAL.

This feeding stuff is used largely in the maritime provinces and, as we have pointed out in several of our past reports, great differences in feeding value exist between the brands found upon the market. We have, further, found that the prices are not in accordance with the quality, so that frequently of two meals offered the price of the inferior brand may be only a few dollars, or even a fraction of a dollar per ton less than that of a brand worth, from the feeding standpoint, one-third more. It is for these reasons that we have repeatedly urged that such products be sold under a guarantee stating the amount of protein and fat present. (See page 143, Report of Experimental Farms, 1903.) Until such time that farmers are so protected it has been thought desirable to submit to analysis such samples as might be forwarded. Among these many have proved of excellent quality, with the proportions of protein and oil found in genuine meals. On the other hand, not a few samples have been shown to be of inferior quality. Thus, genuine grades should contain from 42 to 44 per cent protein, and from 9 to 11 per cent oil, and data have been obtained recently from samples received showing a protein content ranging from 19 to 35 per cent, and from 5 to 7·5 per cent of oil.

With respect to the genuine cotton-seed meals, it is evident from our work that the methods now employed extract more of the oil than was the custom, and thus, while reducing the oil-content, tend to increase the percentage of protein.

An analysis is absolutely necessary to determine the percentages of protein and fat (the constituents of greatest importance from the feeding standpoint) a meal may contain, but it will be of assistance to farmers to know that genuine meals are of a bright yellow colour, while inferior grades are much darker and show on closer inspection many fragments of hull intermixed with the finer meal.

### UVECO AND FLAKERINE.

These are 'cooked' foods, manufactured by the Uveco Cereals Co., Ltd., Newport, Monmouthshire. Quantities of each were received for trial, the Uveco being intended for cattle, the Flakerine for poultry. In appearance they are not at all dissimilar (though with a little practice they can be distinguished), and give the impression that they consist largely, if not solely, of Indian corn which has been steamed or partially cooked, rolled into flakes and dried. They are bright, clean-looking feeds, with a pleasant, slightly sweetish taste.

*Analysis.*

| | Uveco. Per cent. | Flakerine. Per cent. | *Cornmeal. Per cent. |
|---|---|---|---|
| Moisture | 9·75 | 11·50 | 15·0 |
| Protein | 8·94 | 12·43 | 9·2 |
| Fat | 3·89 | 2·37 | 3·8 |
| Carbo-hydrates | 74.62 | 69·71 | 68·7 |
| Fibre | 1·48 | 2·22 | 1·9 |
| Ash | 1·32 | 1·77 | 1·4 |
| | 100·00 | 100·00 | 100·00 |
| Aqueous extract: | | | |
| Total solids, soluble in cold water | 4·76 | 8·16 | |
| Containing dextrine | 4·51 | 6·13 | |

It will be observed that both Uveco and Flakerine contain somewhat less water than corn meal and this, of course, is in their favour. Uveco is considerably the drier of the two.

In protein and fat, the two most valuable nutrients, Uveco (notwithstanding its higher percentage of dry matter) is practically identical with corn meal, and the same may almost be said with regard to the amounts of fibre and ash present. The only difference of moment, therefore, between Uveco and Indian corn meal appears to be that the former contains a larger percentage of carbo-hydrates (starch, &c.), a part of which by the cooking process has been converted into dextrin, which, unlike starch, is soluble in cold water.

Flakerine is considerably richer in protein than Uveco, though poorer in fat. Its percentage of carbo-hydrate is very close to that of Indian corn meal, but a greater proportion has been made soluble by cooking than in the case of Uveco, as evidenced by the larger percentages of extractive matter and dextrin.

While admitting the great palatability of these foods, it is very doubtful if their real feeding value, so far as most classes of stock are concerned, has been enhanced by the cooking process. Many experiments have been made to ascertain the effect of cooking and boiling on foods, and the results show most decidedly that in the majority of instances their digestibilty has not been increased. Very seldom have the practical returns in gains been sufficient to warrant the necessary expense of cooking, and consequently it can only be recommended when it is desirable to render the foods more palatable. Henry in his work on Feeds and Feeding, sums up the discussion on this matter in these words: 'As a general proposition, it may be stated that it does not pay to cook food for stock when such food will be satisfactorily consumed without cooking, for cooking does not increase the digestibility of feeding stuffs, but may lower it, and there is considerable expense involved in the operation.'

It is scarcely necessary to point out that neither Uveco nor Flakerine belong to that class of concentrated by-products which is characterized by a high protein content (Oil Cake, Gluten Meal, Cotton-seed Meal, &c.) and, therefore, cannot be used with economy when the intention is merely to enrich the ration in this constituent.

## MEAT MEALS FOR POULTRY.

Among the nitrogenous foods which we now find being used by poultrymen, the various 'meat meals' take a prominent place. Their high protein content makes them

*The analysis of corn meal (average of FF samples), taken from Jenkins & Winton's tables, Washington, D.C., has been added in order to allow a comparison to be made between these feeding stuffs and corn meal.

particularly valuable for supplying to the animal system that nutrient (protein) required alike for egg and flesh production, and which is not found to any large degree in most grains. Moreover, the use of a ration composed exclusively of grain is very apt to lead to an excessive deposition of fatty tissue—and this is undesirable in both laying and fattening stock. The recognition of this has led in recent years to the mixing of a certain amount (usually about one-eighth) of these meat meals with the grain portion of the ration, and this practice has been followed by most gratifying results, especially during winter, and in the summer when the fowls can only be allowed a very small run. Further, the products of the packing house are frequently rich in bone, which, as most poultrymen know, is, when fresh and untainted, one of the best foods for laying hens.*

There are several brands upon the market, varying in price and in quality, and inquiries are being constantly received as to their respective values to the poultry feeder. We have accordingly submitted to analysis such of these as are being used by, or could be procured by Mr. Gilbert, Poultry Manager, Central Experimental Farm. They comprise:—

Beef Scrap No. 1, Cyphers Incubator Co., Buffalo.
Beef Scrap No. 2, Cyphers Incubator Co., Buffalo.
Darling's Beef Scrap " "
Superior Meat Meal, W. A. Freeman Co., Ltd., Hamilton, Ont.
Meat Meal, A. J. Morgan, London, Ont.

Of Beef Scrap No. 1, two samples were examined, obtained a month apart and from different sources.

ANALYSIS OF MEAT MEALS.

| Brand. | Moisture. | Protein. | Fat. | Total Ash. | Ash Insoluble in Acid, Sand, &c. |
|---|---|---|---|---|---|
| | p.c. | p.c. | p.c. | p.c. | p.c. |
| Beef Scrap No. 1, Cyphers | 7·21 | 54·50 | 14·68 | 19·34 | ·85 |
| " " | 10·52 | 52·38 | 15·19 | 17·29 | 1·33 |
| " No. 2, Cyphers | 5·28 | 38·75 | 21·80 | 31·61 | ·12 |
| Darling's Beef Scrap | 6·67 | 52·81 | 13·11 | 21·91 | ·99 |
| Superior Meat Meal, Freeman | 7·06 | 45·06 | 12·45 | 30·10 | ·35 |
| Meat Meal, Morgan | 5·74 | 35·19 | 11·31 | 40·67 | ·50 |

*Moisture.*—Meat meals by reason of their high nitrogen content are, if at all moist, very susceptible to change of a deleterious character, to become tainted and infested with mites, &c. The drier a meal is the better it will keep. It is advisable for poultrymen to examine critically any meat meal they may be purchasing; it should be sound and dry. Examination with a pocket lens is necessary to detect insect life, which, if present, indicates a certain degree of decay.

With the exception of one of the samples of Beef Scrap No. 1, all are excellent as regards moisture-content. The sample referred to, it is only right to say, was not obtained directly from the manufacturer and may have absorbed moisture through undue exposure.

*Protein.*—This is the most important of the nutrients, and provided the meal is sound and the sourcme of the protein wholesome and digestible, the value of a meal should be very largely regulated by the percentage present.

* Remarks on the general principles of Poultry feeding and the relative values of different foods and rations, may be found on page 218, 219, Experimental Farms Reports, 1902.

Owing to the difficulties in manufacturing a product of this character that shall not vary in composition, it becomes necessary in considering analyses of the same to overlook small differences. Further, the mechanical condition of these meals makes it an exceedingly hard matter to sample accurately—and irregularities of sampling, of course, become apparent in the subsequent analysis. We may, however, safely divide the meals examined into three classes, according to their protein content.

Class I—50 pr cent to 55 per cent Protein—Beef Scrap No. 1, Cyphers. Darling Beef Scrap.

Class II.—45 per cent to 50 per cent—Superior Meat Meal, Freeman.

Class III.—35 per cent to 40 per cent—Beef Scrap No. 2, Cyphers. Morgan's Meat Meal.

*Fat.*—This is also a valuable constituent, serving alike as a source of fat in the body and for the production of animal heat, but a large percentage is not desirable in poultry meat meals. In the brands analysed, this nutrient varies from 11 to 22 per cent. In comparing these meals, using the tabulated data, we would impress upon the reader that it is not desirable to have protein replaced by fat ; in other words, a high protein content with a moderate percentage of fat will give better results than a meal containing a minimum of protein and a large percentage of fat.

*Ash.*—The two last columns of the table allow us to form some opinion of the amount of bone present. The proportion of this material undoubtedly affects the value of the meal when used for laying stock.

We may, for our present purpose, consider bone to consist of, approximately:

Organic matter (nitrogenous and fatty) and moisture, 40 per cent.
Mineral matter (chiefly phosphate of lime), 60 per cent.

On this assumption and, further, supposing that the differences between the data of columns 4 and 5 of the table represent the mineral matter furnished by the bone present, we obtain the following approximate percentages of bones in the various brands:—

| | | |
|---|---|---|
| Beef Scrap No. 1, approximately | 30 | per cent. bone |
| Beef Scrap No. 2 " | 50 | " |
| Darling's Beef Scrap " | 35 | " |
| Superior Meat Meal " | 50 | " |
| **Morgan's Meat Meal " | ? | " |

The very small percentages of 'insoluble ash' make it very plain that in no instance was sand present, either intentionally or by accident.

### MILLING PRODUCTS FROM PEASE, OATS AND BARLEY.

Attention has repeatedly been called to the desirability of some official system of inspection and analysis of concentrated feeding stuffs as sold in Canada and which will, further, necessitate the manufacturer or vendor of these products to attach to each bag or consignment a tag bearing a guarantee of the amounts of protein and fat contained by the feed. Such a plan has long been in force with regard to the essential elements of plant food in fertilizers and the ever increasing number of milling by-products now in the market makes it equally important that a similar method be adopted for them. This matter was discussed at some length in our report for 1903,

**This brand effervesces strongly on the addition of acid, showing the presence of a carbonate. It is the only one of the number analysed that so reacted. By reason of this carbonate (probably carbonate of lime) the method here employed for estimating the amount of bone present cannot be applied.

and is only here again brought forward for the reason that recent analyses have furnished an excellent illustration of the force of this contention.

In the early part of the present year a quantity of several such materials was bought from a miller in western Ontario for use in feeding experiments at the Experimental Farm, Ottawa. These on arrival were sampled and analysed and the results are to be found in the subjoined table. Together with the analytical data, the name under which the product was bought, and the price paid are stated:

| — | Water. | Protein. | Fat. | Carbo-hydrates. | Fibre. | Ash. |
|---|---|---|---|---|---|---|
| | p.c. | p.c. | p.c. | p.c. | p.c. | p.c. |
| Pea meal, ground pea chips ($25 per ton) | 8·02 | 25·91 | 2·19 | 61·19 | ·20 | 2·49 |
| Pea dust ($22 per ton) | 8·37 | 26·16 | 2·77 | 48·70 | 10·28 | 3·72 |
| Ground pea bran ($14 per ton) | 8·01 | 28·53 | 2·89 | 48·44 | 8·11 | 4·02 |
| Barley feed ($14 per ton) | 8·57 | 12·12 | 4·34 | 59·00 | 10·87 | 5·10 |
| Meal seeds ($12 per ton) | 5·67 | 7·09 | 3·83 | 60·05 | 19·17 | 4·19 |
| Oat dust ($5 per ton) | 4·81 | 9·59 | 3·77 | 52·13 | 24·60 | 5·10 |

It is quite unnecessary to enter into any detailed discussion of these results in order to make good the point under consideration. A casual review of them with references to the percentages of protein and fat will be sufficient to assure the reader that in most instances the food values and the prices of these feeds are not in accord. Thus, the Ground Pea Bran at $14 per ton contains more protein than the Pea Meal which is quoted at $25 per ton. Again, the 'Meal Seeds' at $12 per ton is poorer in protein than the Oat Dust at $5 per ton. Similar differences are observable between many of the other feeds, and throughout the whole series there is no direct relationship between prices and feeding value. We do not wish it to be inferred that any fraud was intended by this manufacturer; these discrepancies between price and value are, without doubt, the result of ignorance on the part of the manufacturer as to the nature of what he is selling, but they serve, as we have said, to illustrate admirably the desirability of official analysis and the selling of these products with a statement as to their composition attached.

## RAISINS.

At the request of the Poultry Division, Department of Agriculture, we submitted to analysis a sample of spoiled raisins, the object being to ascertain if they were of any value as a poultry food. A comparatively large quantity could be purchased at a very low rate (our correspondent writes) and it is interesting to know how they compare with grain (oats or wheat) at the same price—say 1 cent per pound.

*Analysis.*

| | Per cent. |
|---|---|
| Moisture | 7·86 |
| Crude protein | 5·19 |
| Fat | 3·39 |
| Carbo-hydrates | 72·44 |
| Fibre | 6·71 |
| Ash | 4·41 |
| | 100·00 |

This could not be regarded as of any considerable value either for egg or flesh production as the crude protein is very low—not quite half that present in oats or wheat, for instance. No doubt a considerable part of the carbo-hydrates is glucose or grape sugar, the function of which in the animal economy is the production of heat and energy, and to some extent, the formation of fat. We do not, however, think that this would prove a satisfactory poultry food even at 1 cent per pound.

### GROUND SEEDS.

A sample under the above name was received from Joseph C. King & Co., Port Arthur, Ont. It was in the form of a fine meal, and results, we presume, from the grinding together of the weed seeds, screenings, &c., from cleaning grain.

*Analysis.*

| | Per cent. |
|---|---|
| Moisture | 8·14 |
| Protein | 15·12 |
| Fat | 8·77 |
| Carbo-hydrates | 49·12 |
| Fibre | 13·15 |
| Ash | 5·28 |
| | 100·00 |

Compared with bran, this product contains about an equal amount of protein and about 3 per cent more fat. It is, however, about 3 per cent higher in fibre.

Provided this feed is found to be palatable, no objection can be urged to its use. The fineness to which it is ground precludes the possibility of any dissemination of weeds over the farm in the resulting manure.

### HERBAGEUM.

At the request of several correspondents, an analysis of this well advertised condimental food has been made. It is manufactured by the Beaver Manufacturing Co., Galt, Ont., and its use is stated to 'ensure true economy in the production of milk, flesh, butter, cheese, poultry and eggs.'

*Analysis.*

| | Per cent. |
|---|---|
| Moisture | 6·70 |
| Protein | 22·94 |
| Fat | 6·98 |
| *Carbo-hydrates | 40·61 |
| Fibre | 7·86 |
| **Ash | 14·91 |
| | 100·00 |

Microscopic examination shows it to consist largely of linseed meal and bran or some other wheat refuse. It also contains, in addition to the salt and sugar stated above, fenugreek and charcoal.

Its price, 4 lbs., 60c., 100 lbs., $12, precludes its consideration as a feeding stuff—and in this connection it may be pointed out that its value as such cannot be equal to oil cake meal. We must, therefore, look upon it largely as a tonic or condiment and suppose that the high price for which it is sold is placed upon it for its (alleged) medicinal properties. But viewed either as a food or medicine, or both, it is altogether

* Including sugar, 2·22 per cent. ** Including salt, 10·17 per cent.

too dear. All its constituents are of a cheap character and the mixture, if desired, could be made at a very much lower figure.

Without denying that such condimental foods may be useful at times, the continuous or general employment of them, as is so frequently practiced, is quite unnecessary and uneconomical. Animals that are in good health and thrifty do no better from the addition of such 'tonics' to their ration—this is the conclusion reached by careful experiment—and it becomes a question whether it would not be far cheaper and better to treat stock that are out of condition as their ailments require.

## SUGAR BEETS, FOR FACTORY PURPOSES.

Examples of roots from the three best varieties of sugar beets, Vilmorin's Improved, Klein Wanzleben, and Très Riche (French 'Very Rich'), as grown on the Experimental Farms during the last season, have been analysed.

SUGAR Beets grown on the Dominion Experimental Farms, 1904.

| Variety. | Locality. | Percentage of Sugar in Juice. | Percentage of Solids in Juice. | Co-efficient of Purity. | Average Weight of one Root. Lbs. | Oz. |
|---|---|---|---|---|---|---|
| Vilmorin's Improved...... | Nappan, N.S........... | 15·59 | 20·04 | 77·8 | 1 | 4 |
| " ...... | Ottawa, Ont........... | 16·59 | 18·50 | 90·2 | | 14 |
| " ...... | Brandon, Man.......... | 16·66 | 20·40 | 81·7 | 1 | 3 |
| " ...... | Indian Head, N.W.T... | 14·87 | 18·00 | 82·6 | 1 | 2 |
| " ...... | Agassiz, B.C........... | 7·03 | 12·13 | 57·9 | 1 | 2 |
| Klein Wanzleben......... | Nappan, N.S........... | 13·83 | 18·03 | 76·7 | 1 | 10 |
| " ..... | Ottawa, Ont........... | 16·92 | 19·34 | 87·5 | | 14 |
| " ......... | Brandon, Man.......... | 16·65 | 20·50 | 81·2 | 1 | 6 |
| " ......... | Indian Head, N.W.T... | 15·96 | 19·50 | 81·8 | 1 | 2 |
| French 'Very Rich'...... | Nappan, N.S........... | 13·82 | 18·89 | 73·2 | 1 | 5 |
| " ...... | Ottawa, Ont........ | 17·24 | 20·01 | 85·7 | 1 | 5 |
| " ...... | Brandon, Man.......... | 16·56 | 19·68 | 84·1 | 1 | 8 |
| " ...... | Indian Head, N.W.T... | 14·89 | 18·03 | 82·6 | 1 | 4 |
| " ...... | Agassiz, B.C........... | 8·17 | 13·13 | 62·2 | 1 | 2 |

SUGAR Beets grown on the Experimental Farms, 1904—Particulars of Growth.

| Locality. | DATE. Sowing. | Pulling. | DISTANCE BETWEEN. Rows. Ft. | In. | Plants in Rows. In. | Remarks. |
|---|---|---|---|---|---|---|
| Experimental Farm— | | | | | | |
| Nappan, N.S......... | May 30.. | Oct. 12.. | 2 | 0 | 12 | Light clay loam, manured at rate of 25 one-horse cart loads per acre. |
| Ottawa, Ont........ | | | | | | |
| Brandon, Man........ | .......... | Sept. 24.. | 3 | 0 | 12 | Rich black sandy loam, manured three years ago with barn-yard manure at the rate of 10 loads to the acre .......... .......... |
| Indian Head, N.W.T.. | May 27.. | Oct. 6.. | 2 | 4 | 8 | Clay loam, 10 loads rotted manure to the acre. |
| Agassiz, B.C......... | April 25.. | " 24.. | 2 | 6 | | |

*Nova Scotia, Nappan.*—The beets of this farm are perceptibly of lower quality than those of last year. This is noticeable in the sugar content, but more particularly so in purity. The average percentage of sugar in the three varieties tested, for 1903, was 15·33, with a co-efficient of purity of 81·3; for the present season, the averages are 14·41 and 75·8, respectively.

It will be observed that as regards both sugar content and purity, Vilmorin's Improved is the best. Klein Wanzleben and Très Riche give results practically identical and are somewhat less valuable for factory purposes.

*Ontario, Ottawa.*—Both as regards sugar content and purity, the results are considerably in advance of those of 1903, due, undoubtedly, to the more favourable character of the past season. They indicate a beet in all respects eminently suitable for sugar extraction.

The following data will allow a comparison of these varieties for the past three years, as grown on the Experimental Farm, Ottawa.

| | Sugar in Juice, per cent. | Co-efficient of Purity. |
|---|---|---|
| Vilmorin's Improved— | | |
| 1902 | 17·26 | 87·0 |
| 1903 | 15·61 | 92·0 |
| 1904 | 16·59 | 90·2 |
| Klein Wanzleben— | | |
| 1902 | 17·84 | 91·5 |
| 1903 | 15·12 | 86·9 |
| 1904 | 16·94 | 87·5 |
| Très Riche (French 'Very Rich')— | | |
| 1902 | 15·81 | 89·1 |
| 1903 | Not grown. | |
| 1904 | 17·24 | 85·7 |

The results not only indicate the high character of these varieties for factory purposes, but furnish an excellent illustration of the effect of the season upon the sugar content of the beet. In 1903, it will be noticed, there was a considerable falling off in the percentage of sugar, compared with the results of 1902 and 1904. This was due, no doubt, to the exceptional climatic conditions that prevailed that season (1903), a protracted drought in the spring followed by heavy and continuous rains in the autumn. These rains induced a second growth of the root at a time when the storing up of sugar more particularly takes place and for which, if the sugar content is to be satisfactory, warm, dry weather is essential.

*Manitoba, Brandon.*—For several years past sugar beets from Manitoba, as grown at Brandon and in the neighbourhood of Winnipeg, have been analysed, but we have never before been able to report—save in what might be called one or two exceptional cases—very favourably. Thus in 1903, Vilmorin's Improved gave only 11·36 per cent sugar in juice and 73·7 co-efficient of purity. Reference to the foregoing table, however, shows the beets as grown on the Experimental Farm, Brandon, this year to be of excellent quality. Mr. Bedford, the superintendent, on being informed of the results, writes: 'I was not aware that the season had been particularly favourable to a high sugar content, but nearly all field roots with us have given above an average yield.'

*North-west Territories, Indian Head.*—In all three varieties a very satisfactory sugar content was obtained. The percentages of sugar are slightly lower than those for 1903, but are sufficiently high for factory purposes.

*British Columbia, Agassiz.*—The two varieties received this year from the Experimental Farm at Agassiz, Vilmorin's Improved and Très Riche, were very poor in sugar content, with a corresponding low co-efficient of purity. In 1903, excellent beets were grown here, showing a very satisfactory sugar content. Mr. Sharpe reports 'a very poor season (1904) for mangels, carrots, and sugar beets,' so we must suppose the present unsatisfactory results have been due to specially unfavourable climatic conditions.

## CHEMISTRY OF THE SUGAR BEET.

Within the last few years, as is well known, there has been a revival in certain centres in the Dominion of the beet sugar industry, and factories are now in operation at Berlin and Wallaceburg, Ontario, and at Raymond, Alta, N.W.T.

The commercial success of the undertaking at any point depends very largely on obtaining an adequate supply of beets. It is necessary, if the extraction of the sugar is to be profitable and the return to the farmer a lucrative one, not only that the beets be up to a certain standard of richness and purity, but also that the tonnage available, in other words, the acreage be sufficiently large. According to the size of the 'plant' or factory so will the tonnage be necessary for its profitable operation, but we may safely assume that not less than 30,000 tons will be required for a modern factory—one Ontario factory stated 40,000 tons as a minimum, and another, 50,000 tons. If we allow a yield of 10 tons per acre (the average over large areas is somewhat less), the area under beets, within reasonable distance of a factory necessary to satisfactorily supply its requirements, will be from 3,000 to 5,000 acres. These considerations and the further fact that on some part of the farm the crop must be grown annually (or otherwise there will be a shortage of beets for the factory), have led to many inquiries as to the effect of the sugar beet on the soil, i.e., as regards the exhaustion of the more esential elements of plant food.

To answer these inquiries we have submitted to analysis beets—roots, collars or crowns and leaves, separately—at three stage of growth, determining, among other constituents, the percentages of nitrogen, phosphoric acid, potash, and lime present. The variety selected was Klein Wanzleben and the collections were made on July 29, September 8, and October 19. The soil of the plot (Experimental Farm, Ottawa) was a fairly rich, warm, well drained sandy loam.

Immediately on taking the samples the beets were cleaned and the proportions (by weight) of the leaves, collars, and dressed roots (as ready for the factory) determined.

PROPORTION of Leaves, Collars and Roots in Sugar Beets.

| Date of Collections. | Leaves. | Collars or Crowns. | Roots. |
|---|---|---|---|
| First collection, July 29 | 68·3 | 6·4 | 25·3 |
| Second " Sept. 8 | 46·4 | 12·7 | 40·9 |
| Third " Oct. 19 | 37·8 | 11·4 | 50·8 |

The proportion of the dressed root had increased from 25·3 per cent to 50·8 per cent between July 29 and October 19 (practically an increase of 100 per cent), while the relative weight of leaves had decreased from 68 per cent to 37 per cent, or 44·6 per cent. The proportion of crowns or collars, the part from which the leaves spring and which with the leaves is left on the ground when dressing the beets for the factory, increased from 6·4 per cent to 12·7 per cent, practically 100 per cent, between the dates of the first and second collection. On October 19, when the last collection was made the proportion of collar was somewhat less, viz., 11·4 per cent.

The composition of the leaves, collars and roots as regards water, organic matter, and ash, on the several dates of collection, is shown by the following data :—

ANALYSIS of Sugar Beets.

| Date of Collections. | Leaves. | | | Collars or Crowns. | | | Roots. | | |
|---|---|---|---|---|---|---|---|---|---|
| | Water. | Organic Matter. | Ash. | Water. | Organic Matter. | Ash. | Water. | Organic Matter. | Ash. |
| First collection, July 29 | 92·16 | 5·96 | 1·88 | 84·21 | 14·59 | 1·20 | 86·38 | 12·71 | ·91 |
| Second " Sept. 8 | 89·16 | 8·74 | 2·10 | 80·95 | 17·59 | 1·46 | 82·12 | 16·97 | ·91 |
| Third " Oct. 19 | 87·58 | 10·10 | 2·32 | 79·50 | 19·22 | 1·28 | 80·70 | 18·50 | ·80 |

*Leaves.*—These show a general and continuous increase in organic matter and ash constituents throughout the growing period.

Compared, weight for weight, with the collars and dressed roots, the leaves are considerably lower in organic matter, but decidedly higher in ash. This is true at all three periods of growth at which the examination was made.

*Collars or Crowns.*—These also show a continuous increase in organic matter, though the increase is not so marked as in the leaves. On July 29 the percentage of organic matter was almost three times that of the leaves. On the two last dates of collection it was practically twice that of the leaves.

Compared with the dressed roots, the collars are invariably the higher (from 1 per cent to 2 per cent) in organic matter.

The percentage of ash is intermediate between that of the leaves and that of dressed roots, but unlike that in the leaves does not uniformly increase. The results seem to show a slight increase between July 29 and September 8, but a decline from that date till October 11, practically to the percentage present on July 29.

*Roots.*—As regards organic matter, we find a marked increase throughout the whole period. The percentage of ash remained the same from July 29 to September 8, and fell off a little from the latter date till October 19.

FERTILIZING CONSTITUENTS IN THE BEET.

Proceeding to a discussion of the essential elements of fertility present in the roots, collars and leaves, respectively, we may first consider briefly the data of the following table, which gives the percentages of phosphoric acid, potash, lime and nitrogen, in the fresh material :—

FERTILIZING Constituents in Sugar Beets (in fresh material).

| Dates of Collection. | Leaves. | | | | Collars or Crowns. | | | | Roots. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Phosphoric Acid. | Potash. | Lime. | Nitrogen. | Phosphoric Acid. | Potash. | Lime. | Nitrogen. | Phosphoric Acid. | Potash. | Lime. | Nitrogen. |
| 1st collection, July 29 | ·051 | ·563 | ·129 | ·231 | ·106 | ·382 | ·038 | ·194 | ·086 | ·403 | ·068 | ·148 |
| 2nd " Sept. 8 | ·065 | ·716 | ·184 | ·249 | ·111 | ·354 | ·042 | ·221 | ·115 | ·366 | ·032 | ·138 |
| 3rd " Oct. 19 | ·110 | ·823 | ·211 | ·279 | ·132 | ·303 | ·062 | ·271 | ·106 | ·338 | ·046 | ·187 |

*Leaves.*—As might have been expected from the already observed continued increase in organic matter and ash, the percentages of all these elements increase.

Weight for weight, the leaves are very much richer in potash than either the collars or dressed roots, and the percentage of this element, it will be noticed, makes a very marked advance as the season progresses.

The same tendency is to be observed in the case of the phosphoric acid and lime and nitrogen. It is thus seen that the older leaves, compared weight for weight, contain much more soil-derived plant food than the younger.

*Collars or Crowns.*—Here we find a slight increase in the percentages of phosphoric acid and lime, but a falling off in the potash.

The percentage of nitrogen shows a notable increase in this part of the beet as the plant grows.

*Roots.*—As the season advances, the following changes are to be noted: The phosphoric acid slightly increases; the potash shows a slight, but more apparent decrease; the nitrogen apparently increases, though the gain is a small one.

A review of the foregoing data when calculated on the dry matter (water-free material) reveals certain interesting facts:

FERTILIZING Constituents of Sugar Beets : Calculated on Water-free material.

| Dates of Collection. | Leaves. | | | | Collars or Crowns. | | | | Roots. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Phosphoric Acid. | Potash. | Lime. | Nitrogen. | Phosphoric Acid. | Potash. | Lime. | Nitrogen. | Phosphoric Acid. | Potash. | Lime. | Nitrogen. |
| 1st collection, July 29 | ·646 | 7·18 | 1·64 | 2·95 | ·670 | 2·42 | ·24 | 1·23 | ·637 | 2·96 | ·50 | 1·09 |
| 2nd " Sept. 8 | ·60 | 6·61 | 1·70 | 2·30 | ·584 | 1·86 | ·22 | 1·16 | ·643 | 2·05 | ·18 | ·77 |
| 3rd " Oct. 19 | ·888 | 6·63 | 1·70 | 2·25 | ·643 | 1·48 | ·30 | 1·32 | ·549 | 1·75 | ·24 | ·97 |

*Leaves.*—Neglecting slight differences, the dry matter of the leaves remains fairly constant throughout the season (July-October) in phosphoric acid and lime.

In potash and nitrogen the percentages decrease perceptibly, more particularly during August. During September there is but little change. It is evident, therefore, that the increase of these constituents before noted as appearing in the fresh leaves, is due to the larger amount of dry matter contained in the leaves as the plant reaches maturity, rather than to any enrichment of that dry matter. This points to the greater absorption of these constituents from the soil in the early stages of growth than subsequently.

*Collars or Crowns.*—The phosphoric acid and lime do not vary to any large degree, but the percentage of potash falls away very considerably as the plant approaches maturity. The nitrogen suffers slight change, but the direction of the change is not well marked.

*Roots.*—The most notable fact to be observed is the large decrease in potash content, as the season advances, evidently due in a large measure to relatively less potash being absorbed in the later months of the season and the fact that it is particularly during this latter period that the sugar is developed, thus, as it were, diluting the mineral constituents in the root. The lime is reduced to about one-half, from July to October, very probably the causes being those just stated. There are minor fluctuations of the other constituents, but they are not sufficiently marked to allow of hard and fast deductions being made as to the general trend in content of these elements in the dry matter as the beet ripens.

FERTILIZING CONSTITUENTS PER ACRE.

From the practical standpoint of the beet grower, who naturally wishes to know the amounts of fertilizing constituents taken from the soil and contained in the different parts of the beet at the various stages of growth, the data of the concluding tables will prove of interest and value. The results will also prove useful in a consideration of those fertilizers that it may be necessary to employ for the sugar beet crop, and at the same time maintain the soil's productiveness.

To obtain them we have employed the foregoing data and the weights of the various parts taken from an equal number of beets at date of collection, the only assumption entering into the calculation being that of 10 tons per acre of dressed roots at maturity.

WEIGHT per Acre of the different parts of the Sugar Beet: Computed on the basis of 10 Tons of Dressed Roots, October 19.

| Dates of Collection. | Leaves. | | Collars. | | Roots. | |
|---|---|---|---|---|---|---|
| | Tons. | Lbs. | Tons. | Lbs. | Tons. | Lbs. |
| First collection, July 29 | 4 | 1,381 | .. | 879 | 1 | 1,475 |
| Second " Sept. 8 | 9 | 1,702 | 2 | 1,392 | 8 | 1,367 |
| Third " Oct. 19 | 7 | 872 | 2 | 470 | 10 | .. |

In spite of the large increase in the weight of the dressed roots per acre during the period, September 8 to October 19 (due chiefly to the development of sugar), the total weight of the crop is less on the latter than on the former date. The weights, respectively, are 21 tons, 461 lbs. on September 8, and 19 tons, 134 lbs. on October 19. This is explained chiefly by the drying out of the leaves; the loss of the weight of water in this way being greater than the gain in weight of sugar. It may in a small measure be also due to the breaking off and falling away of certain of the more mature leaves. This would not only lessen the weight of crop at this date, but also reduce the amounts of the fertilizing constituents contained in the crop at this period, and thus explain a certain small decrease in weight of potash per acre noticeable between September 8 and October 19.

It is of interest to observe that of the total weight of crop at harvesting, if the beets are properly 'topped' on the field, practically one-half is removed in the dressed roots.

In the following tabular scheme the data representing the fertilizing constituents in the crop are given, the figures indicating the amounts (per acre) found in the various parts at the three periods of collection :—

FERTILIZING Constituents in Beet Crop. Pounds per Acre (Computed).

| Dates of Collections. | Leaves. | | | | Collars or Crowns. | | | | Roots. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Phosphoric Acid. | Potash. | Lime. | Nitrogen. | Phosphoric Acid. | Potash. | Lime. | Nitrogen. | Phosphoric Acid. | Potash. | Lime. | Nitrogen. |
| 1st collection, July 29 | 4·8 | 52·8 | 12·1 | 21·7 | ·9 | 3·3 | ·3 | 1·7 | 3·0 | 14·0 | 2·4 | 5·1 |
| 2nd " Sept. 8 | 12·8 | 141·0 | 36·2 | 49·0 | 6·0 | 19·0 | 2·3 | 12·0 | 20·0 | 63·6 | 5·6 | 24·0 |
| 3rd " Oct. 19 | 16·3 | 122·4 | 31·4 | 41·5 | 5·9 | 13·5 | 2·8 | 12·1 | 21·2 | 67·6 | 9·2 | 37·4 |

There is in these results much of interest, but it may suffice for our present purpose to call attention to one or two of the more important deductions that may be made from them. The largest draught is upon the potash. On July 29, the amount was 70 lbs. per acre, increasing to a total of over 200 lbs. by the time the beets were ready to harvest.

The relative amounts of this potash in roots and leaves is also a matter of importance. Thus, according to these results, there is at the time of harvesting the beet practically twice as much potash in the leaves and crowns taken together as in the dressed roots.

Further, we conclude that at this period the phosphoric acid in the dressed roots is essentially equal to that in the leaves and crowns taken together, while the nitrogen in the dressed roots is two-thirds of that contained in the rest of the beet. These deductions will perhaps be more evident from the following table of data, given for October 19, 1904 :

FERTILIZING Constituents in Beet Crop, per Acre.

| Constituents. | Leaves and Crowns. | Dressed Roots. | Total. |
|---|---|---|---|
| | Lbs. | Lbs. | Lbs. |
| Potash | 135·9 | 67·6 | 203·5 |
| Phosphoric acid | 22·2 | 21·2 | 43·4 |
| Nitrogen | 53·6 | 37·4 | 91·0 |

It is very evident that if the leaves are carted away and used as cattle food the restitution of potash and nitrogen to maintain the fertility of the soil must be very much greater than if the crop is 'topped' on the field.

Another important deduction may be made respecting the period of growth at which this plant food is more particularly absorbed by the beet crop. The figures from which to obtain this information are as follows :

WEIGHTS of Fertilizing Constituents per Acre in Beet Crop (Roots, Crowns and Leaves) at various stages of growth.

| Dates of Collections. | Phosphoric Acid. | Potash. | Lime. | Nitrogen. |
|---|---|---|---|---|
| | Lbs. | Lbs. | Lbs. | Lbs. |
| First collection, July 29 | 8·7 | 70·1 | 14·8 | 28·5 |
| Second " Sept. 8 | 38·8 | 213·6 | 44·1 | 85·0 |
| Third " Oct. 19* | 43·4 | 203·5 | 43·4 | 91·0 |

It needs but a glance to show that there is very little appropriation of soil food after September 1, though from that date till the middle of October there was a large production of sugar, as made evident by the increase in the weight of dressed roots (1 ton 633 lbs. per acre) and the higher percentage of sugar in them. The percentages of sugar in the beet at the various periods, were as follows : July 29, 8·07 per cent; September 8, 14·12 per cent ; and on October 19, 14·94 per cent. This early assimilation of nourishment from the soil, to my mind, points to the desirability of thorough

*From the weight of potash recorded for this collection being less than that for Sept. 8th, it seems quite probable that all the data for the third collection are somewhat too low—owing, we conjecture, chiefly to the loss of mature leaves, as already explained.

preparation of the soil, so that by a favourable tilth or mechanical condition of the soil and a generous supply of available plant food the young plant may make a rapid growth during the spring and early summer months. It is not desirable, as is well known, to grow a large beet, as that would mean a poor beet for factory purposes, but the size should be controlled by the system of sowing rather than by lack of plant food or an unfavourable condition of the soil. The elaboration of sugar—the aim of growing the crop—does not take place to any large extent while the beet is yet young, it occurs rather during the maturation of the plant. For a large production of sugar there must be an abundance of foliage, and this cannot be obtained unless the plant has access to large stores of soil food, both mineral and nitrogenous, during that earlier period in the beet's history, when the foliage is more particularly developed.

## THE EFFECT OF RUST ON THE STRAW AND GRAIN OF WHEAT.

The prevalence of rust this season in certain districts of Manitoba has led to inquiries regarding the general effect of this fungus upon the wheat plant—both straw and grain—and more particularly as to how it may influence their feeding value. To obtain data on this subject, samples of both rusted and rust-free wheat have been obtained and analysed.

In order that the results should be strictly comparable, it was important in procuring these samples that the clean and the affected wheat should be of the same age and grown on the same soil. Through the kind offices of the editor of the 'Nor-West Farmer,' we were able to secure such specimens. In the letter accompanying them (under date of September 15), it is stated that both wheats were collected by hand on the same day in the same field, on the farm of Sir William Van Horne at East Selkirk, Manitoba.

There was a marked difference in appearance between them, both in straw and grain. The rust-free wheat had a clear, bright yellow, well-ripened straw; a normal ear, both as to size and colour, and plump, well-filled grain. On the other hand, the rusted wheat straw presented in general a dirty greenish-brown appearance and on closer inspection showed many spots or patches of infection, while its ears were smaller than normal and the kernels light and much shrivelled.

ANALYSIS of Rusted and Rust-free Wheat—Straw and Grain.

| — | Weight of 100 kernels. | Moisture. | Crude Protein. | Crude Fat. | Carbo-hydrates. | Fibre. | Ash. |
|---|---|---|---|---|---|---|---|
| | Grams. | | | | | | |
| Straw from rust-free wheat | ........ | 7·92 | 2·44 | 1·65 | 39·00 | 39·95 | 9·04 |
| " rusted " | ........ | 7·92 | 7·69 | 1·97 | 38·44 | 36·78 | 7·20 |
| Grain from rust-free wheat | 3·0504 | 12·26 | 10·50 | 2·56 | 70·55 | 2·29 | 1·84 |
| " rusted " | 1·4944 | 10·66 | 13·69 | 2·35 | 68·03 | 3·03 | 2·24 |

*The Straw.*—We first notice that in crude protein the rusted straw is much the richer. Under the term crude protein is included all those nitrogenous compounds of a food that go to repair waste, form blood and build up muscle and tissue. The high value of concentrated feed stuffs is due chiefly to the large proportion of protein they contain. It may safely be concluded, therefore, that the rusted straw, containing as it does more than three times the protein found in the rust-free straw, is very much superior in feding value.

Further, in the rusted straw we have a slightly higher percentage of fat—the constituent next in value to protein—and somewhat less fibre—the element of least value in a fodder, and hence there is additional evidence of the most satisfactory character to support the statement respecting the more nutritious nature of the rust-affected straw.

*The Grain.*—The small and shrivelled character of the grain from the rusted wheat may be deduced from the data in the first column of the table—the weight of 100 kernels being only half that of 100 kernels from the unaffected wheat. This fact, however, from the standpoint of a feed does not betoken a lessening of the nutritive qualities; indeed, as the data for the protein show, it has, weight for weight, considerably the higher value.

The protein of the shrivelled grain is 3·19 per cent higher than that of the plump grain from the rust-free plant. Part of this higher protein content in the smaller grain is no doubt to be accounted for in its larger proportion of bran—but chiefly is it due to the fact that the transference and accumulation of starch in the kernel has been but partial and incomplete.*

Other features of note in the analysis of the grain from the rusted wheat are : (1) the somewhat larger percentages of fibre and ash—indicating more bran—and, (2) the lower carbo-hydrates (starch) and fat content.

Apart from the valuable information that these data furnish regarding the relative feeding value of the straw and grain of rusted wheat, we have in these results interesting evidence as to the physiological effect of the rust on the wheat plant. Speaking broadly, there are (after germination) two periods in the life of the wheat plant—the first, a period of feeding and assimilation; the second, a later and usually shorter period, during which the food materials accumulated in the stem and leaf (straw) are transferred to and stored in the seed (kernel). There is, of course, no exact time when it can be said that the one ends and the other begins. Under normal conditions there is a gradual cessation of feeding, both by root and leaf, accompanied by an ever increasing movement of the accumulated material to the seed. The first period is characterized by growth, the second is recognized by the maturation or ripening of the seed.

Further, it would seem that in the development of the seed, the albuminoids or protein are the first to be transferred and later—towards the close of the maturation period—the carbo-hydrates (starch, &c.), are more particularly deposited.

The rust apparently does not affect the vitality of the wheat plant during the first stage or period, but as the season progresses and the ripening period advances the fungus attains the ascendancy, crippling the energies and functions of the tissues and checking the movement of the food materials to the seed. In other words, the growth of the rust arrests development and induces premature ripening, which, as we have seen, means a straw in which still remains the elaborated food, and a grain small, shrivelled, immature, rich in protein and deficient in starch.

It may be well to point out that although the rust makes the grain more nitrogenous, it at the same time very materially reduces the yield per acre—the present figures indicating a loss in weight of about 50 per cent.

We have not as yet been able to complete the analysis of the milling products of this shrivelled wheat, but we may rest assured until such time as the data are avail-

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* NOTE.—Some years ago in determining the relative feeding value of frosted wheat (which presents a shrivelled appearance very similar to that of the grain from rusted wheat) we found that the protein content was considerably higher than in the unfrozen mature grain. It is evident that the effect of rust and frost in this respect, is the same, resulting in a premature ripening or rather a drying out of the grain which, as we have seen, means a kernel high in protein, but low in starch.

able that its proportion of bran to flour will be higher than from normally ripened wheat. We may, further, conjecture that this bran will be found slightly more nitrogenous than that from rust-free wheat. It is held by certain millers that rust makes the flour somewhat 'stronger,' but at the moment there are no data, I believe, to support this contention.

## WELL WATERS FROM FARM HOMESTEADS.

One hundred samples of well water have been received during the past year. Of these, 66 were submitted to analysis, the remaining 34, by reason of insufficient quantity or a dirty bottle or cork, were not examined. In the appended table the data obtained are given, together with a very brief conclusion as to the character of the water. To those forwarding the samples more extensive reports have been sent, indicating the character of the pollution when present, and when necessary and possible making suggestions for the improvement of the supply.

It will be seen by reference to the table that of the 66 waters examined, 27 were returned as safe and wholesome, 18 were found most seriously polluted, and 16 were reported as very suspicious and probably unsafe. Five were saline waters.

There are too many shallow wells in existence and most of them, I regret to say, are situated so that they may receive soakage from the barnyard or similar contaminating source. The barnyard and back-door wells should all be filled up, for they are a menace to the farmer and his family and, further, it should be emphasized that water which is dangerous to use in the house cannot be good for stock.

The soil is an excellent purifying agent, but it has its limitations and once it has become loaded and choked with organic filth it cannot longer perform this beneficial function. When once the soil surrounding a well has become so charged no amount of cleaning the well will prove effective; the well should be abandoned.

Our 'deep seated' waters are for the most part pure and the driven well, placed at safe distance from the farm buildings and equipped with a windmill pump, should be a source on many farms of an ample and wholesome supply for house and barn. There are other sources of good water, creeks, rivers, and lakes, and these can frequently be utilized at little cost. An earnest and intelligent effort will result in most instances in securing pure water, and no farmer should rest content without making this effort if his present supply is from the barnyard well. Pure water is as necessary and desirable in the country as in the city, and there is no reason, with a moderate outlay, why it should not be found in the rural home. We believe there has been a great improvement in this matter during recent years, but the facts clearly show that there is yet room for advance.

All that has been said regarding the supply for the farm applies with equal force to that of the creamery and cheese factory. It was admitted at the Dairy Conference recently held in Ottawa that the water supplies of many of these factories were anything but satisfactory. Instances, and many of them, were given of very foul water being used in the making of both butter and cheese—and the consensus of opinion amongst those present was that there should be a systematic inspection and examination of all the supplies of creameries and cheese factories and, if necessary, to have legislation on the matter. Dairy experts are agreed that neither first-class butter or cheese can be made if the water is not good. It will thus be seen that the water question is one that affects our commerce as well as our health.

# ANALYSES OF WELL WATERS, 1904.

RESULTS STATED IN PARTS PER MILLION.

| Number. | Locality. | Marks. | Date. | Free Ammonia. | Albuminoid Ammonia. | Nitrogen in Nitrates and Nitrites. | Chlorine. | Total Solids at 105° C. | Solids after Ignition. | Loss on Ignition. | Phosphates. | Report. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1903. | | | | | | | | | |
| 1 | Dunham, Que. | E. O'L. | Dec. 7 | ·058 | ·105 | ·100 | Nil. | 65·6 | 48·0 | 17.6 | Slight trace. | Eminently suited for drinking and household purposes. |
| 2 | Calgary, Alta | J. A. T. | " 14 | Free. | ·162 | ·44 | 2·5 | 667·0 | 419·0 | 248·0 | None | Good and wholesome. |
| | | | 1904. | | | | | | | | | |
| 3 | Vankleek Hill, Ont. | J. A. Mac | Jan. 18 | ·05 | ·095 | 5·171 | 34·5 | 422·4 | 266·8 | 155·6 | Traces. | Very suspicious. |
| 4 | Knowlton, Que | S. A. F. | Feb. 6 | ·445 | ·425 | 8·375 | 5·8 | 185·6 | 89·6 | 96·0 | Heavy trace. | Contaminated with drainage matter |
| 5 | Welwyn Station, Assa | A. S | " 8 | ·138 | ·98 | 11·559 | 173·0 | 8632·8 | 6140·0 | 2492·6 | | Saline water. |
| 6 | Fredericton, N.B | F. A. G. No. 1. | Mar. 14 | ·015 | ·1875 | ·267 | 3·0 | 72·0 | 32·0 | 40·0 | Free. | Probably unpolluted. |
| 7 | " | " No. 2. | " 14 | ·09 | ·045 | ·111 | 1·0 | 8·0 | 3·0 | 5·0 | " | " |
| 8 | Bayswater, Ont. | L. N. | " 19 | ·036 | ·135 | 4·615 | 21·0 | 407·6 | 182·4 | 225·2 | Traces. | Polluted. |
| 9 | Oaklake, Man | H. R. T | " 28 | ·01 | ·315 | 4·29 | 72·5 | 4071·0 | 3138·0 | 933·0 | None | Saline water. |
| 10 | McAdam, N.B. | J. W. H. | " 28 | ·06 | ·05 | 3·261 | 9·0 | 102·4 | 62·6 | 39·0 | " | Suspicious. |
| 11 | " | D. T. | " 28 | Free. | ·075 | 3·623 | 6·75 | 71·6 | 33·6 | 38·0 | " | Somewhat suspicious. |
| 12 | Nepean, Ont | J. K. | " 29 | " | ·45 | 5·419 | 27·5 | 446·0 | 247·2 | 198·8 | | Very seriously polluted. |
| 13 | Dunham, Que. | A. W. W. | Apr. 14 | ·335 | ·135 | 1·815 | 2·0 | 182·4 | 108·4 | 74·0 | | Suspicious. |
| 14 | Mahone Bay, N.S. | A. C. No. 3. | May 18 | ·045 | ·18 | ·058 | 4·0 | 27·6 | 2·8 | 24·8 | V. S. trace. | Good and wholesome. |
| 15 | " | " No. 4. | " 18 | ·098 | ·125 | ·017 | 4·0 | 32·4 | 4·4 | 28·0 | Slight trace. | " |
| 16 | " | " No. 5. | " 18 | ·02 | ·195 | ·082 | 6·25 | 34·8 | 6·4 | 28·4 | None | " |
| 17 | Clinton, Ont | D. A. F. | " 25 | Free. | ·18 | 11·62 | 18·3 | 438·2 | 254·4 | 183·8 | Traces. | Contaminated. |
| 18 | L'Epiphanie, Que | J. P. C. | June 7 | ·050 | ·165 | ·041 | 32·5 | 166·0 | 126·4 | 39·6 | " | Good and wholesome. |
| 19 | Campbell's Bay, Que | T. A McT. | " 14 | ·10 | ·90 | ·29 | 1·0 | 253·0 | 149·0 | 104·0 | " | Very suspicious. |
| 20 | Nepean, Ont | W. L. R. | July 6 | 13·07 | 5·03 | 4·38 | 110·0 | 944·8 | 560·0 | 384·8 | V. H. trace. | Contaminated; unfit for domestic purposes. |
| 21 | Hintonburg, Ont. | H. R. | " 12 | ·024 | ·115 | 3·892 | 14·5 | 344·0 | 216·8 | 127·2 | Hvy. ppte. | Seriously polluted. |
| 22 | Wallace, N.S. | C. W. M. | " 20 | ·036 | .4575 | ·0037 | 170·0 | 191·0 | 112·0 | 79·0 | V. S. trace. | Suspicious. |
| 23 | Fredericton, N.B. | E. B. J. No. 1. | Aug. 1 | ·06 | ·188 | ·092 | 2·3 | 70·0 | 33·6 | 36·4 | Traces. | Free from pollution. |
| 24 | " | " No. 2. | " 1 | ·188 | ·165 | ·0297 | 2·8 | 75·6 | 35·6 | 40·0 | Trace. | Seriously contaminated. |
| 25 | " | " No. 3. | " 1 | ·03 | ·14 | ·0249 | 2·2 | 69·2 | 33·2 | 36·0 | " | Free from pollution. |
| 26 | " | " No. 4. | " 1 | Free. | ·138 | ·05 | 1·6 | 64·4 | 32·4 | 32·0 | None | " |
| 27 | South Durham, Que. | R. M. | " 3 | 1·14 | ·135 | 3·55 | 22·5 | 207·6 | 152·8 | 54·8 | Heavy trace | Very seriously polluted. |
| 28 | Muskoka, Ont | W. G. O'H. | " 4 | ·24 | ·27 | 4·923 | 60·0 | 344·4 | 207·5 | 136·8 | Traces. | Contaminated with drainage matter |
| 29 | Summerside, P.E.I | J. R. | " 9 | ·056 | ·038 | 3·0 | 17·0 | 178·8 | 103·6 | 75·2 | V. H. trace. | Dangerously contaminated. |
| 30 | " | A. C. | " 9 | Free. | Free. | ·288 | 9·0 | 126·4 | 86·4 | 40·0 | Slight trace. | Wholesome. |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31 | Elgin, Ont | G. S. C. | " | 9 | " | ·335 | 2·095 | 90·0 | 575·6 | 431·6 | 144·0 | Heavy trace | Unfit for drinking purposes. |
| 32 | Wallace, N.S | C. W. M | " | 9 | ·02 | ·50 | Free. | 21·0 | 146·0 | 85·2 | 60·8 | Traces | Suspicious. |
| 33 | Sky, Ont. | H. A. McD. | " | 9 | 3·87 | ·39 | 9 022 | 28·0 | 475·6 | 403·6 | 72·0 | " | Very seriously polluted. |
| 34 | Hampton, N.B | J. D. F. | " | 10 | Free. | ·315 | Free. | 110·0 | 602·0 | 406·0 | 196·0 | Free | Suspicious. |
| 35 | Rockliffe, Ont | M. A. S. | " | 16 | " | ·073 | ·428 | 2·0 | 160·4 | 103·6 | 56·8 | V. S. trace.. | Wholesome. |
| 36 | Lancaster, Ont. | W. J. S | " | 17 | ·548 | ·28 | Traces. | 21·0 | 343·6 | 270·8 | 72·8 | Slight trace. | Most seriously polluted. |
| 37 | Shawville, Que. | R. H. | " | 25 | ·01 | ·52 | ·008 | 2·25 | 16·4 | 3·6 | 14·8 | " | Good and wholesome. |
| 38 | Ashcroft, B.C | R. S. | " | 25 | ·01 | ·078 | ·304 | 13·0 | 1102·4 | 809·2 | 293·2 | Traces | Slightly saline, but most probably wholesome. |
| 39 | Somenos, B.C. | J. J. | " | 30 | None. | ·03 | ·214 | 1·75 | 45·6 | 29·6 | 16·0 | Slight trace. | Very good water. |
| 40 | Channel, Que | J. W. P. | Sept. | 1 | " | 0·85 | 3·195 | 4·25 | 247·2 | 192·0 | 55·2 | " | Free from pollution. |
| 41 | Arnprior, Ont | G. A. C. | " | 6 | ·21 | 1·74 | 6·695 | 400· | 13·20 | 1032·8 | 287·2 | V. S. trace.. | Very seriously polluted. |
| 42 | Fredericton, N.B. | E. B. J. No. 5.. | " | 6 | ·036 | ·208 | ·0197 | 1·8 | 74·8 | 31·6 | 43·2 | " | Good and wholesome. |
| 43 | " | " No. 6.. | " | 6 | ·010 | ·24 | ·024 | 2·0 | 75·2 | 32·0 | 43·2 | None | " |
| 44 | " | " No. 7.. | " | 6 | ·044 | ·256 | ·0131 | 2·5 | 64·8 | 34·8 | 34·0 | V. S. trace.. | " |
| 45 | " | " No. 8.. | " | 6 | ·050 | ·208 | ·0082 | 2·2 | 75·2 | 31·2 | 44·0 | " | " |
| 46 | Carp, Ont | J. H. C | " | 10 | ·06 | ·155 | 4·48 | 28·0 | 417·6 | 305·2 | 112·4 | Heavy trace | Seriously polluted. |
| 47 | Grenfell, N.W.T. | E. F | " | 12 | ·045 | ·24 | None. | 23·0 | 2035·0 | 1550·0 | 485·0 | " | Saline water. |
| 48 | Baldur, Man | H. McPh. | " | 15 | Free. | ·915 | " | 14·0 | 744·5 | 504·0 | 240·5 | " | Suspicious. |
| 49 | Wolseley, Assa | C. J | " | 20 | None. | ·15 | ·115 | 16·5 | 1671·2 | 1392·0 | 278·2 | " | Saline water. |
| 50 | Monckland Station, Ont. | N. J. R | " | 21 | ·375 | ·165 | None. | None. | 304·0 | 216·0 | 88·0 | Trace. | Decidedly suspicious. |
| 51 | Westboro', Ont. | A. C. M. S. | " | 22 | ·13 | ·123 | " | 1·25 | 152·8 | 127·2 | 25·6 | V. S. trace.. | Suspicious. |
| 52 | Sussex, N.B | W. B. McK | " | 30 | Free. | ·135 | ·026 | 5·0 | 108·0 | 48·0 | 60·0 | Trace. | Pure and wholesome. |
| 53 | " | B. S | " | 30 | " | ·036 | 3·805 | 18·0 | 142·0 | 78·0 | 64·0 | Heavy trace | Decidedly suspicious. |
| 54 | Arrowhead, B.C | D. T. H | Oct. | 12 | ·02 | ·07 | None. | Trace. | 258·8 | 230·8 | 28·0 | Trace. | Excellent water. |
| 55 | Mayton, Alta | A. A | " | 12 | 1·17 | ·77 | " | ........ | 935·2 | 624·0 | 311·2 | None | Seriously contaminated. |
| 56 | Westboro', Ont. | A. C. M. S | " | 22 | Free. | ·14 | 2·47 | 9·8 | 179·2 | 117·6 | 61·6 | V. S. trace.. | " |
| 57 | Yellow Grass, Assa | G. T. D | " | 27 | None. | 39·02 | 11·94 | 2200·0 | 38928·0 | 37015·2 | 1912·8 | None | Strongly saline. |
| 58 | Gaspé, Que | M. S. K. | " | 27 | ·31 | ·625 | 8·54 | 11·5 | 335·2 | 234·0 | 101·2 | Trace. | Most seriously polluted. |
| 59 | St. Samuel, Beauce, Que. | L. P. D | Nov. | 8 | ·02 | ·38 | ·016 | Trace. | 98·0 | 43·2 | 54·8 | Slight trace. | Pure and wholesome. |
| 60 | Kingsmere, Que. | J. G. G | " | 9 | None. | ·038 | 2·026 | ·75 | 115·2 | 76·0 | 39·2 | " | " |
| 61 | North Gower, Ont | A. T. J. | " | 11 | ·21 | ·531 | ·98 | ........ | 259·0 | 159·0 | 100·0 | None | Very suspicious. |
| 62 | Calgary, N.W.T | A. O. M. | " | 18 | ·01 | ·108 | ·47 | 2·75 | 438·6 | 303·6 | 135·0 | V. S. trace.. | Free from pollution. |
| 63 | Westboro', Ont. | A. C. M. S. | " | 18 | Free. | ·08 | 1·35 | 3·8 | 164·0 | 114·8 | 49·2 | Slight trace. | Safe and wholesome. |
| 64 | Rideauville, Ont | Mrs. J. H. A. | " | 19 | ·05 | ·12 | ·38 | 49·5 | 870·8 | 632·8 | 238·0 | Trace. | Very suspicious. |
| 65 | Okanagan Landing, B.C. | F. H. C. | " | 24 | ·07 | ·21 | ·37 | 7·0 | 811·6 | 435·6 | 376·0 | None | Very suspicious, most probably dangerous. |
| 66 | South March, Ont | J. W. | " | 25 | ·038 | ·113 | 1·599 | 26·5 | 442·8 | 282·4 | 160·4 | " | Showing evidence of previous contamination and probably unwholesome. |

## THE SEPTIC TANK FOR THE DISPOSAL OF SEWAGE.

Certainly one of the most hopeful signs of progress, one might almost say of advancement in civilization, at the present time is the widespread desire in the country home for a better and more convenient water supply, for a bath-room, and for those sanitary conveniences (closet, sink, laundry, &c.), which go so far towards making the difference in comfort between the city and the farm house, especially in the winter. The requests for information regarding these matters, and particularly respecting some simple and effective method for the disposal of the sewage from the farm house, have been very numerous during the past year.

As regards the latter question, these inquiries have been answered by an account of the septic tank system, a comparatively speaking new system, but one that has proved highly satisfactory, as far as the writer is aware, wherever it has been tried. In many instances this correspondence has further led to requests for details, dimensions and drawings. It has, therefore, been thought advisable to insert the following detailed account of this system with illustration in the Annual Report, since its publication in this way will not only bring the matter prominently before a very large number of farmers, but will place on record in an available form particulars which it is almost impossible to furnish in the limited scope afforded by an ordinary letter.

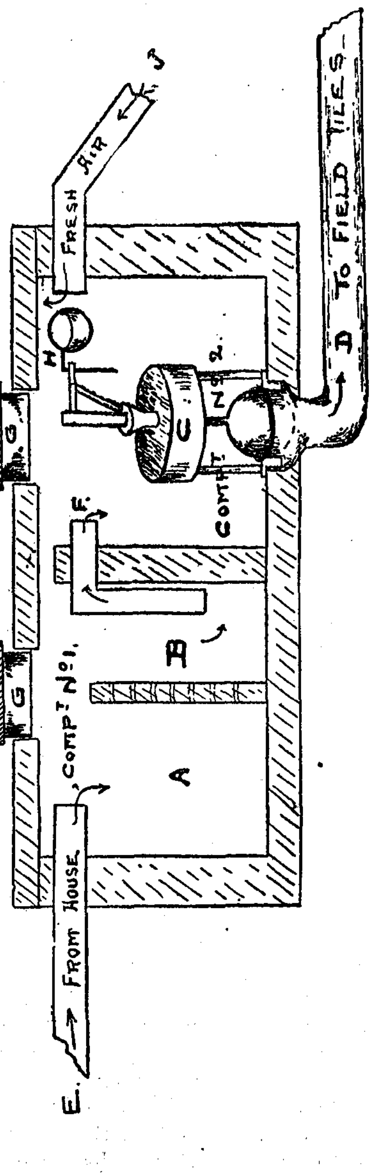
We have no hesitation in saying, at the outset, that there is no method of sewage disposal at once so effective, so cheap, and so simple for the farm house, the creamery and the cheese factory, as that which is known as the Septic Tank System. For its working, a water supply in the house or building is necessary, but there is no good reason now-a-days why such should not be obtainable on the majority of farms. There are many means of bringing water from a safe, and perhaps fairly distant source, into the house and barns, and one or other of these, as circumstances dictate, should be employed. Apart from the question of sewage disposal, apart from the convenience and the saving of labour that would follow, such a water supply must now be considered from the health standpoint most desirable, if not a necessity. Reference to results given annually in these reports show that the shallow well, sunk in the barnyard or about the farm buildings ought to be abandoned. Such wells are always a menace to the health of the farmer and his family, and his stock. With a water supply in the house—even though that may consist merely of a tank in one of the upper rooms periodically filled by a force pump, and from which pipes lead to the bath room and kitchen—there is nothing to prevent the installation of this system, which, as one writer of authority puts it, is at once 'inexpensive, absolutely automatic, scientific, simple, and in every way thoroughly efficient and satisfactory.'

Very briefly, the system may be outlined as follows:—The sewage or waste from the closet and sink is conducted by the soil pipe, 4 inches in diameter, into a tank, situated outside the building, in which, without the addition of any chemical or disinfectant, but simply by the action of certain self-sown microbes or bacteria (which accomplish their useful work of destruction largely in the absence of light and air), its organic matter—its filth—is decomposed and rendered harmless, and moreover its disease germs, if any are present, destroyed. The effluent or what might be termed purified sewage is now discharged automatically and intermittently from the tank, either into a filter box containing gravel or sand, or coke, or, better still, into a system of subsurface or distributing field tiles of unglazed ware which allow the effluent to soak into the soil throughout their whole length. The distance from the house to the tank is not a matter of any moment. The tank must be water-tight, and may be constructed of brick or stone cemented or, preferably, of concrete. When this system was first put into use it was supposed that light and air prevented the development of the filth destroying bacteria and, therefore, that it was essential for the tank to be practically light tight and air tight. Further, it was held that the inlet and outlet should be so arranged that the sewage would not be disturbed by currents. According to certain authorities it is still believed that the bacteria can only do their best work under these conditions. More recent investigations, however, go to show that such precautions are unnecessary. The bacteria which are engaged in this destruction, or rather nitrification, of the organic matter of the sewage do not all belong to that class which can only thrive in the absence of the oxygen of the air. However, these considerations need not be here further discussed. It is sufficient for our present purpose to know that the system, as consisting of the closed tank and distributing tiles, is efficient alike in the satisfactory disposal of house sewage and waste from the cheese factory or creamery.

For practical purposes—that is, for the installation of the system—the following details and the accompanying illustrations will no doubt prove serviceable.

SEPTIC TANK AND DISTRIBUTING TILES

FIG. 1



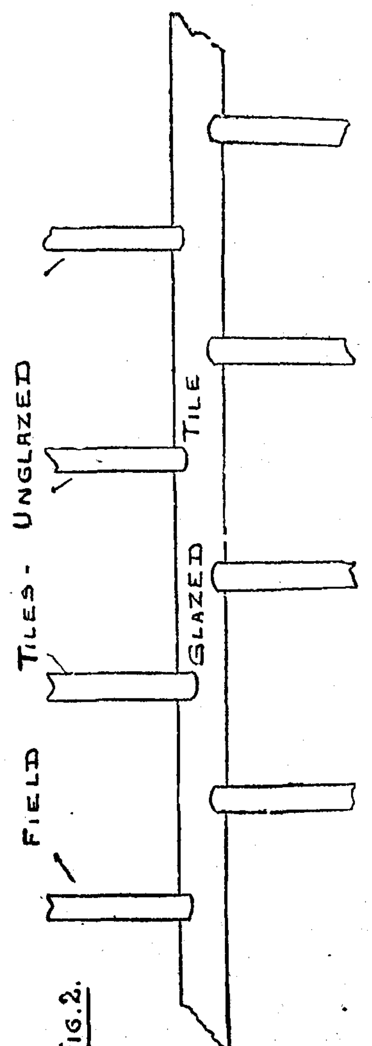




FIG. 2.

Figure I. represents a tank fitted with the automatic discharge valve. The size of the tank for the ordinary farm house may be 6 feet long by 3 feet wide by 3 feet deep, or a working capacity, say, of 120 gallons to each compartment. Since it is apparently desirable that the sewage should be submitted to the action of the bacteria for a period of 24 to 36 hours before passing into the second compartment of the tank, it is perhaps better to have the tank a little too large than too small. It is customary to allow a capacity of 12 gallons for each person. It will be seen that by a partition wall, carried within two inches of the top or roof, the tank is divided into two smaller tanks or compartments, figured as No. 1 and 2. Into the first of these, near the top, the sewage from the house flows through the glazed tile E. connected with the soil pipe which opens above the roof. The pipes from closet, bath, sink, &c., should, of course, be trapped before entering the soil pipe.

In this tank or compartment (No. 1) there should be a perforated partition, as shown in cut, to prevent paper and other solids entering the overflow and being carried over into compartment No. 2. It is in No. 1 compartment that the bacteria chiefly effect their work of decomposing the organic matter of the sewage, and when in time this compartment becomes full its fluid contents pass over into No. 2 by means of the overflow F. If there is no perforated partition in No. 1 the lower orifice of this overflow (F) is covered with wire netting which may act as a strainer to prevent any paper, &c., passing into No. 2. In compartment No. 2 is the automatic valve H., connected with the discharge pipe D, which carries off the effluent to the subsurface tiles (see figure 2). The success of the system depends largely upon this valve, for it is essential that compartment No. 2 should be emptied as soon as it is full, and then allowed to refill. This can only be satisfactorily accomplished by a self-acting (both opening and closing) valve.* This second chamber should have a 4-inch vent pipe, to allow the entrance of air. Manholes are provided at G, to permit of the examination of the tank at any time. The probabilities are, however, that no cleaning out will be necessary for years, as the action of the bacteria is very thorough and complete in destroying the organic matter.

The tank must be so situated that its glazed discharge pipe D. *at the point from which the field tiles are led off is not more than 12 inches below the surface of the ground.* This pipe as well as the field tiles are to be laid on a level so that the latter will be equally filled when the tank is discharged. If the ground be level, this will necessitate constructing the tank so that a portion of it is above the surface of the land, and in this case it should be banked around, covered with earth and sodded. It is not essential that the tank should be close to the house, but if placed at a distance the inlet pipe should have a fall from the house and be protected from the frost. Unglazed field tiles inserted every two or three feet along the discharge pipe D. finally distribute the effluent through the soil (Fig. 2). If desired, these distributing tiles from D need not commence in the immediate vicinity of the tank, but it is important that they should not be at a greater depth than 12 inches, unless the soil is very light and sandy and has good natural drainage. Since a 4-inch tile holds ½ gallon and it is essential that there should be tile capacity for all the effluent immediately on discharge, a tank with a compartment No. 2 of 100 gallons will require at least 200 distributing tiles. If the soil is heavy clay, it should be underdrained. When the soil is of such a character that percolation is very difficult, the distributing tiles may be replaced by a 'filter box' of sufficient size, filled with sand or gravel, or coke, the effluent entering near the top at one end and being conducted away from the other end by subdrains. However, in practice it is found that a larger tank with less frequent discharge and more tiles is preferable to a filter box.

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*An automatic discharge valve is made by the Dominion Valve Co., Toronto. The price is from $18 to $25, according to size and quality.

This system is in operation in many parts of Canada and has proved satisfactory wherever installed, so that it cannot be regarded as an experiment. It is in use in rural homes, in several cheese factories and creameries, in asylums, factories, &c., and in every instance, I believe, it is working efficiently.

In the preparation of this article, the writer has consulted Dr. P. H. Bryce, Chief Medical Officer of the Department of the Interior, who, when Secretary of the Provincial Board of Health for Ontario, was instrumental in introducing this system into various public institutions. He authorizes the statement that after 15 years' experience this system properly installed has proved the most sanitary and most economical method yet discovered for sewage disposal on a moderate scale.

## AN AGRICULTURAL TOUR IN BRITISH COLUMBIA.

Accompanied by Mr. J. R. Anderson, Deputy Minister of Agriculture, Victoria, I visited during May and June of the present year the greater number of the more important agricultural districts of that province, both on Vancouver Island and the main-land. This tour had been under contemplation for some time past, for the number of inquiries regarding soils, crops, &c., &c., received from that province has been steadily on the increase for several years, and it was felt that the information, the advice thus sought could be more satisfactorily given if the writer had some personal knowledge of the country, its soils, and methods of farming. Further, it was desirable to study more fully the climatic conditions prevailing in the various districts referred to, as well as to obtain an insight into the practice of irrigation, largely used in the Okanagan, Nicola and valleys and other parts of the 'dry belt' of British Columbia. The itinerary was planned and arranged by Mr. Anderson, to whom I am greatly indebted for much help and many kindnesses. It was at a time when one could best study the soils and their crops and afford an opportunity of meeting the men working the land on the land and discussing with them their failures and successes. The days, therefore, were spent largely in examining soils, crops, and conditions generally. We were frequently accompanied through the fields by the farmer and his neighbours and this enabled us to hold many impromptu meetings 'on the ground,' which proved of much interest and value to all present. In the evenings, meetings of a more general character were convened under the auspices of the local Farmers' Institute. In all, twenty-one of these evening meetings were held and addressed, and with very few exceptions the attendances were large. The interest of the people in agricultural matters was evident at every point visited and there was a sincere desire on the part of all whom we met in this way to benefit as far as possible by our visit. Considered from every point of view, I look back upon this tour as possibly the most satisfactory I have ever made to any province in the Dominion. The information gained must be of immense value to me in the future when considering the farming problems of that province, and in this connection, I desire to add that very much of the interest and enjoyment of the trip was due to the intimate knowledge of the country by Mr. Anderson, who was not only of the greatest service to me, but who strove to make my visit both pleasurable and profitable, and in this was eminently successful.

It will not be possible to give any detailed account of this survey trip here, but an outline enumerating the places visited, together with one or two of the more salient features of the districts examined, may prove of interest.*

*Vancouver Island—Nanaimo and Cedar.*—Though there are clay lands in this district their area appears to be limited. The larger part of the soil is of a light sandy or gravelly nature, which is frequently deficient in humus. The value of clover—

*A report of this tour, in extenso, has been written by Mr. Anderson, and will appear in his forthcoming report of the Department of Agriculture for British Columbia.

which undoubtedly will grow well here—for replenishing the soil in this valuable constituent was pointed out. The clay soils require similar treatment and would also be improved by an occasional liming. The use of swamp muck as a fertilizer was explained and the most economic treatment for bringing these muck soils (which occupy considerable areas in Vancouver Island) into successful cultivation, given. Orchards here were found, as a rule, in sod. This is evidently a plan not best suited for the soil and climatic conditions prevailing. Dairying is progressing and a creamery, started about a year ago, is stated as making good progress and leading to the increase in the number of milch cows, and consequently to more manure produced on the farm. There seems no reason why pork production should not increase with the development of the dairy industry and thus give the farmer an additional and lucrative source of revenue..

*Comox and Courtenay.*—This has already established an excellent reputation as a dairying district, there being good pasture, excellent water and some very fine dairy animals on practically all the farms visited. The co-operative creamery at Comox is well patronized and is stated to be in a flourishing condition. Greater care is required to keep the fields free of weeds, among which we noticed the Canada thistle and Velvet Grass. This latter is almost worthless as a pasture grass or for hay, and efforts should be made by ploughing up old pasture and re-seeding neglected fields to stamp it out. A very noxious weed that is spreading here and elsewhere on the island is the Wild Barley *(Hordeum jubatum)*. Its awns are dagerous, causing sores in the jaws of the cattle eating the grass. Since dairying will undoubtedly be the most important branch of farming here, the value of corn and the silo was pointed out. In both Nanaimo and Comox districts the introduction of silos would no doubt be advantageous.

From Courtenay we proceeded to Cumberland, and from that point drove to Parkville—most of the way being through a magnificent forest, chiefly of Douglas fir, cedar and balsam. There are but few ranches as yet along the road. The soil on the higher ridges is light and gravelly, but much of the nature of a black sandy loam is noticed in the lower levels. At Parkville there was an excellent meeting, at which many matters of interest in connection with the treatment of soils, &c., were discussed.

*Alberni.*—The drive from Parkville to Alberni (27 miles) traverses a most magnificent primeval forest, one certainly that no effort should be spared to protect from the ruthless axe of the lumberman. This region would, if reserved, make a national park of unexcelled beauty and grandeur, for its scenery, especially in the vicinity of Cameron lake, is very fine. Managed under the rules of good forestry, moreover, it could be made remunerative, which we scarcely think will be the case once the trees are gone, for the soil is very light and for the most part ill adapted to agriculture.

At Alberni a beginning is being made in co-operative dairying, a creamery being in course of construction a few miles from the village. This will materially help to improve the farming prospects, by converting the raw material into a finished and more concentrated product. There will then be a possibility of getting the produce to Victoria and other markets, at present impossible owing to well nigh prohibitive freight rates. The reclamation of muck lands was a subject here of much interest as there are large areas now in swamp that might be made productive.

*On the Mainland—Agassiz and Chilliwack.*—These were the first places visited. Two days were spent with much profit on the Experimental Farm at Agassiz, and under the experienced guidance of Mr. Sharpe, the Superintendent, much information was gained as to the possibilities of the district, not only as a fruit-growing area, but also as to its suitability for mixed farming. It was somewhat a matter of surprise to me to find such excellent soil on the upper benches of the mountain here, soil of better quality in fact than much of that occupying the flats level with the river, the greater part of which at this point is of a very sandy or gravelly nature. The luxuriance of the clover crop here showed that there should be little difficulty in economically maintaining the soil's fertility.

Chilliwack is essentially a dairying district, and here two days were spent in inspecting many of the good farms in the neighbourhood. There are two creameries in operation and each, I was told, had its full quota of patrons. Oats are extensively grown, but the chief crops are roots and clover, though the area in Indian corn is yearly increasing. This is essentially one of the most thriving and prosperous of the districts visited. The crop yields are reported as excellent. Velvet Grass, already referred to is, however, taking possession of some of the fields owing to poor methods of farming. In certain portions of this district the soils were found to be sour and in a measure unproductive, owing to insufficient drainage. I, therefore, spent considerable time in discussing with the farmers such means as might be practicable for lowering the water level, which I feel sure is essential to making such soils profitable. There are certain areas here covered with muck soils, and we, therefore, devoted some time to their careful inspection and the outlining of such treatment as we considered desirable for their improvement.

*Ladner and the Delta Districts.*—Between two and three days were spent in visiting the farms of the Delta, which for the most part are devoted to dairying and are in a thrifty and prosperous condition. Clover, grasses, roots and oats, all give large yields on this excellent soil, which, at many places on the lower Fraser, has been formed by the deposition of rich silt brought down by the river.

Though good pastures were seen that had not been re-seeded for 10, 15 and, in one case we saw, 30 years, my opinion is that still better results could be obtained if they were broken up from time to time and resown. One reason for this opinion is that the Velvet Grass and Buttercup *(Ranunculus acris)* have in many fields taken such possession as to crowd out to a very large extent the clover and good grasses.

A general neglect of the orchards is noticeable in this district ,the trees showing want of pruning and care, the soil being uncultivated and the Tent Caterpillar very common. This pest had in many places stripped the trees of their foliage.

A large number of fine milch cattle in excellent condition were seen here, as at Chilliwack.

Most of the land is of a heavy, plastic nature and would, we believe, be improved by more thorough drainage and an occasional liming.

The district is on the whole in a thriving condition, the only serious drawback being the scarcity of really good water. Nearly all that is used is taken from the ditches between the dykes. The difficulty in this water problem lies in the fact that much of the land is below the level of the river. A system of supply that would convey water from the higher lands and distribute it over the Delta would prove a great blessing.

## THE DRY BELT.

*Spence's Bridge and Nicola.*—Up to this time I had never visited the Dry Belt, and beyond what I had read and had been told, my impression had been formed from what could be observed from the carriage window in passing through on the line of the Canadian Pacific Railway. These impressions, from the agricultural point of view, I am willing to confess, had not been very favourable. The general aspect is forbidding, the apparently barren soil bearing a scanty growth of sage brush and it is indeed difficult to realize that the country is one adapted to agriculture. A closer acquaintance, however, with those parts cultivated under irrigation was destined to dispel this impression and to make one astounded at the truly marvellous results obtained on this sterile looking soil merely by the aid of water. Crossing on the ferry at Spence's Bridge, I had the opportunity of personally examining for the first time the results of irrigation, and these results were certainly a revelation. The farms of Mr. Clements and Mr. Smith are veritable oases. The crop of clover and timothy which was being cut, was very fine; growth generally was of the most luxuriant character and the fruit trees vigorous, healthy, and bearing well. A casual inspection of the soil, apart from what it can produce with the aid of water, certainly would not lead one to suppose it to be a fruitful one; indeed, it would on such an examination be generally judged as of poor quality. We purpose, therefore, during the coming year to subject typical samples of these soils to careful analysis and hope therefrom to arrive at some better knowledge than we have to-day regarding the cause of their great productiveness. Very possibly it may be shown that the climatic conditions prevailing have been conducive to an accumulation of 'available' plant food—we think this more than probable—and if this proves true it will point to the desirability of carefully husbanding this most valuable heritage and not allowing its waste by the excessive use of irrigation water.

From Spence's Bridge to Lower Nicola the road winds along on the side of the Nicola canyon. Several farms on the route are to be observed, chiefly at the bends of the river, most of them apparently being occupied by Indians, near the cultivated spots. The irrigation ditches are to be seen winding their way down, or rather around, steep inclines of barren-looking soil, carrying a stream of living water brought from some creek at a higher level; then as they reach the bottom lands branching and losing themselves and their precious burden in innumerable smaller channels amongst the most luxuriant herbage of field and orchard. Agriculturally speaking, one cannot help realizing, with water, everything; without water, nothing.

At the Lower Nicola we stayed two days in order to allow me to more thoroughly study the irrigation schemes in vogue, to examine the crops and to visit certain outcrops of 'alkali' that I had been asked to report on. It would be undesirable here to enter fully into the several problems in connection with irrigation that must be solved if this country is to be more than sparsely settled, but we may briefly refer to one or two of the more important features, as they occurred to the writer. We have first to recognize that in many parts the water available for irrigation purposes is limited—many ditches several miles in length were seen, proving that even now water has frequently to be brought long distances. To obtain an equitable distribution of the water is of the utmost importance to the future welfare and progress of this country, for land and farms without water are practically unproductive and valueless. If the tapping of the streams and other sources is left so largely to the greed or caprice of the individual, if the conservation or storage of available waters is neglected, it seems scarcely likely that the community can continue to benefit equitably from the supply. At present much water is wasted that might on other lands prove of the greatest service.

Secondly, we should like to point out how the more frequent use of the cultivator and harrow to preserve a dry earth mulch, might be profitably substituted for water. Such a method of conserving soil moisture is most effective and quite applicable in orchards and for root crops.

Lastly, it is quite evident that in some places too much water is used. The excessive application is detrimental both to soils and crops—the soils are injured physically and chemically, by being choked, becoming sour and losing their more soluble plant food; and the crops suffer through the drowning of their roots. In several instances, we noticed much harm as resulting from this excessive use, especially on the lower levels.

Patches of land were examined that were evidently suffering from the presence of alkali, of which both the 'white' and the 'black' forms are found here. The nature and origin of alkali were explained and the best methods for the treatment of such lands outlined. We took pains at all our meetings and demonstrations in the dry belt to give information on this matter, as well as to speak on the equally important matter, the use and abuse of water in irrigation.

At Loewr Nicola and at Coutlées truly magnificent crops of Red Clover, Alfalfa, Sainfoin, and Alsike Clover were seen—it was very evident that all the legumes thrive here. On the roots of all those examined, nodules were found. Potatoes and root crops also do very well. The chief agricultural industry is at present the production of beef though we think, with railroad facilities to a market, the district would prove almost equally suited to dairying and orcharding. The universal custom is to allow the cattle to find their own food in the woods on the mountains during the summer and to feed them in the winter months on the hay cut from the irrigated fields already spoken of. As the land is taken up, this primitive method of farming must be more and more abandoned, and we are of the opinion that even in beef production the more modern methods which the changed conditions will render necessary to adopt, will be more remunerative than those now in vogue.

A day was spent in the vicinity of Nicola, where there was further and abundant evidence of the wonderful growth of both grasses and clovers.

On the road between Nicola and Kamloops many excellent farms were visited, though some fields, we regretted to notice, were badly infested with wild mustard. Exceptionally fine crops of Alfalfa and Brome Grass were examined at 'Pattersons,' about half way to Kamloops. Two, and frequently three, cuttings, I was told, were taken from the former in the season, while the latter gives a large yield of hay and a very heavy and palatable aftermath for grazing.

Strange as it may seem, great injury to roads and fields had been caused in several places along the route by freshets in the spring. With uncontrollable fury the waters had burst forth from the ravines bringing huge boulders, stones, trees, &c., with them and ruining thereby sometimes beyond hope of reclamation, considerable areas of fine land.

Unfortunately our programme did not allow time for an excursion to Grand Prairie, where I am told there is an excellent farming section and a large number of interested and intelligent men.

From Kamloops a drive was taken on the north side of the Thompson river, along which a ditch to bring water for irrigating purposes is being constructed. The water will be conveyed about 17 miles from Jameson creek. It is expected when the scheme is finished that several thousand acres can be brought into productive cultivation.

*The Okanagan.*—Proceeding from Sicamous to Okanagan Landing by rail we thence continued by boat to Summerland, a comparatively speaking new agricultural development near the southern end of the Okanagan Lake. This and Peachland, further north on the same side of the lake, were of particular interest to me, by reason of the methods by which they have been developed and exploited by the parties or companies originally owning these sites. The land after careful survey, has been divided into five and ten acre lots, allowances for roads, &c., being made. These lots are sold subject to certain rules and taxes, among the latter being an annual rate (25 cents per acre at Summerland) for irrigation water supplied by the company. The newer of the two places is Summerland, and here at present the greater activity is evident. Many of the lots have been planted as orchards, and if not at present worked by the owner are managed by the company, which, in addition to an initial charge for breaking and planting, collect an annual fee for this care of the trees. The land before this operation has a 'thin' look and is sparsely covered with the native sage, &c., but with working and the careful application of water, it can no doubt be made productive. We should strongly advise, however, better preparation of the soil, than has been the practice, before setting out the trees, and we further believe that the fertility of the soil should be kept up by the occasional growth of clover or some other legume. There is no doubt as to the success of clover here—evidences were clear as to that—and it is the height of folly to imagine, as many do now, that nothing further than water is or ever will be necessary. The climatic conditions we recognize as most favourable, but warmth and water, though all important, do not constitute all the factors necessary for profitable fruit growing. Most of the people who have taken lots speak enthusiastically of the future and certainly the prospects are promising. Summerland is yet in its infancy and necessarily some years must elapse before there can be much return. Peachland is older and should be in a position to ship fruit in considerable quantities in a year or two. Many who are taking up land in this district have had no experience in fruit growing, but a hopeful sign is the general desire for information by the new-comers. There seems no doubt of the suitability of the climate for fruit, nor with regard to obtaining good markets for the produce in the Kootenays, the North-west Territories, and Manitoba. We may, therefore predict that with careful management of soil and water and the experience that will be gained in the actual culture of the fruit, there is a large measure of success in store for these and similar localities. In addition to apples, pears, cherries, and peaches, corn, melons, tomatoes, and small fruits and vegetables generally are, it is stated, raised successfully.

A very fine cherry orchard in full bearing was seen at Trout Creek, a few miles below Summerlanod. Large shipments of delicious fruit were being made at the time of our visit.

At Peachland the orchards on most of the lots are thrifty. Many of the peach trees were coming into bearing and gave great promise. Examination of the soil revealed areas of excellent quality, more particularly on some of the higher levels. Careful management of the irrigation water is here necessary as it was noticed that the seepage from water applied on the upper slopes appeared on some of the lots at the base of the hill. In several places this was excessive and doing injury to the trees. These lots required drainage rather than irrigation.

*Kelowna.*—Several very fine cherry orchards were seen in this vicinity, notably those of Mr. Pridham and Mr. Stirling, and that the district, speaking generally, is eminently adapted for fruit there can be no doubt. Certain large estates in the neighbourhood are being subdivided and sold in small lots for fruit culture and the 'boom' in land was apparently as active here as elsewhere in the Okanagan district.

Through the kindness of Mr. Chaplin, Secretary of the Farmers' Institute here, I was enabled to go over a large amount of the ground within a radius of 25 miles of Kelowna. At one or two places patches of alkali occur and samples were taken for further examination. One very interesting drive was through the main valley to Duck Lake, returning by 'Dry Valley.' This main valley, or rather the greater part of it, has for the past twenty-five years been cropped with wheat without any rational attempt to maintain the soil in a productive condition. The result is most deplorable. Land that I am told was once the most fertile, has been reduced to such a condition that in many instances I could see the crop was not worth harvesting. The heavy clay of which most of this land is composed has been depleted of its humus and available plant food to such an extent by continuous growth of wheat that it is now refractory, hard and altogether unsuitable, chemically and physically, for farming purposes. The only hope for this land which has been so ruthlessly treated lies in the addition of humus and nitrogen through the growth of clover or some other of the legumes. This no doubt will be very difficult to obtain at the outset owing to the condition of the land, and probably at first buckwheat or rye will be found easier to grow for green manuring. These, however, should be followed by a leguminous crop to enrich the soil in nitrogen. We also think that tile drainage and occasional liming will be found valuable in reclaiming the land, both tending to improve its physical condition. Towards Duck Lake several large hay farms were seen, the crops on the whole being good. 'Dry Valley' suffers for want of sufficient irrigation water. If by an engineering scheme water could be brought at a reasonable cost into this valley, there is a large area of arable land here that would be made profitable.

*Vernon.*—This is widely and favourably known as a fruit-growing district. There is very little grain sown now, but the area devoted to fruits of all kinds is continually on the increase. The planting out of orchards is considered a profitable investment. The interest and pleasure of our visit to Vernon were much enhanced by our stay at

Coldstream ranch, the estate of Lord Aberdeen, Mr. Ricardo, the manager, having kindly extended to us his hospitality. Mr. Ricardo not only took us over the larger portion of this magnificent and well-kept estate, but drove us over a considerable part of the surrounding country. In this way I was able to learn much of the character of the soil, the methods of irrigation in vogue, and the capabilities of this highly favoured district.

A visit to the Commonage was of much interest. This district lies only a few miles from Vernon, but unfortunately has practically no water supply available for irrigation purposes. For the past few years, I understand, the farmers here have done fairly well (the district has been settled about six years) owing largely to a succession of wet seasons. This year being exceptionally dry, the crops are very short. It is certainly a hazardous undertaking when farming is attempted here without the aid of irrigation. Excellent meetings were held under the auspices of the Farmers' Institute at Vernon and Commonage.

*Armstrong.*—It is held that here and northward there is a sufficient rainfall for agricultural purposes and therefore irrigation is not practised. However, the present season had been a very dry one and as a result very short grain crops were obtained. Much of the soil is very heavy and had become refractory owing to poor methods of farming. It stood badly in need of humus. Where hay was grown, both the crop and the soil were better. The soil generally is a strong one, but it already stands in need of much better treatment—which may be outlined as comprising, the growth of clover, more attention to rotation of crops, the use of tile drainage, and the application of lime. We, further, are of the opinion that both dairying and fruit growing might be considerably developed with advantage to the district.

From Armstrong the drive to Enderby was taken, spending a day or two on the road at Sir Arthur Stepney's ranch, now in charge of Mr. Heggie. It is only right that I should add, this ranch is being conducted on rational lines, the land constantly improving rather than deteriorating. As already remarked, much of the land in this district of Spallumcheen is unprofitable, due to the continuous growth of wheat.

At Enderby the general conditions of soil, &c., are much the same as at Armstrong. It has been a wheat-growing district and in consequence the land has suffered. Where Alfalfa and clovers are grown, excellent crops are obtained and the land is steadily improving. If the farmers can only get away from this practice of wheat after wheat and grow the legumes more largely, this district will assuredly hold its reputation as amongst the richest farming areas in the province.

From Enderby we went to Mara on the Spallumcheen river, where a number of low lying, mucky lands were inspected and instruction given for their reclamation.

The last locality visited in British Columbia was Salmon Arm, on Shuswap Lake. Some very promising orchards were seen here, and the district is considered as one eminently adapted to the apple. Though a certain amount of dairying and mixed farming is carried on, it is evident that the future growth of the district is intimately connected with its development as a fruit-growing centre. We were enabled to see many comparatively large areas that had been recently planted, and all gave promise of good returns.

In conclusion, I should like to thank all those who helped to make this tour of such great interest and pleasure to me; many devoting time to driving me over the country in the various districts, explaining much which otherwise would have been obscure, and many kindly and hospitably entertaining me. I should also like to say, as a last word, how gratifying it was to meet so many who were anxious to benefit by our visit. Never have I had the pleasure of speaking to more interested and enthusiastic men than those I met on the field and at the meetings of this visit to British Columbia.

# REPORT

OF THE

# ENTOMOLOGIST AND BOTANIST

(JAMES FLETCHER, LL.D., F.L.S., F.R.S.C.)

## 1904.

OTTAWA, December 1, 1904.

DR. WILLIAM SAUNDERS,
Director of Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to hand you herewith a report of some of the most important subjects which have been brought officially under my notice during the past season.

The development of the Division of Entomology and Botany in the various directions has been pushed forward as evenly as possible, with an effort not to allow any work once undertaken to fall behind by giving undue attention to other branches.

*Collections.*—During the past year, as previously, the collections of insects and plants have been very much increased. Large additions have been made from material collected in the field, as well as also through the kindness of correspondents who have applied to the Division for help in their studies of insects and plants. The great attention which has lately been directed to Nature Study in schools has brought the officers into close contact with many teachers and students in the public schools of the country. There are few things more marked, in matters connected with the development of the country, than the keen interest which is being shown by all classes of society in those investigations which in a general way may be grouped under the head of natural history, and with which the work of the Division of Entomology and Botany is intimately associated. This includes not only a study of insects of all kinds, and plants, wild and cultivated, but also allied researches in forestry, the reclamation of land from the encroachments of the sea or of drifting sand, and also to a certain measure investigations into the habits of birds and animals with which farmers come into contact in their every-day life. This new movement in the schools of the country is giving to the growing boys and girls, who in a few years will be the citizens of Canada, an elementary knowledge of many of the common things which surround them every day of their lives, and which for this very reason are of importance to them. A practical knowledge of animals, plants and natural phenomena cannot but be of enormous assistance to the farmers of the country, whose every occupation is connected in some way with nature. The Nature Study movement is going steadily forward, and it has been a great pleasure to the officers of the Division to be in a position to encourage and help those who have taken it up so earnestly in all the provinces of the Dominion. Our collections here have been of much use in this work, and many visitors have availed themselves of the opportunity of consulting the cabinets.

Insects.—As in previous years, much time has been given to the rearing of insects, eggs or larvæ of many of which have been received by mail from all quarters or collected in the field. An exact knowledge of the preparatory stages of insects, the number of broods, and the time at which they develop, is of the greatest value when devising remedies for injurious species. Careful notes are taken of every species studied, and year by year the collections are enriched by the addition of specimens reared from the egg and prepared for the cabinets, showing all stages of growth, as well as the work of the various species. At the same time, records are kept for reference or for future use in the reports when sufficient data have accumulated or when occasion demands it.

Plants.—Extensive additions have been made to the herbarium, either from specimens sent in by correspondents for naming or as donations; and in many instances fine specimens of rare plants have been acquired by growing the plant from the seed and securing samples at different stages of development. During the year the herbarium has been gone over, and many imperfect specimens have been replaced by better ones, or additions have been made by increasing the series of various species by representatives from other localities.

The collection of weed seeds has been largely increased, and it is now a rare thing for a seed to be submitted by seedsmen or purchasers of seeds, or even to be sent in by students, which cannot be recognized. The institution of the Seed Division, under the Commissioner of Agriculture and Dairying, has had a most marked effect upon the quality of all kinds of seed now offered by seedsmen, and it may be justly said that at the present time, if purchasers will pay a reasonable price, they can easily obtain in Canada all crop seeds of the highest quality, both as to vitality and as to freedom from the seeds of other plants.

*Fodder Plants.*—The Experimental Grass Plots during the past season have been very attractive to visitors. The season at Ottawa was extremely favourable for the development of all fodder plants, and consequently very complete collections of all the leading hay and fodder plants were made for exhibition at the various fall fairs and other exhibitions where the government has assisted by sending exhibits. A large collection has also been made for the museum at the Central Experimental Farm.

*Reclaiming Sand Hills.*—A visit was paid to the large tract of shifting sand near Lachute, Que., locally known as the Argenteuil Sand Hill. This is estimated as now covering nearly one thousand acres, stretching along the Ottawa River in an elongated patch about four miles long by half a mile to one mile in width, for the most part entirely destitute of vegetation, but bearing in places clumps of spruce trees, birches, maples, tamaracks and willows. As is usually the case on such areas, the surface is very dry; but a few inches below this there is an abundance of moisture available for the support of any plants which can be protected against the drifting sand. At the request of Mr. Thomas Christie, M.P., I called upon the various farmers living around this sand hill and examined the work they had been doing in their efforts to control the sand. I found, without exception, that every one of them had taken a keen interest in fighting against the common enemy, and much good work had been done in the way of holding back the drift by planting trees and other vegetation. Since 1898 the attention of the Division has been directed to this tract of land, and a few hundreds of plants of the Beach Grass, and also of Norway and White Spruce trees, have been sent to different farmers to be planted on the sand as an experiment; but no extensive work has been carried on by the department. I was much pleased to see the success which had attended the efforts to grow trees on this apparently barren sand hill. The kinds of trees which were noticed growing wild in the scattered clumps which here and there appear, were White Pine, Tamarack, Canada Balsam, White Spruce, White Cedar, Balm of Gilead, Aspen Poplar and White Birch; and round the edges all the ordinary forest trees of the region are represented. In low spots two or three kinds of willows and the Gray Alder flourish. Of shrubs which attracted attention by their vigour and the extent to which they had spread out in every direction, special mention may be made of the following kinds which doubtless can be made use of in prosecuting this work. The Willow-leaved Meadowsweet (*Spiræa salicifolia,* L.).—This free-growing bush, which not only produces large numbers of running roots or stolons, but also ripens much seed, was found to be covering many acres and spreading rapidly over some low spots in the central portion of the sand hill. This is a native shrub, common in all swamps and low lands. The Red Raspberry (*Rubus strigosus,* Mx.).—A form of this common shrub was seen covering a large area on the farm of Mr. Thomas McGregor, who has encouraged its growth, as well as some other native plants which occur with it. The common Blackberry (*Rubus villosus,* Ait.).—Even more luxuriant than the Red Raspberry was the Common High Blackberry, which rooted freely through the sand and threw up many stems. Both of these berry-bearing plants produce heavy crops of excellent fruit, and it seems as though they might prove a valuable resource to farmers, while at the same time performing the important office of providing a barrier against the encroachments of the sand or as a temporary shelter, while more valuable trees are being grown. Roses.—At various places old and vigorous clumps of Sweetbrier, which were evidently many years old, were seen, as well as of the little old-fashioned semi-double Cinnamon Rose. The Smooth Meadow Rose (*Rosa blanda,* Ait.) was found in spots, covering several yards in diameter and showing an unexpected power to grow up and keep its head above the drifting sand. Shrubs which also showed great vigour and which occurred in many parts of the sand hill, where evidently they had sprung up spontaneously, were the Red Osier Dogwood (*Cornus stolonifera,* Mx.) and the Beaked Hazel (*Corylus rostrata,* Ait.). Of the wild herbaceous perennials growing naturally on the sand, and the growth of which had to some extent been encouraged, the most noticeable were the Common Milkweed (*Asclepias cornuti,* Decne.), the Canada Thistle (*Cnicus arvensis,* Scop.), and Couch or Quack grass (*Agropyrum repens,* L.). There were also seen in some places a few plants of the Strawy Sedge (*Carex straminea,* Schk.), the Ox-eye Daisy and the Dandelion.

The trees which have been experimented with to the largest extent by farmers living in the locality are the White Pine, Canada Balsam Fir, the Norway Spruce, the White Spruce and the Tamarack or American Larch. Of these, the last-named has made the most rapid growth, but seems to require more protection than the sturdy spruces. The Balsam Fir has succeeded as well as the spruces, but is a less valuable tree. The Norway Spruce has been planted only to a small extent, a few hundred trees having been sent from this department three years ago. These were planted carefully, and doubtless will succeed; but it is too early as yet to compare them for this purpose with the White Spruce, which is the favourite conifer and is transplanted from the woods in the neighbourhood. The greatest satisfaction is expressed by all of the way in which willows have succeeded. The kind used for the most part is the large European Tree-Willow (*Salix alba,* L.) known mostly in this country under the name of French Willow. Large numbers of these trees have been started from cuttings and have in a single year made a remarkable growth, even from small cuttings put in with little labour in a furrow made by a plough. Such plantations were seen on the farms of Mr. John Doig and Mr. Walter Smith. On the edge of one of Mr. Doig's plantations the sand had been drifted away by the wind so as to expose the roots of one of his trees. These, by actual measurement, extended for forty feet from the central point, showing the great value of the willow as a sand binder, both from its rapid growth and from its great root production. An observation of much interest, as showing the power of the Canada Balsam to resist destruction by sand, was that this tree, when covered up to a certain extent with sand, threw out large numbers of roots from the branches which were partially submerged. (See Plate II., fig. 10.) Many samples of such branches were found upon trees which had their roots and trunks covered up with from six to ten feet of sand. Experiments with Beach Grass and the Sea Lyme Grass have been very satisfactory, particularly where the former has been planted on exposed banks. In low, undisturbed spots the Sea Lyme Grass has succeeded rather better than the Beach Grass. Tufts of both of these grasses were found in some places to have extended four feet in each direction by the end of the second year, and on Mr. Walter Smith's land one clump was found which had a thick growth four feet across in the centre, with five smaller shoots round it and 18 shoots just showing through the sand, which will produce tufts of leaves next spring at a radius of twelve feet from the centre.

It is hoped next year to encourage this work by sending a large consignment of Beach Grass and several thousand cuttings of those willows and poplars which have shown the greatest vigour at Ottawa and at our western experimental farms. The enthusiasm and interest shown in this subject by the farmers themselves, every one of whom has already gone to much trouble and expense, is most encouraging. I can see no reason why in a few years this large tract of sand may not be brought under control.

*Meetings.*—Meetings of farmers, dairymen, fruit growers, &c., have been attended whenever other official duties would allow of my absence from Ottawa.

December 28, 1903: St. Louis, Mo.—Annual meetings of the Society for the Promotion of Agricultural Science, of the Association of Economic Entomologists and of the American Association for the Advancement of Science.

January 29, 1904 : Cowansville, Que.—Convention of District of Bedford Dairymen's Association.

February 12 : Ormstown, Que.—Huntingdon Dairymen's Association.

April 18 : Perth, Ont—Horticultural Society and address to school children of the Public Schools in the town hall.

May 5 : St. Catharines, Ont.—Meeting of fruit growers to discuss the San Jose Scale remedies.

May 6 : Toronto.—Normal School : Address on Nature Study.—Toronto Branch of the Entomological Society of Ontario and Toronto Horticultural Society—joint meeting : Address on 'The Opening of Spring and Spring Work.'

June 14 : Amherst, N.S. ; and June 18 : Halifax, N.S.—Meetings of Maritime Stock Breeders' Association and Nova Scotia Farmers' Association.

June 21 to 24 : St. John, N.B. ; June 16 : Kentville, N.S.—Address before King's County Board of Trade on 'Orchard Insects.'

June 27 and 28 : Gagetown, N.B.—Address before Farmers' and Dairymen's Association on 'Farm Insects,' and attending spraying demonstration in orchard.

July 11 to August 11.—In Manitoba and the North-west Territories, holding weed meetings for the North-west government.

September 5 : Brome, Que.—Attending the Brome County Fair and judging horticultural exhibits.

September 9 to 17 : Halifax, N.S.—Attending the Nova Scotia Provincial Exhibition in company with the Dominion Live Stock Commissioner. Meeting farmers and fruit growers in the Farmers' Pavilion and delivering addresses on Noxious Weeds and Injurious Insects.

September 19 to 23: St. John, N.B.—Attending Canada's International Exhibition and judging the natural history exhibits sent in by the school children of the province. This competition is worthy of special mention on account of the excellence and number of collections sent in. No less than 83 separate collections, aggregating nearly three thousand specimens, were on exhibition and formed a most attractive exhibit. For the most part, the specimens were well preserved, neatly mounted and labelled. The identifications in most of the collections were also as accurate as could be expected under the circumstances. On the whole, I believe that this competition was the most extensive and best managed of any similar effort which has ever taken place in Canada. The example of the Exhibition Association may well be followed by other similar institutions.

September 24 to 30 : Charlottetown, P.E.I.—Provincial Exhibition. Attending meetings and giving addresses in the Farmers' Pavilion upon Weeds, Hay and Pasture Grasses and Injurious Insects.

October 19 : Lachute, Que.—Visiting the Argenteuil Sand Hill and discussing with farmers means of controlling the drifting sand.

October 21 : Whitby, Ont.—Visiting the Model Fair Grounds with the Live Stock Commissioner and examining the illustration plots of various crops; and also the fodder crops grown in the district.

October 26 and 27 : London, Ont.—Annual meeting of the Entomological Society of Ontario : 'Injurious Insects of the Year,' 'Entomological Record for 1904.'

November 15: Toronto, Ont.—Provincial Fruit, Flower and Honey Show: Address on 'The Value of Bees to the Fruit-grower.'

In addition to the above, Mr. Arthur Gibson attended the County of Carleton Annual Exhibition at Richmond, Ont., and judged the natural history exhibits made by the teachers and school children of the county. These exhibits were on the whole very satisfactory, and showed good careful work on the part of the teachers.

Mr. Gibson also attended the annual meeting of the Entomological Society of Ontario at London, and took an active and acceptable part in the proceedings, reading two papers : 'Further Notes on Basswood or Linden Insects,' and 'The Columbine Borer (*Papaipema purpurifascia*, G. & R.).

*Acknowledgments.*—I have again gratefully to acknowledge many favours from specialists who have assisted me with identifications of many specimens of insects received for the collections during the past year. My thanks are specially due to Dr. L. O. Howard, Chief of the Bureau of Entomology at Washington, and members of his staff, particularly Dr. H. G. Dyar, Dr. W. H. Ashmead, Messrs. Schwarz, Coquillett and Busck; also to Prof. J. B. Smith, of New Jersey; Mr. W. D. Kearfott, of Montclair, N.J.; Prof. J. S. Hine, of Columbus, Ohio, and Rev. G. W. Taylor, Wellington, B.C.

Valuable additions to the collections of insects have been made by the following:

Mr. F. H. Wolley-Dod, Millarville, Alta.—A collection of named noctuidæ from Alberta.

Mr. T. N. Willing, Regina, N.W.T.—Many specimens of insects of all orders from the North-west Territories.

Mr. Norman Criddle, Aweme, Man.—Many rare moths and other insects from Manitoba.

Mr. W. Metcalfe, Ottawa.—A large collection of minute diptera and other insects beautifully pinned, mounted and labelled.

Mr. A. W. Hanham, Victoria, B.C.—A large collection of pinned hymenoptera, diptera and hemiptera taken in Manitoba and British Columbia.

Mr. E. F. Heath, Cartwright, Man.—A collection of Manitoban moths in papers.

Mr. C. H. Young, Ottawa.—Specimens of rare moths taken at Ottawa.

Mr. E. P. Venables, Vernon, B.C.—A collection of named *Bombi* taken at Vernon, B.C.

*Correspondence.*—The correspondence of this Division has been sufficient during the past year to take up every minute of the time of the officers which could be spared from time necessary for investigation. Many thousands of specimens of insects and plants have been received from students for naming. This requires much time, but is of great value in the work of the Division in bringing the officers into contact with students all over the country and in learning of the occurrence of many insects and plants, which otherwise would not come to their notice. From December 1, 1903, until November 30, 1904, the number of letters, exclusive of circulars, registered in the Division as received on official business was 3,231, and the number despatched was 2,909.

I have the honour to be, Sir,

Your obedient servant,

JAMES FLETCHER,

*Entomologist and Botanist.*

# DIVISION OF ENTOMOLOGY.

## CEREALS.

The season of 1904 in all parts of the Dominion has been remarkably irregular and uncertain. Extensive areas have suffered from drought, while in other places there has been trouble from too much rain at certain periods; crops, accordingly, have been very irregular. Through the greater part of the Maritime Provinces and in the eastern part of the province of Quebec, a prolonged drought during the months of June, July and August reduced enormously all hay and grain crops. In the western portion of the province of Quebec and in eastern Ontario, weather conditions were very favourable and excellent crops of grain and hay were secured. In western Ontario, on the other hand, and in the whole of the province of British Columbia, hot dry weather prevailed and somewhat reduced crops of all kinds. The Ontario November crop report describes the wheat crop as below the average and rather light in weight; barley as one of the most successful crops of the year; oats a splendid crop, yield and quality most gratifying. Throughout the Dominion, however, the season on the whole has been cool and backward. In the North-west Territories and Manitoba the growing season began late; but with improved summer conditions and no killing frosts until rather later than usual, a large crop was reaped. The quality was not quite as high as was at one time hoped for, owing to rain at harvest time and slight frosts in some localities, and also to a certain amount of injury by rust. Rust is almost unknown in the West as a serious enemy of cereal crops; but during the past season a more severe epidemic of this destructive parasite made itself manifest towards the end of August, than has ever previously been recorded. Mr. J. R. C. Honeyman, the Deputy Commissioner of Agriculture for the North-west Territories, although stating that the presence of rust last summer was a factor to be considered, claims that practically it did not affect the crops in the Territories to any appreciable degree. Writing on November 16, he says: 'There is a large amount of very good grain in the country, and prices are satisfactory. However, a comparatively small proportion of the crop has been marketed, owing to the continued fine weather, which enables farmers even at the date of writing to continue their fall ploughing.'

Mr. J. R. Anderson, Deputy Minister of Agriculture for British Columbia, writes: 'The abnormally dry season which extended through the whole of the province, had the effect of reducing considerably the production of all crops in those parts where irrigation is not practised, because it is unnecessary. Spring wheat was generally a failure where it is grown for milling purposes. Fall wheat was better, but on the whole, milling wheat was short. Nevertheless, some fine samples were produced. Kansas Red from Spallumcheen weighed 69½ lbs. per bushel, with a fine, hard, plump grain. Oats and other small grains were good where the seed was got in early, and on irrigated land. In dry regions these crops were indifferent.'

In Northern Alberta the summer was fine and dry, and grain crops were better than they had been for two or three years, except in some instances where poor seed oats had been sown. No mention was made of rust. In Manitoba, however, the injury by the Black Stem Rust caused great anxiety to farmers. Some crops were actually cut green or before they were ripe to save further damage. The districts most affected were between Brandon and Winnipeg and in the south and west of the province. Loss from this cause was not confined to the West. Reports from Ontario and Quebec mention rust on wheat, oats and barley, and a consequent shrinkage in those crops. An undetermined injury referred to as 'Dead Heads' by settlers also occurred rather widely in Manitoba just before wheat harvest. Unfortunately, no cause for this injury which involved patches of from two to fifteen feet in diameter, could be discovered by my correspondents, who made investigations in accordance with suggestions sent to them. Neither fungus nor insect enemy could be discovered. Mr. Geo. H. Greig, Secretary of Live Stock Associations of Manitoba, wrote that the injury ceased about August 20, and that in speaking with the farmers in the district where this occurred, the opinion seemed to prevail that new land was worse affected than old, and he estimated the loss in the fields which showed most of the injury at about 5 per cent.

Among insects which have attracted attention by their numbers on cereal crops during the season of 1904, mention may be made of the following:—

WIREWORMS.—Wireworms in grain fields were complained of in New Brunswick, near St. John, on Prince Edward Island, at Kensington, and at Qu'Appelle in the North-west Territories. These troublesome larvæ, for which up to the present time no satisfactory remedy has been discovered, did much harm by eating into the young sprouting grains of wheat. It was noticed by Mr. William Henley, of Qu'Appelle, that oats sown on the same land where wheat was being destroyed, were not injured by the wireworms. The destruction of the wheat, however, was considerable. He writes under date June 20:—'Wireworms are destroying our wheat crop in the Wascana District (T. 13, R. 15, W. of II., 30 miles south of Qu'Appelle). This is heavy hummocky land full of humus. I broke a hundred acres last summer, disked it in the fall and harrowed it before and after seeding this spring. I shall not get over half a crop from it. I am breaking another hundred acres this summer, and should like to avoid this trouble next season, if possible. Would more cultivation in the spring have any effect on this insect, or would you recommend putting on extra seed? I don't think this worm does much harm after the wheat has germinated. We had two weeks of cold weather this spring after seeding, and the seed did not start to grow for some time. This was when the wireworms did most harm.'

A remedy which has given a measure of satisfaction to those who have tried it, is to plough the land twice in autumn—once in August, when the wireworms (the larvæ of several species of Click Beetles) change to the pupal condition, in which they are soft and easily injured, and then again in October or later, when the perfect beetles have formed but are still too soft and delicate to stand the cold of autumn and winter if their pupal cell is broken. This late ploughing also exposes them to many enemies. In the North-west, as Mr. Henley has pointed out, it is very rarely possible to plough land as late as October. The present open season, nearly up to the end of November, gives farmers a good opportunity to try this remedy. It has been noticed that oats are not so much attacked as wheat; and barley and rye are even less so, therefore, when land is found to be badly infested with wireworms, it will be advisable to sow other crops than wheat.

CUTWORMS IN GRAIN.—In the middle of July the 'Nor'-West Farmer' referred to the Division several complaints of injury to wheat crops by cutworms (Plate I, fig. 1), and specimens were received from Manitonas, Man. These proved to be the Red-backed Cutworm (*Paragrotis ochrogaster*, Gn.), which is a very general feeder, but, as a rule, restricts itself in a large measure to the weeds growing in grain crops, instead of attacking the grain. Occasionally, however, as in the oat crops of Manitoba in 1901, widespread injury was done by this cutworm; and, in 1900, as well as in 1901, several undoubted instances were reported of its attacking wheat. This bad habit, however, must be considered exceptional; and it is particularly to low vegetables and root crops that the Red-backed Cutworm does harm. The Glassy Cutworm (*Hadena devastatrix*, Brace), a greenish white caterpillar with a red head, which works beneath the ground, damaged wheat fields seriously in the neighbourhood of Virden, Man.

In grain fields it is difficult, as a rule, to apply remedies for cutworms; but, as many of the different kinds assume a marching habit as they clear away the food before them, it is frequently possible to prevent damage to a large extent by applying poisoned bait in advance of their line of march. The poisoned bran remedy, which gives such remarkably good results against all surface feeding cutworms, is probably the best form of bait. This can be scattered lightly through the grain near the spots where the caterpillars are numerous, and the small particles of bran will be found by the cutworms, which eat this material with avidity. For the Glassy Cutworm, which feeds almost entirely underground, this remedy would be of little avail, and the best means of combating this insect is to keep the land to be used for small grain crops the following year as free as possible from long grass and weeds in the autumn before. Prairie or sod land which is to be broken for seeding the next year should be fed off as late as possible or mowed before breaking. In this way the female moths will not be attracted to the tall vegetation on such land when laying their eggs.

GRASSHOPPERS.—I visited the districts in Central Manitoba lying between Treesbank and Douglas in the middle of July, and saw no traces of injury by locusts. Mr. N. Criddle, of Aweme, writes under date of November 1: 'As was anticipated, locusts did not hatch out in sufficient numbers to cause any loss to farmers in this district. A few reports of their being unduly numerous were heard in the spring from places south-east of here; but, as far as I can learn, very little, if any, damage was done. The gradual disappearance of these troublesome pests seems to have been brought about chiefly by the multiplication of their well known parasites, mention of which was made in my last year's report.'

The kinds of grasshoppers which have been devastating the crops in Central Manitoba for the last four years are the Rocky Mountain Locust (*Melanoplus spretus*, Uhler), the Lesser Migratory Locust (*M. atlanis*, Riley), and Packard's Locust (*M. packardii*, Scud.). The two parasites referred to by Mr. Criddle are two blister beetles, *Epicauta sericans*, Lec., and *Epicauta pennsylvanica*, DeG., as well as two or three kinds of *Tachina* flies.

In some of the dry regions of British Columbia another species of locust, *Camnula pellucida*, Scud., appeared in a few places, and did a good deal of harm on the ranges. Mr. George Packham, of the Plateau ranch, Okanagan Mission, writes on June 25: 'Grasshoppers are coming out in thousands again this year. Last year they destroyed most of the crops and damaged the young orchards considerably. Is there nothing that can be done to check them? Is there not a fungous disease that the Australian government supplies to settlers? If so, could not our government supply it to us at cost price? It is important that we get it immediately, or we shall lose acres of vegetables and thousands of young trees.' In view of the great success which had been obtained by Mr. Criddle in controlling vast hordes of grasshoppers in Manitoba in a practical way with the Criddle mixture, I recommended Mr. Packham to try that mixture in the Okanagan country. It has been noticed that the Pellucid Locust, which was the species there prevalent, has the habit of occurring in dense swarms in rather restricted localities, and therefore gives a good opportunity for the application of poison.

The Criddle mixture, for convenience, is made in quantities of half a barrel at a time. It consists of fresh horse droppings 100 parts, Paris green 1 part (=1 pound), and salt 2 pounds, dissolved in half a pail of water, and the whole mixed together. In this connection, Mr. Criddle says: 'We usually measure with a three-gallon patent pail, because it is more convenient to farmers than to weigh the material. Five pails we calculate approximately equal 100 parts of horse droppings, and each part equals in bulk one pound of Paris green. The great drawback in using weights is that horse droppings are not always of the same weight.'

The propagation and wholesale cultivation of the fungous disease for the destruction of grasshoppers of all kinds, which is mentioned by Mr. Packham and has been inquired about from time to time by many other correspondents, I regret to say, has not proved to be, on the whole, of much service in fighting outbreaks of injurious locusts.

For a short period, and in restricted localities, with all conditions favourable, good results have occasionally been obtained; but the difficulty of preserving the spores alive and using them when required, has been so great that all entomologists who have experimented with the fungus have, after a short time, relinquished the effort in favour of other methods not so dependent for their most effective use on climatic conditions. Hopper dozers and other mechanical contrivances have proved of much service; but the best results have followed agricultural methods of control, such as the early ploughing down of all stubble lands, in which by preference the eggs are laid, before the young emerge in spring or have grown to such a size as to be able to save themselves by hopping or flying, so as to avoid being ploughed down and buried.

The HESSIAN FLY *(Cecidomyia destructor,* Say.).—Injury by this destructive enemy of the wheat crop has been slight this year. Most reports merely refer to its absence. Last year specimens were found as far west as Indian Head, N.W.T. In Manitoba it has done less harm by far than in 1903. Mr. Norman Criddle, who has been on the lookout for it, says: 'The only report of this insect comes from Mr. Cooper, of Treesbank, who states that quite a number of puparia were to be found on his stubble fields this autumn and that he estimated the damage on his farm at about half a bushel to the acre. Elsewhere in the province, it is just possible that this insect may have escaped notice on account of the damage done by rust. There was no appearance of Hessian Fly here at Aweme.'

Prof. F. M. Webster, who is making a special study of wheat insects in the United States, writes at the end of this season: 'I found Hessian Fly in large quantities in North Dakota, quite as bad as in many places further south. You will be interested in hearing that from a lot of stubble collected west of Fargo, I have not reared a single adult this autumn; but from stubble collected at Lincoln, Nebraska, we get plenty of adults, showing that there must be a dropping out of the fall brood somewhere between these two localities.'

This observation confirms the opinion that there is only one brood of the Hessian Fly each year in our western wheat fields. This is an important fact, as indicating a proper remedy, and shows the value of cutting wheat high and then burning over the stubble before the time when the flies emerge in spring. In the Ontario November Crop Returns we find: 'The crop suffered much less than in recent years from Hessian Fly and other insects;' and 'in the new fall wheat little injury was complained of, compared with the ravages of this pest during the past three or four years.' In Prince Edward Island, where the Hessian Fly is always present to some extent, little harm was done, but specimens of infested straws were received from Mr. A. M. McMillan, of Eldon, P.E.I.

WHEAT-STEM SAWFLY [*Cephus pygmæus,* L. (?)].—The intermittent manner in which this insect attacks wheat in the North-west was again demonstrated this year. It was not reported from any of the localities where it did harm during the past two years. The only place where a crop was injured conspicuously was at North Portal, Assa. Mr. George Harris writes under date August 24: 'I send samples of wheat injured by a small white worm. The attack is worst on the edges of fields, but is present all through the grain. Where the plants stand thick, you can cut with a binder; but where thin, the wheat falls down and there are patches three and four feet square, which are quite flat.'

The worm which causes this breaking of the straw is the larva of a slender black four-winged sawfly, about one-third of an inch in length, banded and spotted with yellow. The eggs are inserted into the straw by the females near the top of the stem; and the grub on hatching eats its way down to the root, near which it passes the winter in a cocoon spun inside the stem, but above which it has first gnawed almost through the walls of the straw, so that about harvest time injured stems fall over easily and break off, leaving the grub inside the stubble, where it remains, and about June of the following year turns first to a pupa and then to the perfect fly. Burning over stubble fields and ploughing down all land left for summer-fallow early, so that the cocoons may be destroyed by the burning or buried so deeply that the flies cannot emerge, are the remedies recommended.

The GRAIN APHIS *(Nectarophora granaria,* Kirby).—It is probable that two or three species of plant-lice have been spoken of collectively by correspondents under the name of the Grain Aphis, as there is a remarkable difference in the appearance and colour of many of the plant-lice described in their letters, and very few send in specimens of what they consider a so well known insect. The grain plant-lice were more complained of this year in the West than any other enemies of cereal crops. They were exceedingly abundant in many places, and did some harm by sapping the stem and grain and causing shrunken wheat. Specimens were sent from New Brunswick by Mr. W. H. Moore, of Scotch Lake, and reports of unusual abundance were received from several places in Ontario. Nevertheless, there was little appreciable injury to grain crops in the East. In Manitoba and the North-west grain plant-lice were in places so abundant as to cause a good deal of anxiety. Mr. T. N. Willing, the Chief Territorial Weed Inspector, of Regina, reports that the Grain Aphis was very plentiful at some points, particularly north of Wapella, N.W.T. 'They were so abundant on Mr. F. Carr Dufton's farm, Wapella, and that of Mr. W. M. Gordon, Hazelcliffe, that the binder was actually stopped by reason of the canvas slipping on the rollers, from the slipperiness caused by the crushed plant-lice, and these were cleared off from the platform by the shovelful.'—T. N. WILLING.

'Pilot Mound, Man., Aug. 17.—I send wheat heads attacked by the Grain Aphis. I have a large acreage in which the grain is infested; but the only harm I can see that they do so far is to delay ripening. In walking only a short distance into the standing grain my clothing became covered with these insects.'

'Aug. 28.—The plant-lice which were so abundant when I last wrote, soon afterwards suddenly disappeared. They got wings about August 18 and flew away, I hope, never to return.'—PHIL. W. ROBINSON.

'Winnipeg, Man., Sept. 6.—We send sample of wheat received from a farmer at Wawanesa, Man. You will notice that it is affected by a small insect which is working on the head. The farmer writes : "The heads of the wheat are covered with a small insect of a green and black colour, which seems to be a bad pest. The heads of the wheat are covered with them and there must be millions in a single field. They seem to be sucking out the juice of the straw and the berry.'—W. J. BLACK, Editor *Farmers' Advocate.*

'Yorkton District, Assa. (30.25.2.W. of 2nd), Sept. 13.—There was an insect on the grain this year which, had it come sooner, would have done a great deal of damage. There are millions of them on the oats, and I understand they are on the wheat also. They cluster around the kernel.'—A. C. GIBSON.

So far, no treatment has been discovered for controlling plant-lice on grain crops; but fortunately, they very seldom affect the output to any considerable extent; for an excessive occurrence of these insects is invariably attended by a correspondingly abundant development of parasites which feed upon them.

The WHEAT MIDGE *(Diplosis tritici,* Kirby).—It is many years since any noticeable loss from the larvæ of the Wheat Midge, usually called 'The Weevil' by farmers and millers, has taken place. Fifteen years ago the injury through the country was enormous, but suddenly, about 1889, the insect practically disappeared from our wheat fields. In 1898 a rather severe outbreak—the loss amounting to about 25 per cent of the crop—appeared as suddenly in the Niagara Peninsula, particularly along the lake shore in the county of Lincoln. Nothing has been heard of the Wheat Midge since that time, there or elsewhere, until the past summer, when specimens were sent from the fertile Chilliwack district of the Fraser River valley, in British Columbia. Mr. J. R. Anderson, in his report on the crops of the year, says : 'The Wheat Midge

(*Diplosis tritici*, Kirby) made its appearance at Chilliwack, but does not seem to have shown itself elsewhere. Where noticed, the infested wheat was destroyed by fire.'

Specimens of wheat heads more heavily infested than any I have ever seen, were received from Mr. Henry Kipp, of Chilliwack.

'Chilliwack, July 27.—I enclose heads of wheat infested by a small red maggot. There were a few last year, but this year my field is ruined. Please let me know what it is, and send a remedy if there is any. I believe there are hundreds of acres more or less injured by this insect. You will be doing the farmers of this district a great favour if you publish a remedy for it so that we may be ready to protect ourselves another year.'—R. ROBERTS.

'Chilliwack, July 28.—I enclose heads of wheat infested with a little red insect, which is attacking all the wheat crops here. Is there any remedy? I suppose not, as the wheat is so far advanced and is just beginning to ripen. I hear rumours of barley being attacked. So far, oats and peas are not. I see under the microscope this little insect resembles a minute worm. Most people, including myself, are going to cut the wheat green.'—G. MAXWELL STUART.

'Chilliwack, Nov. 24.—As far as I can hear, wheat was damaged by the Wheat Midge more or less all over the lower Fraser valley; the extent of the injury varied according to locality and to the state the wheat was in when the Midge attacked it. On the whole, the average would be, I think, less than one-third of the crop for the turn out. I heard of one farmer who only got 10 sacks of wheat off 10 acres; another got 25 bushels off five acres; he estimated the crop, before the Midge attacked it, at at least 20 bushels to the acre. On the other hand, Mr. Evans, of Sumas, had his wheat in very early; and it was not injured at all. I suppose the wheat had got too hard for the Midge; and for the same reason the fall wheat here was not hurt at all. I do not put in much wheat, my land being better suited for clover and peas; but off two acres which looked very well before the Midge came, I got only about two sacks. A good many cut their wheat for hay as soon as they knew it was attacked. Do you think this insect is likely to occur again next year? It would be a useful hint to farmers if you could include in your report a suggestion as to whether it would be wise to sow much wheat or not.'—G. MAXWELL STUART.

As to sowing spring wheat next year in the Chilliwack valley, it would certainly be wiser not to do so, but to use the land for some other crop such as oats or barley, which are not attacked by the Wheat Midge. It is, of course, possible that the Midge may not be abundant next year; but it is much more likely to be present in some numbers, which would make it unwise to grow wheat when the land can be used for so many other valuable crops.

'Chilliwack, November 28.—*Re* losses from Wheat Midge in this valley, I may say they were even more serious than I first thought. After attending a number of threshings, I am sure fully half of the wheat crop was destroyed by it; there would be found several bushels of the grub underneath the machine after it had worked one or two hours. But a few like myself cut their wheat and made hay when the insect was found to be bad; but I may say the loss was not felt as bad here as it would have been in a wheat-growing district; for the farmers here only grow wheat for feed, and only a comparatively small acreage is annually sown to wheat; so the loss, although considerable, will not be felt very much, and the chickens will have to eat something else. I notice an increase in the acreage of fall wheat sown this fall; for, strange to say, the insect does no harm to fall wheat, and a few fields of very early spring wheat escaped the Midge. I have just rubbed out a few heads of the wheat which I cut for hay, and find the grub still there, with no change, as far as I can see, since I first noticed it.'—R. ROBERTS.

All the samples of infested wheat received were remarkable for the enormous numbers of the larvæ clustered round the grains in each floret; and, although few farmers reported injury by the Midge, this was without doubt great where the insect occurred. Immediately on receipt of the samples an article was prepared for the *Province* newspaper of Vancouver, B.C., in which the insect was described and the best steps to take were mentioned, so that as much as possible loss might be minimized in the future. The Wheat Midge possibly attacks some grasses, but has never been detected, as suggested above, on barley nor upon oats and peas.

The Wheat Midge and its attack are thus described in my report for 1888, page 49, which I reprint here, as I have nothing further to add to it in the way of useful information:—

'The Wheat Midge is more widely known in Canada under the inaccurate designation of 'Weevil,' a term which must be discouraged, because it belongs to another class of insects altogether. The weevils are hard-shelled beetles, with elongated snouts, while the Wheat Midge in its larval stage is a legless maggot, and, when in the perfect state, a delicate gnat-like creature with gauzy wings. The life history of the Wheat Midge, as at present understood, is as follows:—During the month of June, just when wheat is in blossom, tiny yellow midges with black eyes and yellow bodies may be seen flying over the fields, particularly on dull days or towards evening. Large numbers of the same midges may also be seen in houses as soon as the lamps are lighted. These are the Wheat Midge and the parents of the Red Maggot of wheat.

'The body of the female fly is prolonged into a long slender tube which can be extended or drawn in at pleasure. With this tube, which is called the ovipositor, she pushes her minute eggs down between the chaff of the green wheat ear. In about a week these eggs hatch into small transparent yellowish maggots, which at once attack the forming grain. Gnawing through the outer skin of the kernel of wheat, they extract its juices and prevent it from filling out properly. As these larvæ grow older, they gradually become darker in colour until they acquire the tint which has given them the name they are best known by in England, "the Red Maggot of the wheat." Grain injured by the Midge has a characteristic shrivelled appearance, known amongst millers as "fly struck." There are sometimes four or five maggots to each grain in an ear.* As soon as the maggots are full grown they either work their way up between the scales of chaff and fall to the ground, or remain in the ears until the crop is carried. Those which fall to the ground—and these are by far the most numerous—penetrate about an inch beneath the surface, where they spin a small cocoon of exceeding thinness, which fits so closely to their bodies that it is sometimes thought to be only the skin hardened, in the same manner as takes place in the case of many other flies when they pass through their pupal or quiet state. It was generally supposed that the perfect flies from these pupæ did not appear until June in the following year. This, however, is not always the case, for, on a warm, damp evening in August, and again in the beginning of September, 1888, large numbers flew into my study and were killed at the lamp. Prof. F. M. Webster, a special agent of the United States Department of Agriculture, on one occasion bred considerable numbers of perfect Midges in the month of July, from heads of wheat which had been badly attacked by the red maggots during the previous month; and, off and on, during the rest of the summer until November, he caught the perfect insects at large. In the report of the United States Entomologist for 1884 the same observer records as follows:—"From September 4 to 15, I not only found larvæ in considerable abundance under the sheaths of volunteer wheat, but adults too in the same situation, and also on the outside of the plant or hovering above the upper leaves. From a quantity of this wheat placed in a breeding cage, on September 7, appeared three or four adults." Not only, then, did these maggots of June produce perfect flies that same summer, but there was a second brood which had time to lay eggs in the young fall wheat. That this insect has a double life history, living both in the ears and later in the season in the shoots of young

*There were from 10 to 15 in almost every instance with each grain in the heads sent from British Columbia this year.

wheat plants, is an important discovery made by Prof. Webster, and suggests another means of checking its ravages.'

*Remedies.*—The remedies for the Wheat Midge, as for all other insects which attack crops, depend largely upon its habits and the way in which it passes the winter. Those methods which have given the best results are as follows :—

1. Deep ploughing directly the crop is carried, so as to bury the larvæ so deep that the flies cannot work their way out through the soil.

2. The burning of all chaff, dust and rubbish known as 'screenings' or 'tailings' from beneath the threshing machines, as these contain many of the larvæ which are carried with the crop. If fed to chickens or domestic animals, this should be done in a place where none of the puparia can escape destruction.

3. Clean farming, including the cutting of all grasses along the edges of fields and the ploughing down of all volunteer crops found in wheat fields before winter sets in, so as to destroy an autumn brood where one exists.

4. The cultivation of such varieties of wheat as experience has shown are least affected by this insect. There is a great difference in kinds of wheat in this respect, and from time to time so-called 'midge-proof' varieties have been introduced, but it is probable that there is no truly midge-proof variety of wheat as yet known.

The PEA WEEVIL *(Bruchus pisorum,* Linn.).—The satisfactory state of affairs referred to in my last year's report as to the sudden and remarkable decrease in the numbers of this pest has continued, and, even to a greater degree, during the summer of 1904. This sudden cessation of activity on the part of such a persistent enemy cannot be accounted for by any one cause; but it must be claimed to be due, to some extent at any rate, to the persistent work which has been done by entomologists in stirring up farmers to greater care in treating their seed pease before sowing them, and in harvesting and treating the crop as soon as possible after it is ripe. Many farmers, for fear of loss from the depredations of the Pea Weevil, gave up growing peas altogether during the last two seasons. In 1903 the numbers of the Pea Weevil were perceptibly reduced, but no natural parasites such as frequently bring down the numbers of other insects when they increase unduly, could be detected to account for this. The winter of 1903-4 was more severe, both from its duration and the intensity of the cold than has been experienced for many years. There is no doubt that the cold weather destroyed many of the weevils which had emerged in the autumn and were hibernating around barns and buildings. It is probable, too, that many of those still remaining in the seeds through the winter were also killed by the cold. In some rather extensive experiments carried on during two or three years to decide whether there was any exact limit to the low temperature which could be borne with impunity by the Pea Weevil, I found that beetles exposed inside the pease, both with the skin of the pea intact or with the cell cap pushed off, were killed at between 18 to 20 degrees below zero, Fahr. On several occasions during last winter the thermometer dropped lower than 20 degrees below zero, Fahr., in those districts of Ontario where the best seed pease are grown. Mr. Geo. E. Fisher, a practical farmer and careful observer of insect life, writing from Burlington, Ont., on September 29, says : 'The pea crop here is now being threshed. It is a good crop and characterized by the entire absence of bugs. This substantiates my contention that cold weather settles the Pea Bug. I believe there will be a large acreage put in to peas next year.'

Prof. C. C. James, in his November crop report for Ontario, says : 'The round or common field-pea has not been widely sown during the past three or four years owing to the weevil or "bug." The yield and general quality of pease this season, however, will do much to restore confidence in the growing of this crop. The injury from weevil was comparatively slight, and a larger area of peas may be looked for next year.'

Mr. J. D. Evans, President of the Entomological Society of Ontario, who has made inquiries for me in Prince Edward county, one of the most important districts in Canada for the production of first-class seed and pease, writes on November 11: 'The Pea Weevil was not destructive at all this year; in fact, it seems to have entirely disappeared. There were none found at Picton, Bloomfield, Wellington, Trenton or Frankford. Mr. Cooper, of Bloomfield, and Mr. W. P. Niles, of Wellington, both well known to you as first-class men, report its apparent disappearance in the above-mentioned localities.'

I draw special attention to the great diminution in the numbers of the Pea Weevil at the present time, in the hope of inducing growers to avail themselves of this exceptional opportunity of pressing home their advantage now when the infestation is so slight, and when, therefore, every insect killed is of much greater importance in the conflict than when Pea Weevils are occurring in the incredible numbers in which they existed in Canada only three years ago. I again repeat that I can see no reason why the Pea Weevil should not be entirely wiped out in Ontario.

There are special features about the attack of this insect which render its control a simpler matter than is usually the case with injuries of an equal magnitude. The Pea Weevil is not a native of North America, and has no other known food plant than the cultivated pea, which, being an exotic plant, will not live over the winter in our climate if seed is left in the open field; consequently, every seed sown for the pea crop of the year must, before it is sown, have been under the control of some one by whom it could have been treated before sowing to destroy the contained weevil if it had one. Fumigation with bisulphide of carbon is a certain, effective, easy and cheap remedy, which is well known and can be applied by any one. If all growers of pease, will combine to do this this year, when on account of the cool season of 1904, it is not likely that many of the weevils have left the seed, by far the greater number of the Pea Weevils now remaining in the country can be destroyed before another season opens. This, however, alone will not be sufficient. The knowledge of the life history of the insect must be made much more widely known to farmers than is the case; for, notwithstanding all that has been written on the subject and the attention which has been given to it at farmers' institute meetings, I have received during the past season a great many inquiries as to the best means of treating pease before sowing; and further steps must be taken at the proper time of the year to spread more widely a general knowledge of the subject, so that those growing seed and sowing pease, may understand the reason why certain steps are advised. My recommendations are :

1. That all pease for seed should be treated before they are sown, whether the weevil is thought to be present or not, and that seeding should be as early as can be, so as to get the crop ripe and ready for treatment at the earliest possible season.

2. That pea-growers should harvest their pease as much on the green side as is safe, rather than, as is usually done, waiting until they are dead ripe. This has many advantages; not only is the straw of much higher quality for feed, but the seed is heavier and better for every purpose. The pease should be threshed as soon as dry enough, and then fumigated at once. The weevils will not have completed their growth and will have destroyed a smaller proportion of the bulk of the seeds than if they were left until later in the winter. It is certain that weevils in all stages of growth may be killed inside the pease by fumigating with bisulphide of carbon. Consequently, if growers will sow early and harvest and thresh a little earlier than usual, and either themselves treat their seed immediately or sell to the grain buyers, who for their own sakes will do this, much good must surely result. When for any reason pease cannot be treated at once or disposed of, they should be bagged up and the sacks tied up immediately so as to prevent the escape of any weevils which might emerge in the autumn. When the grain is required for feeding, and therefore it is thought not necessary to fumigate, pease should be ground as soon as they are dry enough; and, for the convenience of grinding and to prevent the meal from becoming musty, some old pease should be mixed with the new before passing them through the grain grinder.

3. That everybody who understands the gravity of this question should use every endeavour to persuade all growers of pease to abstain from sowing any pease which contain living weevils, and, when purchasing seed, to refuse determinedly to buy any without an assurance from the seed merchant that they have been treated, and, even with this assurance, to examine for themselves to see that any contained weevils are really dead. There are two points which should always be remembered by those who purchase pease for sowing. Seeds which have been injured by weevil are so much reduced in vitality and producing power that they are only worth about one-quarter as much as sound seed, and also, that treatment with bisulphide of carbon in no way injures the pease, whether they are to be used for seed or to be fed to stock.

## FIELD CROPS.

The irregular nature of the weather during the summer months of 1904, which has already been referred to under cereal crops, was manifested even more plainly by its effects upon fodder crops. Good hay crops were the exception, perhaps the best being secured in western Quebec and central and northern Ontario. Corn was nowhere heavy nor well developed. Complaints of poor seed were frequent; but it is possible that some of the disappointment was due rather to weather conditions than to lack of quality in the seed. Late spring frosts did some injury, and early frosts in autumn reduced very much the weight of ensilage corn per acre. The Ontario returns sum up the crop as follows :—'Corn for the silo is described by some as being of inferior quality, while many others claim that it will be good or of fair quality. Taken altogether, however, it has been a decidedly poor year for corn.' In the Maritime Provinces and Quebec some injury was done by cutworms, necessitating replanting and a consequent retarding of the crop, so that it was caught by frost in the autumn. The drought which prevailed from the Temiscouata district in Quebec to the sea coast reduced enormously hay crops, which up till the first of June were apparently in a flourishing condition. Writing of the climatic conditions in Prince Edward Island, the Rev. Father Burke says :—'The season opened with much promise, and there was more soil moisture than we have had for several years. The weather was warm and genial, and the opportunity for getting the crop in was unexcelled. Towards the end of June, however, the complete absence of rain began to be felt, and, as almost every day we had high winds from the south-west, growing crops became a greater concern to farmers. We had merely a few insignificant showers till away on to the last of September, so that grass and all forage crops were seriously affected. Hay was not half a crop, and grain in land not particularly rich in humus very poor indeed. We are exceedingly short of fodder, and the government is importing hay from Quebec to prevent the wholesale slaughter of cattle.'

A much brighter report comes from British Columbia, notwithstanding that large areas were affected by drought. Mr. J. R. Anderson reports grasses and clovers as giving 'good yields throughout the province, and on account of favourable weather hay was mostly well cured. Red clover, alfalfa, sainfoin and alsike in different localities gave some surprisingly large yields on irrigated lands, as much as three crops being cut in places. Timothy is largely grown, but its production is discouraged, as other grasses are preferable for pasture.'

Insect enemies of these crops were not complained of to any large extent; but this cannot be taken to mean that no injury was done. Enormous losses may be sustained in hay and fodder crops without farmers noticing the fact. Then, again, some losses have become so much a matter of every year occurrence that no mention is made of them in reports. This is particularly the case with the CLOVER-SEED MIDGE, to which I have drawn attention very frequently. The annual loss at the present time is enormous, and yet, if those who grow clover seed practise the simple remedy of feeding off or mowing the first crop before June 20, the results are always so satisfactory that I cannot understand why the practice is not more generally adopted.

Mr. G. H. Clark, Chief of the Seed Division of the Department of Agriculture, who has exceptional opportunities of learning the condition of crops throughout the country, writes to me as follows:—

'Ottawa, Nov. 30.—Referring to your inquiry about the condition of the clover seed crop for 1904, I have to say that our instructor in seed-growing for the province of Ontario has reported that, on account of the severe winter, the crops of alsike and red clover in June and later months appeared patchy, and, in consequence, a much smaller area was left for seed crop than in previous years. Mr. Newman also inspected fields of red clover that had been left for seed in nearly all of the districts where red clover seed is extensively grown, and found in practically every county that the crops had been badly injured by the midge. These conditions, together with the unfavourable weather for ripening the seed, would indicate that the clover seed crop of 1904 will fall considerably below the average.'

Further efforts will be made next season to draw the attention of the clover seed growers to this important matter; and it is to be hoped that a reduction may be made in the great amount of loss which is now taking place every year. Letters appeared in the newspapers last year at the end of June, advising the best steps to take and a few farmers followed them; but the result of the clover seed harvest of this year is very unsatisfactory. The plants in many places suffered from the severity of last winter, and there was a great deal of winter-killed clover in spring. Alsike seems to have suffered even more than red and mammoth clovers, and red clover in all parts of the province of Ontario was injured by the midge. In travelling over part of New Brunswick and in the Annapolis valley of Nova Scotia in June last, I found red clover in almost every section badly attacked by the midge.

The CORN WORM (*Heliothis armiger*, Hbn.).—From time to time complaints are received from various parts of the country of more or less injury to sweet corn in autumn by the caterpillar of a noctuid moth, which is known by various popular names. It is what Professor Lugger called the Sweet Corn Moth, or Tassel Worm, in Minnesota, and is also the same as the notorious southern 'Boll Worm' of the cotton, to which crop it frequently does great damage and for which it has been found very difficult to find a practical remedy. The name of widest use is the Corn Worm, although its injuries in Canada are not confined to Indian corn, for the caterpillars have also been found boring into the fruit of tomatoes and attacking many other plants. There is but one brood in the year in Canada, the caterpillars occurring in autumn and the moths from these emerging the following summer. The worst injury by this insect in Canadian crops is to the cobs of sweet corn, because the work of the caterpillars renders the ears unsightly and discoloured so as to be unfit for the table.

In 1898 there was a bad attack at Orillia, Ont., when as much as 95 per cent of the ears of both sweet corn and yellow field corn were injured. There were other outbreaks in the same year in western Ontario and at Ottawa. These caterpillars do not appear till late in the season, generally during the months of September and October, when they may be found of all sizes, eating the young grains near the tips of the ears, frequently as many as five or six caterpillars working in the same ear. As they approach full growth, when they are an inch and a half in length, they frequently eat their way out of one ear and attack another one.

The only account of injury by the Corn Worm this year comes from Nova Scotia, and is the first record I have had of injury by it in that province.

'Mahone Bay, Sept. 7.—I send you under separate cover specimens of what is to us a new pest. It affects garden corn in the way you will see by the portions of several ears I am also sending. There are from one to three of the caterpillars in each ear, and, of about 45 ears picked by me, so far only five were free from them. This pest seems quite general here, and at least for eight or ten miles around. One man only, of all I have asked about it, tells me that his corn is not affected. After a while the caterpillars make a round hole through the husk and disappear, I suppose, into the ground, although I have vainly hunted for them in the ground about the corn roots.' —Charles A. Hamilton.

The caterpillar is somewhat variable in colour, and is from one and a quarter to one and a half inches in length when full grown. The head is honey yellow, and the body varies in colour from pale greenish to dark brown, and is marked with longitudinal dark stripes and with a conspicuous band along the sides where the breathing pores are situated. This band is white, mottled with pink. On the body are the ordinary tubercles which are found on noctuid larvæ. These are distinct and black, each one bearing a slender bristle. The upper surface is marbled irregularly with white, and the whole surface of the skin has a velvety appearance, owing to numberless very short bristles, which are black and white in about equal numbers. A single specimen, which turned out to be a caterpillar of this moth, was found in a greenhouse late in the year (October 28). It was full grown and buried in the ground on October 31. The jar containing it was kept out of doors for the winter, and the moth emerged on July 8 the following year. This caterpillar was remarkably unlike those occurring on corn the same year, being entirely dark velvety green, without conspicuous markings, and was feeding on the leaves of a scarlet geranium. This moth, however, is by no means a common species in Canada, and nearly all of the specimens I have seen have been taken late in the year. Prof. Lugger states that the insect does not winter in Minnesota, but that all are killed late in the fall. This, he points out, would mean that the insect has to be reintroduced every summer from the south, where it can successfully hibernate. Whether the insect also hibernates as a moth in Canada, I have been unable to decide, but it certainly passes the winter in some instances as a pupa, although the caterpillars vary so much in size late in the year that many of them must be caught by early frost, which destroys their food plant. The moth of this insect is somewhat variable in the intensity of colour, but is usually of a dull pale ochreous yellow, with olive or ruddy markings on the forewings. The yellowish hind wings have a broad blackish band, and are edged with pink. These moths expand a little more than an inch and a half from tip to tip of the opened wings.

The caterpillars of the Corn Worm are recorded as having been found on a great many different kinds of plants, including the following crops: Pumpkins, tobacco, beans and peas; and the full grown caterpillars seem to have a penchant for eating into any solid firm object, such as a fruit or pod of any kind.

*Remedies.*—Unfortunately this is a very difficult insect to keep in check. When it attacks corn, as described above, it is seldom noticed until a considerable amount of harm has been done. Where the caterpillars are troublesome regularly every year, growers, it is claimed, get into the way of recognizing at a glance, ears which are infested, by the discoloration of the silk earlier than is natural in perfect ears. As soon as an infested ear is discovered, the leaves of the husk are pulled back and the caterpillars destroyed by hand. Where, as in Canada, it is only at long intervals that harm is done in any one place, corn growers are taken by surprise, and the injury is done before it is noticed. It is claimed that many of the moths may be taken in lantern traps consisting of a lamp standing in an open pan containing water with a little coal oil on the top of it. Anyone, therefore, who knew the appearance of the insect, upon recognizing the moths in years of great abundance flying around lights at night, might place lantern traps as described above in his crop, and thus prevent future loss; but this insect, like many others which appear in an intermittent manner, will always be a source of trouble. On fields where a crop of corn is known to have been attacked by the Corn Worm, the old stems should be removed from the field as soon as the crop is gathered, and the land ploughed deeply in autumn so as to break up the cocoons and expose the pupæ to the weather and their various enemies among the small birds and mammals.

The BLACK ARMY WORM *(Noctua fennica,* Tausch.).—This cutworm was found in small numbers at Ottawa, chiefly in gardens and clover fields, but no great harm was done. There was a serious occurrence of the insect at St. Emile de Suffolk, Que. Mr. Elsimère Guérin wrote on May 27 : 'This spring I sowed 13 bushels of peas, which have been destroyed by the caterpillars of which I send you specimens. They are beginning to attack my oats. Can you tell me what I can sow in place of the peas without loss ? Also, if there is anything I can use to destroy the worms ?'

The samples sent were full grown specimens of the Black Army worm, which is a velvety black caterpillar with red head and legs and is striped down the back and sides with distinct but fine white lines. The dorsal area is sometimes more or less washed with a reddish tinge. There is a distinct white waved stigmatal band, washed with yellow and bearing in the centre an irregular black line. The lower side of the body of these caterpillars is a dusky green mottled with white. They become full grown about the end of May, when they burrow into the ground and turn to chrysalids, from which the moths emerge in July. In reply to Mr. Guérin's question, he was advised to leave the pea field and see if the plants did not recover, this having been our experience at Ottawa in 1891, when from a field similarly injured a heavy crop of peas was harvested. Later in the year Mr. Guérin wrote to me that he had reaped a heavy crop of peas from this field.

The COTTONY GRASS SCALE *(Eriopeltis festucæ,* Fonsc.).—In the report of the Entomologist and Botanist for 1895, some account is given of a curious scale insect which has occasionally appeared in vast numbers in pastures and meadows in Nova Scotia and Prince Edward Island. From time to time specimens of the egg-sacks of this scale insect on grass (Plate I., fig. 4) are sent in for information, and apparently the species is not uncommon in the Maritime Provinces. During the past summer I observed small colonies in many places, and Mr. W. H. Harrington tells me that he also found them very abundant near Sydney, C.B. Mr. Charles Myers sent specimens from Lake Verd, P.E.I., with the statement that in many places, both in new meadows and on old sod, almost every blade of grass had one or more of the scales upon it.

This insect passes the winter in the egg condition beneath the scales. The young hatch in spring and feed on the leaves and stems of grass. The females become full grown in July, and towards the end of the month lay their eggs in conspicuous elongated oval sacks of closely felted downy white threads. As the eggs pass the winter upon the old grass, the burning over of pastures and meadows late in autumn or before growth begins in spring, would be an easy way of destroying this scale, should it at any time multiply so as to become injurious.

## ROOTS AND VEGETABLES.

Both field and garden roots and vegetables have been to some extent affected by weather conditions in spring, and also have suffered considerably from well known enemies, but in most places they picked up well in autumn. Foremost among insect enemies were cutworms, which were extremely abundant and destructive in some parts of the Maritime Provinces, Ontario and the North-west Territories, and also in some places in British Columbia. The Turnip Flea-beetle did a great deal of harm in Nova Scotia, making it necessary sometimes to sow twice and even three times. Turnips in fields as well as in gardens were much injured by the ordinary Cabbage Root Maggot. The Onion Maggot was destructive everywhere. Beets and mangels had their leaves somewhat blistered by the mining larvæ of the fly *Pegomyia bicolor*, Wied., reports being received both from western Ontario and Nova Scotia; little harm, however, was done, as the attack stopped early in the season. The Turnip Aphis, Cabbage Aphis and plant-lice upon several other vegetable crops were numerous and destructive.

Potatoes were in most districts a satisfactory crop. The Colorado Potato Beetle was less aggressive than for many years, and no new enemies of prime importance were reported. The Potato Aphis occurred at Mahone Bay, in Nova Scotia, and did some harm ; but this is an insect which so far has only appeared at long intervals. The Potato Rot has been rather prevalent and destructive. In Prince Edward Island 'the root crops were good—potatoes never better nor less attacked by pests of any kind.' (Rev. A. E. Burke.) At the Provincial Exhibition held at Charlottetown in September last, the exhibit of potatoes was simply wonderful, the tubers being even in size and remarkably free of blemish. In Nova Scotia the crop was a good average one, with little mention of rot. In Ontario there was a large yield, but considerable rot appeared, especially on heavy soil or on low land; the extent of the loss is variously estimated at from 20 to 50 per cent. In British Columbia, Mr. J. R. Anderson says: 'Potatoes are decidedly under the average in those sections where the best qualities are produced; fair on low lands; prices firm. The yield of other root crops is about normal, but short in some of the higher regions, although the quality is good.'

Spraying potato fields with Bordeaux mixture to prevent injury by the Potato Rot has again shown the great value of this useful remedy. Four sprayings on August 1, 15, 31 and September 14, gave potatoes absolutely free of all traces of disease. This was on light sandy land, and, as a rule, one or two more sprayings would be advisable. The saving from this treatment for Potato Rot is now so well established and so many object lessons have been given at fall exhibitions and on the experimental farms, that it is a most remarkable thing that more farmers and others do not practise such a simple method of saving a large proportion of their crop. Although, as with every other remedy, there is a variation in the amount of protection, in every instance that has come under my notice, and these have been many since we began to spray potatoes on the experimental farms, to show farmers what an excellent remedy it is—it has been invariably shown that spraying potatoes with the Bordeaux mixture to prevent Potato Rot always pays. Every year such demonstration plots have been grown since 1891, and, besides this, the Horticulturist and Agriculturist now spray all their potatoes as an economic method of obtaining as big a crop as possible.

The Potato Scab, another fungous disease which frequently disfigures and lowers the market value of potatoes very much, was also reduced to a minimum by soaking the tubers used for seed, before sowing, in a solution of 8 ounces of commercial formalin and 15 gallons of water.

CUTWORMS.—The larvæ of several species of noctuid moths known collectively under the name of cutworms (Plate I., fig. 1), as usual, did a large amount of harm in gardens, as well as, in some instances, in fields. By far the greater part of the injury was done by the Red-backed Cutworm (*Paragrotis ochrogaster*, Gn.), which is one of the widest spread and most injurious cutworms we have in Canada, appearing every year in greater or lesser abundance. It is not always possible to determine the species which is reported upon, but in most instances mentioned below actual specimens were received:

I was informed when in Prince Edward Island recently that, in almost all parts of the Island, cutworms had been most destructive last spring. Father Burke says : 'They were never more plentiful than last year and did a great deal of damage to all crops. Your poison bran remedy seems dangerous to apply where there are birds, fowls and other domestic animals about.'

Mr. A. McNeill, Chief of the Fruit Division, Department of Agriculture, writes on July 27: 'During my last visit to Prince Edward Island, I saw in many places, particularly in Queen's County, most serious depredations by cutworms. Our July crop reports emphasize this and show that the root crops as well as garden truck have been almost completely destroyed by cutworms. I trust you will be able to think out some scheme to help farmers get rid of this enemy.'

Mr. Saxby Blair, Horticulturist at the Experimental Farm, Nappan, N.S., told me, when visiting the farm in June last, that this same cutworm had done a great deal of damage in his vegetable plots and in the flower beds. I advised him to use the poisoned bran remedy, and he now tells me that, as far as the cutworms are concerned, this was most satisfactory in checking them.

'Mahone Bay, N.S., June 28.—I send specimens of cutworms which are doing damage here. They cut off indiscriminately all kinds of vegetables. One of the specimens sent had just finished cutting off a potato stalk nearly half an inch in diameter. About ten per cent of my peas were taken, and other vegetables were injured. Some of my neighbours suffered somewhat more severely. These grubs, I notice, are becoming more common. Last year there were comparatively few, and the year before I saw none. Please tell me the species. I don't need other information as I find cutworms fully treated in your reports.'—C. A. HAMILTON.

'Tignish, N.S., June 30.—Cutworms are doing much damage in this part of Cumberland County. In my garden, with the exception of potatoes and sweet corn, they have eaten nearly everything.'—G. E. STOPFORD.

'Northport, N.S., July 6.—The cutworms I am sending are destroying cabbages, mangels, beans, &c., and are a perfect pest. What can be done to prevent their still growing more plentiful another year and to put a stop to the damage they are doing now ?'—G. BRANDER.

'Forest Glen, N.B., July 1.—I send you specimens of grubs which have given us great trouble this spring in our garden. They eat off the bean stalks just as they come above the ground. After they had destroyed a great many of our early beans they attacked black currant and gooseberry bushes.'—J. BLEAKNEY.

'Hartland, N.B., July 4.—I am very much troubled this year with insect pests. Many of my plants are being cut off by grubs, and the trouble is general in this neighbourhood. In my garden, only cauliflowers and cabbages are attacked; but, with my neighbours, beans and tomatoes are badly destroyed. One man lost half his beans. I see that you recommend mixing bran with Paris green and sweetened water, putting a little of this round the plants. Is there any possibility of the plants absorbing enough of the Paris green so placed to render them unsafe for food ?'—JOHN BARNETT.

'Batiscan Station, Que., July 8.—What can I do to destroy grubs that are eating up my onions, cabbages and other vegetables ?'—M. SISSONS.

'Trenton, Ont., November 11.—The only instance of serious loss from insect enemies during the past season, which has come under my notice, was when I was at Coe Hill about midsummer. I learned of the almost total destruction of young cabbage plants early in the season by cutworms.'—JOHN D. EVANS.

'Calgary, Alta., June 20.—We are sending herewith some cutworms which are destroying all plants they come in contact with.'—HOLE & ANDERSON.

'Blackfalds, Alta., July 8.—Cutworms are very bad here this year. They have even started to eat off stalks of the potatoes.'—E. DALTON TIPPING.

At Ottawa there was again this year a veritable plague of cutworms. My assistant, Mr. Arthur Gibson, took notes upon some fields which had been treated to save the crops from cutworms; and his observations confirmed us in the belief that the poisoned bran remedy, which I have advised so widely during the last few years, was on the whole the most satisfactory way of stopping injury by cutworms, and is a practical remedy equally applicable for crops growing in fields as in gardens. Mr. Gibson found in a field of tobacco which was being rapidly destroyed, that, by the second day after the remedy was applied, the destruction of the plants stopped entirely, and dead

[PLATE I.]

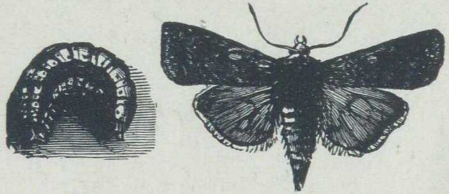

Fig. 1.—A cutworm and its moth.

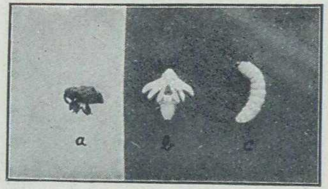


Fig. 2.—The Plum Curculio: *a*, beetle; *b*, pupa; *c*, larva—natural size.

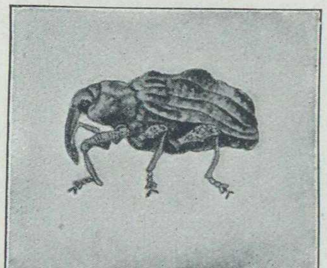

Fig. 3.—The Plum Curculio: beetle —enlarged.

Fig. 4.—The Cottony Grass Scale: egg-sacks on grass—natural size.

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*(Figs. 2 and 3 kindly lent by J. M. Stedman, Columbia, Mo.; Fig. 6, by the N.H. Agr. Exp. Station.)*

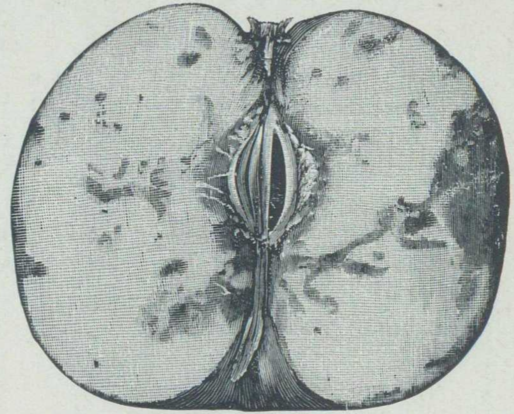

Fig. 5.—Apple infested by Apple Maggot.

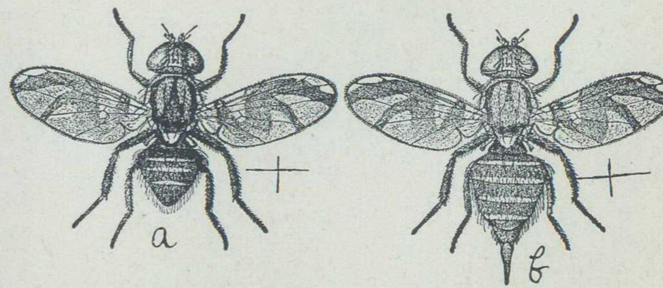


Fig. 6.—Flies of the Apple Maggot: *a*, male; *b*, female—enlarged.

or dying cutworms could be found by moving the soil lightly beneath every plant. By actual count, as many as nineteen were found under a single plant, and nearly as many under several others. This is only one instance of the very remarkable effectiveness of this remedy.

*Remedy.*—The poisoned bran mash is made by mixing half a pound of Paris green with fifty pounds of slightly moistened bran. In making this, it is best first to dampen some of the bran slightly with water containing a little sugar. After mixing thoroughly, add the Paris green by dusting it on the surface and stirring all the time. We have found that when Paris green is added to perfectly dry bran, owing to its weight, it will sink at once to the bottom when stirred, in the same way that it does in water. Half a pound of Paris green is enough to poison fifty pounds of bran, although double this amount may be used. If the mixture is too wet, more dry bran should be stirred in until the mixture will crumble easily and run through the fingers without adhering.

When required for garden use, all that is necessary is to sprinkle a little of the poisoned mixture by hand around such plants as are liable to attack. When crops are planted in drills or in rows, a convenient way is to make the mixture almost dry and then distribute it by means of a Planet Junior or other wheel seeder. In field practice, among such close growing crops as standing grain, which are sometimes injured by the Red-backed Cutworm, the poisoned bran remedy is also serviceable. The mixture can be distributed by means of a paddle or shingle and can be thrown easily to a distance of twenty feet. When distributed in this way, there is much less danger of chickens and birds picking it up than if it is placed in lumps.

The question of danger from the use of this poisoned bait is one which must be considered. It is frequently inquired about by correspondents, and some instances of the poisoning of poultry where it has been used, seemed to be justly attributable to their having eaten some of it. As a rule, there is little danger from this cause. The quantity used is so small that it is not noticed by poultry; and then, in gardens, poultry do so much harm to plants that they should never be admitted, at the time of year when cutworms occur injuriously and only at special times of the year when there are no crops to injure. If, however, there should be a bad infestation by cutworms and there is no means of barring out or driving away the chickens, the owner of the crops must decide whether he will lose his crop or take special means of protecting his chickens. The experience of a great many people who have used this remedy without taking any special precautions, is that injury to domestic animals is extremely rare ; and, although I have been on the watch for any trouble of this sort for many years, I do not know of a single instance when poultry have been poisoned, without doubt by eating poisoned bran put out for cutworms. However, there will be many occasions when plants in gardens may be protected by putting out the poisoned bran in small heaps and then covering these up with a piece of shingle or some other covering, so that the material cannot be got at by stray chickens and other poultry.

It has also been asked whether there is any danger of plants absorbing Paris green from this mixture when placed near their roots. In reply to this, it is only necessary to point out that Paris green is practically insoluble and therefore cannot be absorbed by the plant.

ROOT MAGGOTS.—These insects, which every year are a serious tax on market gardeners, were in 1904 particularly aggressive, and from every province frequent demands were made for a practical remedy. Radishes, cauliflowers, cabbages, turnips, onions, and, in a few instances, beans and sweet corn were injured. Only a few years ago there were many districts in the West where root maggots were unknown; but of late years these have been invaded. Bad infestations are reported by Mr. N. H. Holland, from Norquay, Man., who speaks of his success in growing onions in former years, but now finds that he has this year lost a third of his crop and says that the maggots are getting worse every year. Loss is also reported from Regina, Moosejaw and Calgary, as well as from many places at the coast, in British Columbia. In the Ottawa district these maggots were particularly destructive, and on the Central Experimental Farm Onion Maggots worked actively throughout the season from the middle of June till November, when they were destroying the ripe bulbs. The Radish Maggot was abundant in spring, and again in September. Cabbages and cauliflowers which were kept free from these enemies till the middle of July, were not afterwards injured. This was probably due to the hardening of the stems and the abundant root growth. Beans planted late and too deep in the soil were moderately attacked, but this is an unusual injury. Only one instance of corn being injured came to my notice, and this was from the seed having lain in the land for a long time and growth being retarded by cold wet weather. Several remedies were experimented with, but no very satisfactory results were obtained, except in the case of plants grown under a light wooden frame covered with cheese cloth, such as was mentioned in my last report. Under these protections, however, radishes and cauliflowers of high quality were grown which were perfectly free from the attacks of the maggot. Onions were too much drawn up by the shade and did not bulb well. I found that a convenient covering of this nature 8 feet long by 2 feet wide, and 2 feet high, can be made for about 25 cents, the frame being of light one-and-a-half-inch square wood simply nailed together at the corners and with cheese cloth tacked on on the outside. In a frame of these dimensions five cauliflowers and two rows of radishes were grown. The frame was kept on from the time the seeds were sown until the radishes were pulled. Cauliflowers were sufficiently advanced to require no further protection, and the frames were removed about the 1st of August. As a rule, the attack of the root maggots becomes perceptibly less by the first of August; and even late cabbages planted in July are seldom attacked by root maggots. During the season of 1904, the insect in all stages could be found throughout the season.

For plants grown in the open, the best results this year were secured from the following remedies:—

For Onions.—White hellebore dusted along the rows once a week gave comparatively clean onions, very few being attacked. In years when it is necessary to apply the remedy throughout the season, this would be too expensive to be considered a practical remedy. The Cook carbolic wash, which is very effective for radishes, was less so with onions. Pyrethrum insect powder, Bug Death, Paris green and plaster, used as dry powders, had little effect. Sand saturated with coal oil and Jeyes' Gardeners' Friend, were also tried this year without any decided results in saving onions from attack.

For Cabbages.—The remedies which have given the best results for cabbages are: 1. The Goff tar paper disks, which are pieces of ordinary tarred building paper three inches in diameter, with a slit running to the centre so as to allow of their being placed around the stems of the young cabbages at the time of planting. 2. About half a teacupful of a decoction of pyrethrum insect powder, four ounces to a gallon of water, poured around the roots of each plant after drawing away the earth, right down to the rootlets. The earth should then be pushed back again and hilled up round the stem. As a substitute for pyrethrum insect powder, hellebore was tried this year, not only at the Central Experimental Farm, but also by Mr. Saxby Blair, the Horticulturist at the Experimental Farm for the Maritime Provinces, at Nappan, N.S.. The results were very satisfactory. Mr. Blair writes : 'The Cabbage Root Maggot gave us considerable trouble last year; but this season their numbers were much greater and they proved very destructive to all the plots of cabbages and cauliflowers except two. These were where hellebore was used. This remedy exceeded all my expectations, and no root maggots could be seen around any of the plants in these two plots; indeed, they were the only good cabbages out of some 1,500 set out. The powder was mixed with water and applied with a force pump; I used two ounces to the gallon and four ounces to the gallon, and found the results of the two ounces just as good as where four were used: I am much pleased with this remedy, and, as far as one can judge from a single season, I am inclined to consider this a positive remedy for the root maggot of cabbages.'

Hellebore as a remedy for root magots was first recommended to me many years ago, about 1888, by Mr. S. Greenfield, a successful gardener of Ottawa East; and I have found that, as a rule, it is a useful remedy. At Ottawa this year, as in previous years of heavy infestation, it provided considerable protection, but was not as perfect a remedy as Mr. Blair found it at Nappan.

For Radishes.—The Cook carbolic wash, consisting of one quart of soft soap, or one pound of hard soap, in a gallon of water, with half a pint of crude carbolic acid added, and the whole boiled together for a few minutes, to make the stock emulsion, has proved over and over again an excellent remedy for radish maggots. The stock emulsion can be kept in a closed vessel, so that dust and rubbish will not fall into it; and, when required for use, one part of this mixture by measure is added to fifty of water, and should be sprayed directly upon the growing plants from the time they appear above the ground, once a week until ready for the table. Applications of nitrate of soda, kainit and potash whale-oil soap, all of which have been from time to time recommended, proved to be quite useless at Ottawa.

It must still be acknowledged that up to the present time we have not secured a practical remedy for root maggots on onions. For radishes, which are ready to pull from five to six weeks from the time the seed is sown, the question of protecting them is much simpler than in the case of onions, which are growing throughout the season. The maggots of the first brood are nearly full grown and very destructive about the end of June ; and, in some years, if the plants can be protected from injury up to that time, they are as a rule safe for the rest of the season.

There are some features about this attack which make it of interest to the entomologist. Some experiments have seemed to indicate the great value of a certain remedy, and then under other conditions this same remedy has proved comparatively useless.

For next year extensive experiments have been planned, and special attention will be given to this matter, which is one of great importance, both to the professional and amateur gardener from one end of the country to the other. From the limited experience we have had with the cheese-cloth coverings, I have no hesitation in recommending these to amateur gardeners, however small their gardens may be, as a sure means of obtaining perfectly clean, as well as early, radishes and cauliflowers of the very best quality, at a comparatively light expense.

The Green Blister Beetle (*Cantharis cyanipennis*, Say).—Several kinds of blister beetles occasionally attack cultivated crops, and, unless driven off or poisoned, do much harm in an incredibly short time. Although in the larval state they are predaceous parasites feeding on the eggs of locusts, in the perfect condition they feed voraciously on vegetation. The Green Blister Beetle has not been previously sent in as a crop pest, but on June 15 last Mr. Richard Coates wrote from Cowley, Alta.:—'Enclosed you will find some insects which have come in numbers to my garden this year. They stay right with the beans and peas and soon destroy them.'

These beetles are long narrow insects, sometimes nearly an inch in length, of a most beautiful deep blue-green colour, which alight in large numbers and then may be noticed crawling quickly over the plants they are attacking and rapidly devouring the foliage. I have collected this species on the wild American vetch, at several places in western Assiniboia and southern Alberta.

Cabbage and Turnip Aphis (*Aphis brassicæ*, L.).—Reports of injury by this plant-louse have again this year been received from many and very distant localities. On the whole, however, I do not think it has been quite as destructive as usual.

'Victoria, B.C., November 1.—Aphides of various kinds were in evidence. Swedish turnips and cabbages suffered severely from their ravages.'—J. R. ANDERSON.

'Cowley, Alta., October 19.—My vegetable garden is covered this year with a grayish-green insect, something like the green fly that attacks house plants. They began on the turnip tops, but now the Brussels sprouts are so covered that I cannot use them, and I can only use the large heads of cabbage which are too firm for them to get inside the leaves. Most of the cauliflowers were unfit for use from the same cause.'—F. W. GODSAL.

'Depot Harbor, Ont., September 12.—I send you samples of insects which are destroying my turnips and cabbages. What are they and what is the cure?'—J. F. PRATT.

Other Ontario occurrences which came to my notice were of fields moderately infested at Whitby and at Ottawa. There were a few reports from Quebec and from Prince Edward Island, and one from Mahone Bay, N.S.

The remedies are to watch for the beginning of the infestation when hoeing turnips and cabbages, and destroy the colonies either by spraying with kerosene emulsion or whale-oil soap, and the destruction or deep ploughing down of all turnip tops or refuse of cabbage beds in autumn, so as to destroy the eggs.

Although parasites are generally present in considerable numbers, they have not, as a rule, controlled this species so completely as is the case with many others. On the Ottawa fields, specimens of a parasite were present, which has been kindly identified by Dr. Ashmead, through Dr. Howard, as *Lipolexis (Aphidius) rapæ*, Curtis. Dr. Howard says:—'This is a European species evidently introduced. We have it also from Michigan.'

PLANT-LICE of various kinds were complained of on many kinds of vegetables and root crops during the past season. Dr. C. A. Hamilton, of Mahone Bay, N.S., has favoured me with some interesting notes which he has made from time to time in his locality during the past summer.

POTATO APHIS (*Nectarophora solanifolii*, Ashm.).—Potatoes are not often troubled with plant-lice in Canada; but at long intervals outbreaks have been observed on this crop, and such a one occurred last summer at Mahone Bay, which was closely watched by Dr. Hamilton.

'Mahone Bay, June 28.—I send you some aphides from potatoes. These are apparently the same species as is now on my salsify and are abundant enough to have appreciably blighted my potato plants.'

'July 10.—There seem to be aphides on almost everything this summer, probably because of the abnormally dry season. Besides those sent, I noticed them to-day on squashes, cucumbers, broad beans, turnips, cabbages, beets and carrots, in fact, on almost everything I looked at.'

'July 14.—The aphis on my potatoes has overrun the whole patch, with the result that the potatoes have stopped growing and look very unhealthy. The blossoms have withered up and fallen, the lower leaves have turned yellow, and many others have turned black, just as if smitten with the blight, and are falling. They occur in immense numbers. Their favourite position is upon the peduncles of the flowers, which they cover completely. They are also found in large clusters on the stems and upon the under surface of the leaves. In many colonies there are a few flesh-coloured individuals.

'July 15.—In *re* potato aphis, I to-day examined several plots near the village and found one field with about half the plants which had blossoms fairly well covered with aphis; other plants also had a few.

'July 16.—The plant-lice on the potatoes are fast diminishing in numbers; but they have left the crop in a sorry condition.'

'August 1.—I send you to-day a last specimen from my potato plot. They have evidently been killed by a fungus. I first noticed its effects about a week ago on one corner, and it has since spread over the whole piece. Very few aphides are left alive. Since I last wrote, I noticed larvæ of lady-bird beetles and of *Syrphus* flies; but neither of these nor anything else had much effect in reducing the numbers of the plant-lice until this disease appeared. A month ago my potatoes could not have looked more promising. To-day I tried them, and out of six average hills I got 17 tubers, of which two only were large enough to be marketed.'—C. A. HAMILTON.

*Remedy.*—Should this plant-louse again appear in large numbers, infested plants may be freed of them by spraying either with whale-oil soap solution, one pound to six gallons of water, or kerosene emulsion, one to nine. These remedies would also be effective against the Colorado Potato Beetle, the Four-lined Plant Bug, Leaf-hoppers, and probably all other insect pests likely to be found on potatoes. They would not, however, probably be of any use against the Potato Rot fungus for which the Bordeaux mixture is such a useful remedy.

Aphis on celery, carrots and parsnips (*Siphocoryne,* sp.).—Dr. Hamilton sent also some aphides which he had found on celery, carrots and parsnips. It is probable that there were only two species concerned, and that both of these occurred on celery. Plant-lice are very difficult insects to send alive by mail, and, when put in alcohol or other preservative fluids, they lose their colour so much that they are not very suitable for study unless the species is well known. I am sorry to say that, notwithstanding much trouble taken by Dr. Hamilton in sending them, the specimens did not arrive in very good condition. They were, however, referred to Dr. Howard, Chief of the United States Bureau of Entomology, who reports under date July 17: 'Mr. Pergande has examined your aphides and says that 1 and 2 are species of *Siphocoryne,* apparently undescribed. The specimens on potato and salsify were rotten, but they appear to be *Nectarophora solanifolii.*'* The two species of *Siphocoryne* referred to above were very different in appearance, and there seems to be little doubt that they are different species. The specific description of these, however, will have to be postponed until further material is available. I shall be obliged to any of my correspondents who may at any time find plant-lice on carrots, parsnips or celery, if they will forward them to me for study.

Injury to celery and parsnips by plant-lice I have never seen before; but the attack on carrots has come to my notice on two or three occasions previously, and has been one of considerable importance.

'Mahone Bay, June 28.—I send aphides from my celery, some have wings and some are without; but, as I always find them together, I take them to be the same species. The small wingless ones are extremely active, disappearing at a touch to the plant. This is the first time I have seen plant-lice on celery in the three years I have been raising that crop. Eight or ten days after I set out the young plants I found them swarming with these insects, and my neighbour's plants are the same. What I think are the same kind of plant-louse, I find also on near-by weeds, *Chenopodium album* and *Galeopsis tetrahit.* I had some carbolic acid and soap wash made up for root maggots. I gave them two sprayings with this and it cleared them out.'

'July 8.—I send a number of aphides with a few celery leaves, which I hope will reach you alive or at least in good condition for examination. It is very difficult to capture these, but by touching the plants with a piece of cotton batting they jump into it and become entangled. The specimens you ask for are in bottle No. 1. Bottle No. 2 contains another kind, I suppose, which are found rather sparsely on the underside of the leaf. In one of my letters I said that I thought that these insects had been brought here from Halifax on plants obtained by a neighbour. I do not think this now, as I find them infesting the celery of another neighbour who raised his plants from seed and who lives over half a mile from either of us. When first noticed, the insects were very plentiful, the celery was only an inch or an inch and a half high,

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*Dr. Ashmead's description of this aphis is to be found in 'Canadian Entomologist', vol. XIV., 1882, p. 92

but each leaflet bore from six to ten aphides. They were scattered promiscuously over the plant, not clustered in any way. I sprayed my celery three times at intervals of a few days with the carbolic wash mentioned on page 182 of your 1903 report, with the result that the insects disappeared entirely each time for a day or two, then reappeared, but in diminished numbers. Close observation to-day shows me that these plant-lice are on the celery bed, on the soil and plants of an adjacent salsify bed, one foot away, as well as a few upon beds of carrots; and they appear to be feeding on both of these latter plants. I cannot see that they have injured my celery very much, whatever they might have done, had they been left unchecked; still, they undoubtedly are feeding upon it, and perhaps the injury does not show, because the ground is very rich and the plants are well cared for. No. 2, however, whenever present, distorts the leaves, and, if present in larger numbers, would, I think, be very injurious.'

'July 10.—Aphides from Salsify: These are increasing very fast, and my plants are getting overrun, but you will notice that some of them are parasitized, having died and turned white. They are bound down to the leaf with a webby material which covers a small grub.'

'July 14.—Whitish fragments of dead aphides lying in abundance upon my carrot leaves and upon the ground beneath called my attention to them, and I found the new leaves had their petioles swarming with plant-lice. Although very plentiful, they do not yet seem to have done much harm. I find a few species of lady-bird beetles and some other predaceous parasites, of which I send you specimens. I have been more anxious for you to see these insects, because on looking over your reports I find no reference to either a potato or a carrot aphis.'

'July 15.—I find to-day that my parsnips are also infested by aphis. Please notice if these are not the same species as those on carrot; and those on potato look very much to me like those I sent you some time ago, which were found on salsify.'

'July 16.—The dark hopping aphis on celery has disappeared; but I send you more of the green ones from the underside of the leaves, with as many winged specimens as I can find. They have not been very plentiful on the celery, but seem to me very much like those from the carrots and parsnips. I find lady-bird larvæ very plentiful on my carrots to-day, and they are clearing off the aphides nicely. I have been much interested in watching these pests, and shall be obliged if you can send me the names of them: two from celery, one from parsnips, one from carrots, salsify, cabbage and potatoes.'—C. A. HAMILTON.

'Antigonish, N.S., Sept. 7.—My celery has been infested by a green bug. I inclose specimens and should like to know what it is and how to get rid of it.'—F. H. BEALS.

As stated above, there is still some doubt as to the exact identity of the species found on celery, carrots and parsnips. I shall, therefore, be glad to get specimens for further study.

THE RED TURNIP BEETLE (*Entomoscelis adonidis*, Fab.).—In travelling through Manitoba and the North-west Territories in July last, I saw very few specimens of this beetle, which is sometimes a rather serious pest of cruciferous crops in the West; but some inquiries have been sent in as to its nature and habits.

'Edmonton, August 21.—Some gardens here are infested with a beetle somewhat like a lady-bird but bigger, which is bright red with black bars down its back and a spot on the collar, about three-eighths of an inch long by a quarter of an inch wide. This is doing some harm to radishes and turnips. In addition to this, some of the white turnips are terribly diseased this year.'—C. H. STUART-WADE.

The same insect was written about from St. Lazare, Man., by Mr. Louis Worms, who says that the insect had appeared in his district, and had been the cause of a good deal of discussion among farmers as to whether or not it was the Colorado Potato Beetle. He speaks of the leaves of turnips being entirely eaten or cut up into rags, and also that a large number of the turnips had rotted.

Mr. Norman Criddle reports that 'The Red Turnip Beetle became rather troublesome last summer to cabbage, radishes, turnips and a few other garden plants. I noticed, too, that it had a preference for radishes in the seedling state. A few of these plants left to go to seed would, I think, make excellent traps for the beetles, and could be sprayed from time to time to destroy those which have gathered there.'

The PURPLE-BACKED CABBAGE WORM [*Evergestis (Pionea) straminalis*, Hbn.].—Occasional reports have been received at different times during the past ten years of the presence of short bristly caterpillars attacking cabbages and turnips in the Maritime Provinces. This injury was for the most part to turnips, and was generally noticed late in the season, the caterpillars congregating on the crowns of the turnips and eating cavities into the roots, as well as consuming the leaves. During the past season this caterpillar seems again to have been somewhat abundant, particularly on Cape Breton Island, whence Mr. E. J. Williams, of Little Bras d'Or, sent specimens, together with notes on the occurrence. He also reports that in some years whole fields of cabbage and turnips have been destroyed by these caterpillars. Among the specimens sent by Mr. Williams were a large number of half-grown larvæ of the Spotted Cutworm (*Noctua c-nigrum*, L.), which undoubtedly had been responsible for some of the injury described by him in the following note. Writing under date of October 24, he says:—'I am sending you some of the caterpillars I spoke of. They are very gregarious in their habits; they start under the leaves right on the ground but mine their way up to the head, tunnelling it hollow.'

In 1903 Mr. C. H. Young, of Ottawa, made some observations on injuries by this species upon cabbages near Old Chelsea, Quebec, twelve miles from Ottawa. The caterpillars, however, were not very numerous in this instance, and were not noticed to bore into the stems as mentioned above, but lay exposed on the leaves, and only two or three caterpillars were found on a single plant. Full-grown larvæ collected by Mr. Young on July 11 produced moths on August 8.

There is little reference to this species in the literature on injurious insects; but under the name of *Pionea eunusalis*, Walk., there is an account, with a good figure of the larva, by Thaddeus Harris in his Entomological Correspondence, page 322, stating that on October 30 and November 1, 1841, he had found larvæ on the leaves of horse-radish. He thus describes the attack: 'They eat large holes out of leaves, leaving finally only the veins untouched. They live beneath the leaves, stretched out by the sides of the midrib. They creep regularly, not haltingly, and move pretty fast. When alarmed or disturbed, they curl quickly and loose their hold and fall to the ground. Found the same on turnip leaves, October 20, 1844. Their ravages were considerable.'

The Purple-backed Cabbage Worm is closely related to the Cabbage Pionea (*Evergestis rimosalis*, Gn.), which is a well known pest of the cabbage and turnip. That species, however, does not occur injuriously in Canada. The following is a description of the caterpillar, and is made from the specimens sent by Mr. Williams:—

Body tapering slightly to each end; length, three-quarters of an inch by one-eighth at the widest part; head, a shield divided into two spots on the second segment, and a small plate at the end of the body, black. The general colour of the back, purple with a brownish tinge, the lower part of the body, pale greenish. The body is marked with the ordinary bristle-bearing tubercles and a rather conspicuous yellow band on each side, where the breathing pores are placed. The six tubercles above the side lines are rather more conspicuous than those below the lines and are of a deeper black. The tubercles are all black, but have white marks at their bases, which form a part of an indistinct network of lines over the whole upper part of the body. These lines are broken up into dots, or seem to be narrow, broken, thread-like longitudinal lines connecting the tubercles in each series. There is also an equally indistinct line which runs transversely across the middle of each segment, and one in each intersegmental fold, the whole forming an open network composed of two series of very indistinct but perceptible lines running at right angles to each other. The chief character by which this caterpillar will be recognized from that of the Cabbage Pionea, is that its head is shining black, while that of the last named is yellowish.

The moth of the Purple-backed Cabbage Worm is a very neat little species, which expands seven-eighths of an inch. The upper wings are of a strawy yellow with a satiny lustre, and are marked rather distinctly with a heart-shaped discal spot, two distinct transverse waved lines across the centre of the wing, the inner of which runs through the middle of the heart-shaped spot, and two less distinct lines, one at the base and the other close to the apex. There is also a conspicuous dark blotch bearing a white crescent outwardly, towards the apex of the wing. The spaces between the transverse lines, especially on the nervures, are powdered sparsely with brown scales. The lower wings are silvery white, with a clear, broad black margin and a narrow submarginal line inside this. The fringes of the upper wings gray, of secondaries white.

The full life history of this insect is not yet known; but it passes the winter as a chrysalis in a closely woven cocoon, to the outside of which many particles of earth are attached. The moth emerges in the spring, and there are probably two or three broods in the season.

## FRUIT CROPS.

The conditions affecting the value of fruit crops in Canada during the past season are peculiar. The apple crop has not been particularly large in most districts, but was of exceptionally good quality. Early apples were abundant, but the markets were poor and 'thousands of bushels of fall apples remained unpicked or were fed to live stock.'—(Ont. Crop Rep., Nov., 1904.) Winter apples were rather short in quantity and, notwithstanding the quality, the present prices are low, owing to the enormous crop of high quality apples in Europe, which discouraged shipments and kept the fruit in our own markets, glutting them and holding down prices. There was an unusually poor plum crop almost everywhere, except in British Columbia, where it is reported 'plums and cherries were up to the average; large quantities were sent to the North-west, and good average returns were realized. Small fruits also gave our growers good returns this year; raspberries were a fair crop, blackberries good, strawberries yielded well, and those shipped to the North-west and Manitoba arrived in excellent condition.'—J. R. Anderson.

The excessive cold of last winter seems to have affected somewhat nearly all of our fruit crops this year. Apples are everywhere reported as rather small in size. Many varieties were severely killed back on the young wood. The same thing, and to a greater degree, is reported of pears; and this fruit was also injured by drought in British Columbia, and Black Spot and Fruit Crack in Ontario. Strawberry plants nearly everywhere suffered from winter-killing. The heaviest loss to fruit-growers from the winter was in the great destruction of the peach orchards in western Ontario, and in the orchards of Northern Spys and Baldwins throughout the country. Grapes were a fair crop, but where not sprayed, were considerably injured by Black Rot (*Læstadia Bidwelli*, V. & R.), the Brown Rot (*Peronospora viticola*, De Bary), and mildew.

Injurious insects were fortunately not very aggressive in 1904. There was, of course, as is always the case, a certain amount of damage done by the regularly occurring pests of the orchard, such as Tent Caterpillars, Cankerworms, the Eye-Spotted Bud-moth, the Oyster-shell Scale, the Cherry Slug, the Imported Currant Sawfly, &c., for which standard remedies are available to all who wish to use them. These insects give no trouble in any properly looked after orchard, where the work is done systematically at the proper time and with due regard to the true value of each operation, where regular cultivation and spraying are done as a matter of course, and not as an exceptional expedient which some unusual occurrence has made necessary.

Mr. A. McNeill, Chief of the Fruit Division of the Commissioner of Agriculture's Branch of the Department of Agriculture, has kindly allowed me to examine the reports from his correspondents all over the Dominion; and in this way I have been able to learn many useful facts concerning the condition of fruit crops and the insect and fungous enemies which have affected them during the year. Mr. McNeill writes as follows:—'Our crop reports this year furnished us with a large amount of material bearing upon fungous diseases and insects. On the whole, it may be said that these enemies did not do as much harm as usual. There were, however, several sections where the Apple Scab (Black Spot, *Fusicladium*) was particularly bad. One of these was the western peninsula of Ontario, where it was difficult to secure any clean fruit except in well sprayed orchards. A curious condition prevailed in the Annapolis and Cornwallis valleys of Nova Scotia. One part of the valley was particularly free from fungous diseases, while in another these were decidedly prevalent. There were no serious attacks of insects, and indeed the year 1904 may be said to have been remarkable for the absence of injury by the Codling Moth. This exemption, however, must not be counted on for the future, inasmuch as there were still sufficient insects to propagate the species; and, with favourable conditions, there is no reason why the Codling Moth should not be prevalent again next year.'

Mr. J. R. Anderson writes :—'Victoria, B.C., Nov. 1.—Apples were good, but the yield was only average. Prices ruled high, and those growers who put their product on the market in good shape realized well. Fruit-growing is receiving much greater attention, as it is better realized that, with that care which is due to every branch of agriculture, a very superior article can be produced, with a corresponding profit to the grower. An exhibit sent to England from British Columbia was awarded the highest gold medal of the Royal Horticultural Society. This alone has stimulated the planting of orchards to an unprecedented extent.'

'Wolfville, N.S.—We have been singularly free from injurious insects this year ; but Cankerworms and Tent Caterpillars are both on the increase, and there has been some loss from Eye-spotted Bud-mouth and Cigar Case-bearer, the latter of which is especially common in Annapolis County.'—F. C. Sears, *Horticulturist, Department of Agriculture, Nova Scotia.*

'Alberton, P.E.I.—Our apple crop is large and cleaner than for many years, even in unsprayed plantations. The Black Knot on plums and cherries, wild and domestic, was bad.'—Rev. A. E. Burke.

The following occurrences of insects injurious to fruit crops, among others, have been brought to my notice during the season and have received attention from the officers of the Division.

The San José Scale (*Aspidiotus perniciosus*, Cmstk.).—It is satisfactory to be able again to report that no new infestations by this insect have been reported beyond the limits of the area already invaded in 1903. It is probable that during the severe winter of 1903-1904 a large proportion of the wintering scale insects was destroyed. Among reports received, the following is of considerable interest, as coming from one who is specially able to observe and draw correct conclusions. Mr. Geo. E. Fisher, of Freeman, Ont., writes on July 10 last as follows :—

'The past winter was so unusually severe that I have been much interested in examining the condition of the San José Scale, to learn if possible the effect of extreme cold on this insect. Mr. Davis, of this place, for the past two years, has prepared about 100 barrels of lime and sulphur wash each year, which has been used by the fruit-growers in the district with such good effect that there is really little opportunity for investigation. However, I found a spot where the scale had been for some time, and had not been treated. I made weekly visits to this orchard, beginning about the middle of June. At that time most of the scale insects appeared to be dead, and, as I had found in my experiments, that the males were more easily killed by treating with various mixtures than the females, I hoped that the winter might have destroyed the males, and that there might be no breeding. The cold weather certainly reduced the scale very much indeed, only a small proportion being alive, and these developed slowly; but I find that some have reached maturity, and at the present time trees which last fall had a lot of live scale upon them, have larvæ in moderate quantity running on the twigs, some with new white cover scales just formed, and some which have reached the drab-coloured state. From what I saw in this orchard, I take it that breeding began about July 5 this year, or two weeks later than usual.'

Although the San José Scale has not spread beyond its former limits, there is still a heavy and destructive presence of this insect in the orchards within the infested area. As misstatements with regard to this matter have frequently appeared in newspapers and elsewhere, it may be well to again repeat that the only part of Canada where the San José Scale is found is in the Niagara Peninsula and in the counties along the north shore of the western end of Lake Erie. Every care is being exercised by the Honourable the Minister of Agriculture to prevent any fresh importation from outside countries. The fumigation stations at Vancouver, B.C., Winnipeg, Man., Windsor and Niagara Falls, Ont., St. John's, Que., and St. John, N.B., are kept open in charge of competent men, who unpack, fumigate with hydrocyanic acid gas, and promptly repack and send on, all nursery stock which comes into the country. The fumigation with hydrocyaic acid gas, of the strength and for the time the trees are submitted to it in the government stations, is perfectly certain to kill every scale insect upon them.

A rigorous watch has been kept on every kind of nursery stock which could possibly bring in fresh importations of the San José Scale; and I have again this year the greatest satisfaction in reporting that no single instance has been brought to my notice of living scales having been detected on trees which had passed through the fumigating houses. The superintendents at all of the stations have done their work carefully and well, and no well-founded complaints have been received from importers, either as to the slight delay which must occur while the stock is being treated, or as to any injury to the trees during the necessary unpacking, handling and repacking. Careful experiments have shown that the formula used at our federal fumigation stations is thoroughly effective in killing the San José Scale, and does not in any way injure the stock submitted to the gas. The formula used is one ounce of cyanide of potassium (98 per cent), one ounce of commercial sulphuric acid (66° Baumé), and three ounces of water—exposure, 45 minutes.

In addition to the above, the provincial government of Ontario have strictly enforced an Act compelling nurserymen to fumigate every shrub and tree sent out by them from their nurseries, whether the San José Scale had been found in their nurseries or not. These firms have, wisely, acted well up to the letter of the law, and, while complying with the provisions of the Act, by sending out only first-class stock, have sustained their business reputation in the best way possible.

The federal fumigation houses are kept open, with a superintendent constantly in attendance throughout the seasons of spring and autumn shipments of stock. The fumigation seasons for the various stations are as follows:—

Vancouver, B.C.—October 15 till May 1.
Winnipeg, Man.—March 15 till May 15, and October 7 till December 7.
Windsor, Ont.—March 15 till May 15, and September 26 till December 7.
Niagara Falls, Ont.—March 15 till May 15, and September 26 till December 7.
St. John's, Que.—March 15 till May 15, and September 26 till December 7.
St. John, N.B.—March 15 till May 15, and October 7 till December 7.

The San José Scale Act and the amendments which have from time to time been made, are the result of an effort on the part of the Honourable the Minister of Agriculture to help the fruit-growers of the Dominion by allowing them to import nursery stock of such new kinds of fruits as from time to time are originated outside of Canada, and which it is claimed by fruit-growers are necessary for the profitable prosecution of their business, but at the same time, to safeguard their interests in every possible way by taking such precautions as would make it practically impossible for any new infestation of the San José Scale to be brought into the country with the nursery stock. The whole expense of the different stations is assumed by the Dominion Government; but all shipments are made entirely at the risk of the shippers or consignees, the government assuming no risk whatever. The packages must be addressed by the shippers so as to enter Canada at one of the above-named ports of entry, and the route by which they are to be shipped must be clearly stated upon each package.

Many horticulturists and nurserymen have availed themselves largely of this concession, and at every point much stock has been imported from the United States and Japan. Nursery stock of all kinds can be imported from Europe without fumigation, as the San José Scale has never gained a foothold in European countries. Certain other plants which are not liable to the attack of the San José Scale are also exempted from treatment under the San José Scale Act. These are: (1) greenhouse plants, including roses in leaf which have been propagated under glass; (2) herbaceous perennials, including strawberry plants; (3) herbaceous bedding plants; (4) all conifers; (5) bulbs and tubers; (6) cottonwood (*Populus monilifera*), grown in Minnesota and the Dakotas.

*Remedy.*—Frequent inquiries are made as to whether there is a practical remedy for the San José Scale. I believe that it may now be justly claimed that the lime and sulphur wash made by any of the recognized formulæ is a reliable remedy for this insect. Orchards which have been carefully treated, are in better condition than they were at this time last year, and have borne during the past summer satisfactory and profitable crops of fruit. No remedy, however perfect it may be, will give good results unless great care is taken in applying it; and even with the lime and sulphur wash, it is not claimed that a single application will always give perfect results. Any remedy which does not cost too much for labour and materials, and which will ensure a paying crop, is certainly a practical remedy. All remedies will vary in the degree to which they secure the ends aimed at, and all that is claimed for the lime and sulphur wash for the San José Scale, is that up to the present, all things considered, this has proved the best remedy, and is, at any rate, as successful in its results as any known remedy which is used in medicine for controlling the diseases of animals or human beings. Success with any remedial treatment will necessarily always depend on the thoroughness with which it is carried out.

The making of the Lime and Sulphur wash is described with full details in my last report.

The Canadian wash is made by mixing lime and sulphur together in the proportion of twice as much lime as sulphur, and boiling these together in an iron kettle for two hours (or not less than one hour). The quantity of water added to make up the required amount of wash is largely a matter of convenience in using. When boiled with steam, barrels may be used, and to begin with, should be one-quarter filled with water and the steam turned on until the water is boiling; then turn off the steam and put in the lime and sulphur together as quickly as this can be done without making the mixture boil over. When the lime is all slaked, turn on the steam again, and leave the mixture boiling for at least an hour. In Mr. Geo. E. Fisher's outfit, which has been frequently described and has been figured more than once, eight barrels of wash were cooked at once, and he found that with steam at 80 or 90 lbs. pressure, the quarter barrels of water, before the lime and sulphur were turned in, could be brought to a boil in five minutes. Mr. Fisher secured the best results when each gallon of the wash contained one pound of lime and half a pound of sulphur.

The Oregon wash consists of lime 15 pounds, sulphur 15 pounds, blue vitriol 1¼ pounds. Dissolve the lime and sulphur by boiling for one hour, then add the blue vitriol dissolved in hot water, and boil for fifteen minutes longer; fill up to 50 imperial gallons.

The California wash consists of lime 15 pounds, sulphur 15 pounds, salt 15 pounds, water 50 imperial gallons.

The Lime-Sulphur-Soda wash consists of lime 40 pounds, sulphur 20 pounds, caustic soda 5 pounds. In making, the 40 pounds of lime is placed in a barrel, and only enough water is added to make it boil rapidly. While slaking, 20 pounds ground sulphur, which has been made into a thin paste, is stirred in thoroughly; the five pounds of caustic soda dissolved in hot water is then poured in, with more water as needed, and the whole is kept stirred thoroughly all the time. As soon as all chemical action ceases, as shown by the absence of bubbling in the mixture, add hot water up to 60 gallons, and the wash is ready for use. The whole time necessary is twenty minutes.

Dr. E. P. Felt, the State Entomologist of New York State, has made a further modification in this formula, by which he substitutes ordinary washing soda for caustic soda and has secured equally good results.

In all of the above mixtures, it is best to use hot water, and to have the sulphur powdered so as to help the rapid combination of the constituents.

The lime and sulphur mixtures must only be used as winter washes while the trees are dormant, or the trees will be injured. The best time is late in spring, just before the buds expand. If necessary, they may be followed in summer by applications of whale-oil soap solution, one pound to six gallons of water, or kerosene emulsion in the dilution of one part in nine of water.

Plum Aphis (*Aphis prunifolii*, Fitch).—The Plum Aphis was found rather abundantly on plum trees in Prince Edward Island, and Mr. Saxby Blair found it also troublesome in the orchards at Nappan, N.S. He writes: 'The pests that have worried me most are the plum and apple aphides. They are perfect nuisances. I thought I had them all controlled this year by early spraying, twice with whale-oil soap, one to six, but later on they appeared in myriads on some of the trees. It seems almost impossible to get men to spray their trees thoroughly enough to get at all of the plant-lice. Any information you can give about Plum Aphis will be useful to our fruit-growers; for this insect is becoming a general pest. Another thing is this: you advise whale-oil soap; now the average farmer in this country cannot get whale-oil soap. I tried to get some in this locality last summer, and they wanted 20 cents a pound for what they called whale-oil soap. If you can give in your report definite information where this soap can be procured, and what the usual price is, it would help. Could you not give instructions by which it could be made by the farmers themselves? I must say I find the whale-oil soap much easier and more convenient to use than bothering with tobacco water. Tobacco stems in most places are very difficult to get; but if whale-oil soap is just as good and can be got easily, that is what the average man will use. I find, too, that it takes much more liquid to do thorough work with tobacco wash than with a strong solution of soap.'

*Remedies.*—The standard remedies for plant-lice are soap washes and kerosene emulsion. Strange as it may seem, dark-coloured species of plant-lice certainly require stronger applications than the green kinds.

Kerosene emulsion in the dilution of one part to six of the stock emulsion has given good results against all kinds of aphides.

Soaps.—The most effective soap wash is made with whale-oil soap, one pound to from four to six gallons of water. The term whale-oil soap is merely a trade name for a fish oil soap, made with either potash or soda. The potash soaps, which are the best, because even strong solutions remain liquid when they cool, are soft soaps. The soda soaps are hard. Of the two the potash soaps are considered the best to use on vegetation, and they are more convenient to use. Both kinds should always be dissolved in hot water.

When bought at retail prices these soaps cost from 15 to 20 cents per pound, according to the locality, but, if obtained in large quantities, can be got at from 3 to 5 cents per pound. Fifty pound kegs are supplied at 5 cents per pound. Two well known brands of potash soft soaps which have been much used in Canada and have given good satisfaction, are those made by W. H. Owen, of Port Clinton, Ohio, and by Good & Co., of Philadelphia, Pa. If thought desirable, these soaps can be made at home; but it is very unpleasant and dirty work, and it is besides doubtful whether such good or cheap results can be secured as by buying from firms which make a special business of manufacturing soaps with only the required amount of moisture and the proper grade and amount of potash. It has been found in experiments carried on at Washington that what is required for spraying purposes is a caustic potash and fish oil soap, made with a fairly good quality of fish oil and from which water has been eliminated by boiling, so that it does not exceed 25 or 30 per cent of the weight of the soap. Soaps made with caustic soda instead of caustic potash are unsuitable for spraying purposes. Dr. J. B. Smith, in his circular No. 5, 'Whale Oil Soap and its Uses,' says: 'Whale oil or fish oil soap is one of the most reliable materials for use against plant-lice, and generally against sucking insects which can be killed by contact insecticides. It kills by clogging the spiracles or breathing pores of the insects and also to some extent by its corrosive action. The advantages of fish oil over ordinary laundry soap lie in the greater penetrating power, in the fact that it remains liquid when cold at much greater strengths, and that fish oil itself seems to be more fatal to insect life than other animal fats. A good soap can be made as follows:—

| | |
|---|---|
| Concentrated potash lye.......................... | 3½ lbs. |
| Water.................................... | 7½ gallons. |
| Fish oil.................................. | 1 gallon. |

Dissolve the lye in boiling water, and to the boiling solution add the fish oil; continue to boil for two hours, and then allow to cool. Any grade of fish oil will answer.'

The PLUM CURCULIO *(Conotrachelus nenuphar,* Herbst.).—The Plum Curculio made serious inroads into the sparse crop of plums of 1904. It was complained of in all localities east of and including Ontario, and was perhaps the fruit pest most mentioned by correspondents. Plums, apricots, cherries and apples were injured.

The injury of the Plum Curculio is known by sight by thousands of fruit-growers who have never seen the beetle to recognize it as the cause of the injury which they know so well on their fruit. The beetle itself (Plate I., figs. 2*a* and 3) is less than one-fourth of an inch in length, brown and rough, with black and gray mottlings, which give it a remarkable resemblance to a small piece of bark, and make it very difficult to distinguish. There is only one brood of this insect in the year; but perfect insects may be found at all times, because the beetles which emerge during August or September of one year, pass the winter as perfect insects under dead leaves, &c., and feed on the buds and leaves of plum trees early in the spring, and later during the season on leaves and fruit of various kinds; the old insects of the year before may often be collected at the same time as the newly emerged brood. When plums are about as large as pease, the crescent-shaped slit, with a small flap containing the egg, may be seen upon them. The egg hatches soon after, and the white grub (Plate I., fig. 2*c*) bores into the fruit, so that in the case of the plums they soon fall from the tree. The peach, apricot, cherry, apples and pears are also injured, but do not fall from the trees to nearly the same extent as plums. A great many more of the larvæ of the Plum Curculio come to full growth in plums than in the other fruits; the rotting of the fruit seems to be necessary for these grubs to mature. There is no doubt that by far a larger number of the grubs become beetles when they have fed in plums and cherries than in any other fruit. In apples, to which it causes serious injury also, from the disfiguring of the fruit, very few larvæ mature. By midsummer the larvæ are full grown and burrow a short distance into the ground, where they turn to pupæ, and the adult beetles emerge in August.

Apples badly disfigured were sent by Mr. C. L. Stephens, from Orillia, Ont., and similar samples were also received from two or three localities in Quebec province.

*Remedies.*—The remedies for the Plum Curculio are as follows : (1.) Spraying the trees early in the season so as to destroy the beetles which for some time feed upon the buds and opening leaves of plum trees. The second spraying, with poisoned Bordeaux mixture, should be made when the plums are about as large as pease. This will coat the young fruit so that the beetles are destroyed when they feed on the fruit or cut the crescents for egg laying. (2.) The destruction of all windfalls or injured fruit that drops, so as to clear away all fruit before the larvæ emerge and enter the ground to pupate. Poultry, pigs and sheep help well in this work. (3) The ploughing up and cultivation of orchards so as to remove grass and other vegetation which, besides weakening the trees, gives places for the insects to hide in. The depth at which the larvæ pupate is about an inch beneath the surface, and the pupation in this part of Canada takes place during July ; therefore cultivation during that month will destroy many of the pupæ, and this has been found the remedy which has given the best re sults in old orchards which had been in sod for many years and in which the fruit had been seriously injured year after year. (4.) The jarring of plum trees, which is much written about and highly recommended, will certainly destroy many of the beetles, but costs too much for labour when compared with spraying with insecticides, which give more certain results in my experience. As the plum and peach are rather easily injured by some arsenical poisons, arsenate of lead, 1 lb. to 50 gallons, is preferable to Paris green for these trees.

The APPLE MAGGOT (*Trypeta pomonella,* Walsh).—The Apple Maggot has never done much harm in Canada, although its injuries are very serious in the apple orchards of Main and some other States adjoining our borders. The slender white maggots, about a quarter of an inch in length, burrow in all directions through the flesh of attacked apples, feeding upon the pulp and leaving discoloured channels (Plate I., fig. 5). There are sometimes as many as a dozen maggots in a single apple, but even one is sufficient to render it worthless. The eggs are inserted beneath the skin of the fruit by beautifully marked black and white flies, with shining greenish golden eyes. The general appearance of the fly is shown in Plate I., fig. 6. In size it is about half as large as the ordinary house fly. There is only one brood in the year, and the eggs are inserted into the fruit by the females with a sharp ovipositor. Egg-laying takes place from the beginning of July until autumn. The young maggots become full grown in about six weeks, and their work, as a rule, causes the fruit to ripen prematurely and fall to the ground, when the maggots work their way out and enter the soil for a short distance, where they change to pale-coloured puparia, but inside which they remain as maggots until the following spring The pupa forms only a few days before the perfect insects appear the next summer. The maggots of late-laid eggs are frequently in the fruit at the time it is picked, and these develop, destroying the fruit more and more as they grow. Apples apparently sound when gathered may, by the presence of eggs or young larvæ, afterwards become perfectly useless. The development of the maggot is slower in late and hard fruits.

In September last I received from Mr. R. W. Shepherd, the well known apple shipper, of Como, Que., samples of infested Fameuse apples, with the following information:—

'Montreal, Que., September 26.—I mail you to-day specimens of Fameuse apples taken from one of my orchards, an old one, which show serious blemishes. There is some disease unknown to me which has affected some of the Fameuse trees in that orchard. The outside skin of the apples shows dents, and, when the apple is cut open, there are brown punky spots in the flesh; the fruit is generally undersized, and in any case is practically worthless for sale. No other varieties are affected here, as far as I have been able to learn; but there are some other orchards which are suffering in a similar way to my own.

'October 10.—It is only my old orchard, which has been replanted at different times, that is badly affected. I have pigs there eating up the fallen fruit. I do not notice the maggots affecting any other variety than Fameuse, and in that orchard there are St. Lawrence, McIntosh Red, Scott's Winter, and other varieties. I noticed this injury last year for the first time, when the Shiawassee Beauty was affected. At that time I thought it was a fungus affecting the inside of the apple.

'October 20.—I am glad it was right to put pigs in the orchard; and, as they do not eat up the apples fast enough, I have given instructions that a herd of cows should be put in every day to make sure that all the fallen apples are done away with.'—R. W. Shepherd.

'Como, Que., October 25.—I thank you very much for your annual report. I am glad to have it, and hope to profit by your suggestions. Last year was the first time we noticed the Apple Maggot in our fruit; but it has increased a good deal this year. The McIntosh Red does not seem to have been troubled like the Fameuse, but Russets have.'—M. L. Gibb.

In addition to the above occurrence, apples from St. Hilaire, another celebrated locality for the production of first-class Fameuse apples, showed slight infestation. Como is thirty miles west of Montreal, and St. Hilaire twenty-three miles east.

Early and subacid varieties of apples seem to be preferred; but all varieties are said to be liable to attack, including late and winter varieties. When the late varieties are infested, the maggots do not emerge until some time during the winter after the fruit has been stored, the larvæ emerging and the pupæ forming inside the barrels or bins. The destruction of these pupæ and of all fruit when it falls to the ground during the summer and autumn constitutes the most reliable remedy for this injurious insect. The fallen fruit may be collected by children and fed to stock; or sheep and swine may be turned into the orchard from about the middle of July. Poultry will destroy many of the maggots and puparia beneath the trees. Late autumn ploughing will throw up many of the puparia to the surface of the soil, where they will be destroyed by birds, &c. Although the Apple Maggot has never done very much harm in Canada, the losses in Vermont, Maine and parts of New York State are sometimes extensive, occasionally amounting to 50 per cent of the fruit; and, as the injury does not show much on the outside, the uncertainty as to whether fruit is attacked or not renders it useless for sale. It may be well to point out here that, as the egg is inserted beneath the skin of the apple by the female fly, spraying with arsenical mixtures is quite useless as a remedy for this insect.

Codling Moth (*Carpocapsa pomonella*, L.).—One of the striking characteristics of the season of 1904 is the absence of injury by the Codling Moth, and this seems to be the case in all the fruit-growing districts of the country. I fear that this state of affairs may have an injurious effect by inducing many to give up spraying their orchards for the control of this pest. The absence of the Black Spot disease of the apple in 1903 had just this result during the past season. In some orchards which were free from disease in 1903, no spraying was done this year, and, as a consequence, what might have been beautiful crops have been ruined. Fungous diseases, although not caused by climatic conditions, are checked or developed enormously in accordance with favourable weather conditions or the reverse. The fruit-grower who is a good business man, has learnt before this that there is no longer any question as to whether spraying pays or not. That it does, is manifest every year by the predominant excellence of the fruit from all orchards which are sprayed, both as to insect presence and as to injury by fungous diseases. Mr. R. W. Shepherd, of Como, Que., and other buyers of the very best apples for the European market, assure me that, when purchasing the high quality fruit they require for that purpose, they cannot afford to waste time even in looking at orchards which have not been sprayed.

Although the Codling Moth was less destructive than usual this year, the presence of the eggs on apples and of the larvæ in fruit could be detected if closely looked for.

The weather throughout the past season has been such that insect occurrence of all kinds has been markedly less than has been the case for the last thirty years, so that the small numbers of the Codling Moth larvæ seen this year must not be taken as an indication that this most injurious enemy of the apple has disappeared to such an extent that spraying for it is no longer necessary. Moreover, it must be remembered that, by spraying apple trees at the times advised, viz., just when the buds are bursting and once a fortnight for two months afterwards, not only is the Codling Moth kept in check to the extent of saving an average of from 75 to nearly 100 per cent of the fruit, from its ravages, but also a great many other insects as well as fungous diseases are destroyed, giving the fruit-grower an enormous profit, compared with the cost of spraying.

Green Fruit Worm (*Xylina*, sp.).—When examining orchards at Gagetown in New Brunswick, as well as in the Annapolis Valley and other places in Nova Scotia in June last, I frequently came upon the larvæ of a *Xylina*. These caterpillars, of which there are many species very similar in appearance, are known by the name of Green Fruit Worms, and have the habit of gnawing large cavities in the sides of apples, as well as devouring the foliage. The perfect moths from these caterpillars emerge in the autumn, and after passing the winter as such, lay their eggs on the trees in spring. The best remedy is the regular spraying of fruit trees with the poisoned Bordeaux mixture.

The Red-humped Caterpillar (*Schizura concinna*, S. & A.).—This caterpillar feeds upon a great many different kinds of trees besides the apple, and is seldom destructive except upon young trees. The eggs are laid in clusters, and the caterpillars are gregarious throughout their lives. Mr. E. P. Venables, of Vernon, B.C., reports that they were numerous in his locality last summer and did much damage in young orchards, in many cases the whole foliage being stripped from infested trees. He detected a hymenopterous parasite which was doing good, and is now rearing specimens so as to learn the identity of this useful insect.

The Shot Borer (*Xyleborus dispar*, Fab.).—There were several complaints from fruit-growers in the Annapolis Valley, N.S., of injury to apple and plum trees by the small wood boring beetle, which has received the name of the Shot Borer (Plate II, fig. 7). There has not been much complaint concerning this insect since 1897, but last spring its work was noticed in many places in the above district. The attack consists of a small black burrow (Plate II, fig. 8), beginning generally at a bud and running right round the stem inside the wood and near the bark of young living trees. Inside this there is often another burrow, and then a short perpendicular shaft at right angles running down the centre of the twig or branch. There is variation in the nature of the tunnels, according to the size of that part of the tree where they are located; but they are always about one-sixteenth of an inch in diameter, and if in a small branch or stem form a circular gallery with an ascending or descending perpendicular shaft, which serves as a brood chamber. When, as is sometimes the case, they occur in trunks of young trees of moderate size, from 4 to 6 inches in diameter, the galleries are straighter and simpler. These galleries are the homes and breeding chambers of the larvæ and their mother; for, although this insect is the cause of much injury to trees, with the exception of the wood which is gnawed out to make the tunnels, the tissues of the wood are not eaten either by the mature beetles or the larvæ; but the tunnels form caves within which a special kind of fungus is cultivated by the beetles as food for the larvæ, which simply lie in a small cell and feed or are fed by their parents on the fungus as it grows. An account of these beetles and their method of feeding upon the 'ambrosia' is most delightfully described by the late H. G. Hubbard, in an article entitled 'The Ambrosia Beetles of the United States,' one of the most charming narratives to be found in the literature of Economic Entomology. (See Bulletin No. 7, n.s., U. S. Division of Entomology.)

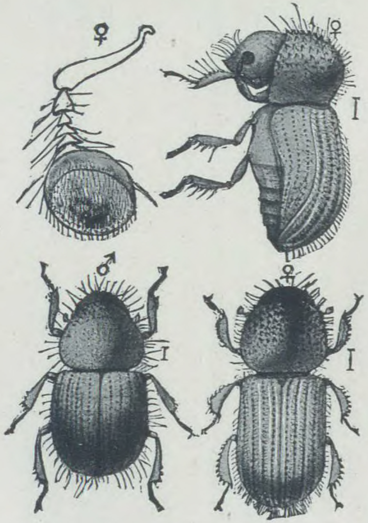


Fig. 7.—Shot-borer : ♂ male ; ♀ ♀ female—enlarged ; antenna of female—more enlarged.
*(Figs. 7 and 8 from H. G. Hubbard, U.S. Dept. of Agriculture.)*

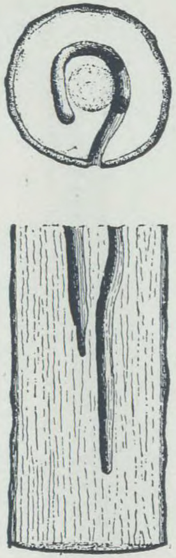


Fig. 8.—Gallery of Shot-borer in twig, cut across and lengthwise.

Fig. 10.—Branch of Canada Balsam Fir, with roots from base covered by sand. *(Photo. by F. T. Shutt.)*

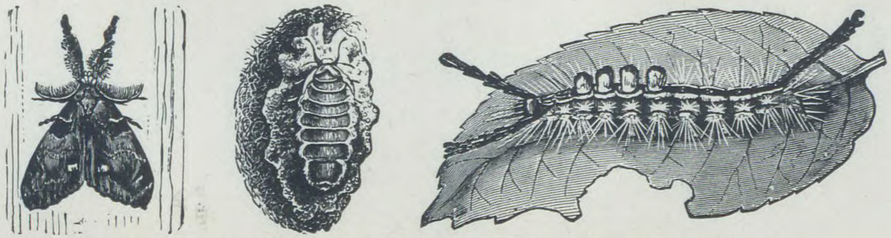


Fig. 9.—The White-marked Tussock-Moth : male, female and caterpillar.

The remedies for this insect aim at either filling up the entrances to the holes in which the broods are being reared, so as to suffocate the larvæ, or in applying some liquid which will penetrate and destroy the fungous food or the larvæ and mature beetles while in the holes. For this purpose, kerosene oil and carbolic washes have been used with success; crude petroleum could probably be used with even greater effect, as on account of its extreme subtility it would penetrate the burrows more deeply than most liquids, and also would act as a deterrent wash which would keep the mature beetles away from the trees when seeking places to make their breeding burrows.

The carbolic wash which has given good results in Nova Scotia is soft soap, 1 gallon, water 3 gallons, crude carbolic acid ½ pint; the trees to be washed two or three times when the beetles are known to be prevalent. A difficulty with this insect will be found in the intermittent nature of its occurrence. As it is pretty sure to be present in some numbers in the same orchards where it was troublesome last spring, it will be wise for the owners to spray or wash their trees with a deterrent wash next season. Trees noticed to be badly infested at the time of winter pruning should be cut out and burnt before the beetles appear in spring, unless considered to be of special value, when they may be treated.

The Black Vine Weevil (*Otiorhynchus sulcatus,* Fab.).—This weevil seems to have become a regularly occurring pest in gardens around Victoria and some other places on Vancouver Island, and also near New Westminister and Vancouver on the mainland. It is a black snout-beetle, three-tenths of an inch in length, of a dull black, the wing cases being deeply grooved and spotted with fine white points. The grubs are yellowish white, with dark heads, and have the body somewhat curved; they feed on the roots of several kinds of plants. These beetles have no true wings and the two wing-covers are connate or joined together in the middle, so their only means of spreading from place to place is by crawling. The beetle occurs near the coast on both sides of the continent and is sometimes a destructive pest in strawberry beds in Nova Scotia and British Columbia. The plants which have been reported to me as injured by the Black Vine Weevil in Canada do not include the grape vine; the name Black Vine Weevil is taken from European publications, where it is the recognized popular name, and will answer here until a better is suggested. The grubs probably do more harm than the adult weevils and have been found attacking the roots of Cyclamens and other plants in greenhouses, particularly Gloxinias, Primulas and Maiden-hair ferns. The most important injury so far recorded against this weevil is of its attacks upon strawberry beds. Mr. J. R. Anderson, reporting on the insects of the season, says 'the Black Vine Weevil did a considerable amount of injury to strawberry beds. This was principally on the lower Fraser. It also attacked the roots of Primroses in some localities.'

'New Westminster, B.C., May 30.—The Strawberry Weevil (*Otiorhynchus sulcatus*) is very bad in several places this spring, and I find that in every case where strawberries are infested, they have been planted on land where the sod had been turned in previously, and that in neighbouring patches where no sod had been turned in they are comparatively few.'—W. D. Dashwood-Jones.

'Victoria, B.C., May 30.—I send you specimens of larvæ and pupæ of an insect which is in large numbers in a strawberry bed at Esquimalt, near here. I take these to be *Otiorhynchus sulcatus*; am I right? There are many complaints of injury to strawberry plants this spring from this or a similar pest, chiefly along the Fraser at Hammond, Haney and Mission, but also in the Victoria district.'

'June 13.—I will send you further specimens of *O. sulcatus* from Mr. Fleming's garden near Victoria, and I will also try and get you other specimens from the lower mainland, where by the bye, I am told by Mr. Cunningham that there are two distinct species of weevils infesting strawberry plantations.'

'June 20.—I send you a box containing specimens of weevils, principally in the pupal form, but also including some beetles which were taken from strawberry fields at Hammond. You will see that there are two species, one much smaller than the other. From the appearance of the infested plants, I take the larger specimens to be either *Tyloderma fragariæ*, or *T. foveolatum*. Will you kindly identify and suggest remedial measures?'—R. M. PALMER.

The specimens sent forward by Mr. Palmer were extremely interesting, and showed distinctly the work of two different insects which attacked the roots in a similar manner, but could be easily distinguished. All the plants sent were old plants, with large crowns, from a stout caudex; and it was into this that the larvæ bored from the outside, leaving large cavities, and in some instances destroying the whole of the interior of the stems. By the time the parcel reached Ottawa, most of the specimens were pupæ, and from these a little later I reared several specimens of the Black Vine Weevil and of the SLEEPY WEEVIL (*Otiorhynchus ovatus*, L.). This latter is a common weevil, and is a curious slow moving creature, which is frequently found in out-of-the-way places. It may always be found out of doors at almost all times of the year, when sifting moss or leaves to collect beetles. It frequently penetrates into houses, sometimes in large numbers, and it has even been accused, with every appearance of good reason, of having inflicted very painful bites on campers sleeping in tents during the summer time. It occurs commonly throughout Canada east of the prairies, but I had not heard of it previously from British Columbia. The Sleepy Weevil has occasionally been accused of injuring potatoes, and Mr. P. J. D. Edmonds sent me from Summerville, P.E.I., specimens with potato leaves, and the following note: 'I send you a sample of a new kind of potato beetle, showing the way he folds himself up after cutting off the branches of potatoes. Please let me know what this is, and whether he is doing damage or how he can be destroyed. I did not actually see this field, but I am told that many of the stalks are stripped bare of leaves.'

The Sleepy Weevil is only about half the size of the Black Vine Weevil, and is of a dull pitchy brown colour, smooth and without any markings. It is always a very slow moving beetle, and it is probable that some injury may have been attributed to it for which it was not responsible. From its habit of hiding in dark corners, folded leaves and in hollows, it is frequently found in close proximity to injury which may have been done by other culprits. There is now no doubt that the larvæ feed on the roots of strawberries, and it is probable that they also attack the roots of many other plants. I have frequently found the beetles in old grass fields, and I shall not be surprised, especially after the observation made by Mr. Dashwood-Jones that strawberry beds planted on sod were most injured by weevils, to find that the usual food plant of both the Sleepy Weevil and its larger companion, the Black Vine Weevil, may be the roots of grasses. Should these insects become abundant in strawberry beds it will be well for growers to adopt the one-crop plan which has been used very successfully by Mr. Macoun, the Horticulturist of the Central Experimental Farm, and was adopted many years ago by Mr. Peter Dempsey, at Trenton, Ont. This consists of setting out new beds of strawberries in the spring, cultivating these for the first summer, taking one large crop of berries the next spring, and then ploughing the plants up as soon as the crop is off. In the meantime a new bed will have been set out from the runners of the bearing bed early in spring before the fruit ripened. This plan of strawberry culture not only prevents loss from the attacks of such enemies as the White Grub and the above-mentioned Weevils, but is also a paying operation, giving better returns from the higher price secured with the large fruit thus grown than from a large crop of smaller berries.

Both of the weevils here treated of are nocturnal, doing such injury as is attributable to them at night and remaining quiet by day, hidden away in crevices or beneath rubbish and other shelters. They can, therefore, be trapped in considerable numbers by placing objects about the beds convenient for them to hide in by day, and also easy of examination for the destruction of the beetles.

## FOREST AND SHADE TREES.

No widespread or extensive injury to forest or shade trees was brought to my notice during the past season, but there were many inquiries sent in with specimens for information concerning these insects.

TENT CATERPILLARS of several species, which a few years ago were so enormously abundant, but which everywhere suddenly decreased in 1900, seem to be again increasing in certain districts, not only on forest trees, but also in orchards. There is some confusion as to the species mentioned in reports; but western references are probably to *Malacosoma (Clisiocampa) californica*, Pack., and *M. americana*, Fab., northwestern to *M. disstria*, Hbn., and *M. fragilis*, Stretch, and eastern to the Apple Tree Tent Caterpillar, *M. americana*, and the Forest Tent Caterpillar, *M. disstria*.

Mr. J. R. Anderson says:—

Victoria, B.C., Nov. 1.—The Tent Caterpillars again appeared in larger numbers than usual this year. In some localities on the lower Fraser and in those places where no steps were taken to check their ravages, fruit and ornamental trees were utterly defoliated, and this was also the case with trees and bushes on the roadside.'

When travelling in northern Alberta last summer, holding meetings with Mr. T. N. Willing, the Territorial Weed Inspector and Entomologist, I found, on July 21, two destructive colonies of what I took to be the Forest Tent Caterpillar *(M. disstria)*. The first one was in a bush of many acres of Aspen Poplars, a few miles out of St. Albert. The moths were in thousands and were just emerging from the cocoons. Only a few dipterous and hymenopterous parasites were noticed at large or detected by their larvæ in the cocoons. The second colony was close to the town of St. Albert and was less extensive than the first one referred to, the chief injury being done on the tops of young aspen trees. Earlier in the season Mr. Willing sent me specimens of the larvæ of *Malacosoma fragilis*, Stretch, which he had found abundant on rose and other bushes at Medicine Hat. There are a few reports of injury by Tent Caterpillars in orchards and wood lots in western Ontario; and I hear from Nova Scotia that Tent Caterpillars are evidently again increasing in numbers.

The remedy for all these species, where practicable, is prompt spraying as soon as the young caterpillars appear, with poisonous mixtures.

BASSWOOD LOOPER [*Erannis (Hibernia) tiliaria*, Harris].—Mr. T. N. Willing found caterpillars of this eastern moth very abundant on the flat north of the south branch of the Saskatchewan at Medicine Hat. They were stripping the Negundos or Ash-leaved Maples (also called Box-elders in the United States), and skeletonizing all the leaves on some trees over an area of more than two acres. A moth was reared from these caterpillars, which like the larvæ, did not appear to differ in any way from eastern specimens.

The NEGUNDO TWIG-BORER (*Proteopteryx willingana*, Kearf.).—For many years the Ash-leaved Maples grown at Winnipeg, Brandon, Regina and other points in the West as street shade trees, have been injured every season by the caterpillars of a small moth, which burrow in the bases of small twigs and branches, and hollowing these out, cause them to swell and form elongated galls. These have occasionally been reared, and some years ago moths were sent to a specialist who identified them as *Proteoteras æsculanum*, Riley. Under this name the insect has been referred to until the present season, when several specimens were reared by Mr. T. N. Willing, of Regina, and were forwarded to Mr. W. D. Kearfott, a specialist in microlepidoptera.

(See 'Canadian Entomologist,' vol. xxxvi., 1904, p. 306.) After careful examination they were decided to be an undescribed species, which was named in honour of Mr. Willing, as a recognition of the excellent work he is doing in working up the natural history of the North-west Territories. The caterpillars attain full growth during June and then leave their burrows in the twigs, and penetrating a short distance into the ground, spin close cocoons from which the moths emerge early in July. Some caterpillars of this moth, however, reared here in the Division of Entomology, pupated in the twigs where they had been feeding. It cannot be said that this insect does very serious injury to the Negundos; but it is sometimes extremely abundant and by destroying shoots makes it difficult to train these favourite trees in the way desired by those growing them as shade trees.

The NEGUNDO PLANT-LOUSE *(Chaitophorus negundinis,* Thos.).—As might be expected from the enormously extended area over which the Ash-leaved Maple or Box-elder is cultivated of late years, the insects which attack it are gradually spreading from the west with their host plant. One of the most troublesome of these is the Negundo Plant-louse, which for many years has been a disgusting pest of shade trees in the West, covering the trees with honey-dew during the summer and making them very unsightly objects instead of ornaments, in the streets, by reason of the copious growth of the Sooty Fungus (*Fumago salicina*), which always develops as a consequence of their attack. From several points in Ontario during the past summer, even as far east as Ottawa, this plant-louse was reported upon the Ash-leaved Maple trees. When not controlled by spraying with kerosene emulsion or whale-oil soap solution, these plant-lice do serious injury to the trees they infest; and they are so persistent in their attacks that many lovers of trees in the West have given up the cultivation of the desirable and quick-growing Negundo, for other trees less subject to insect attack.

The ASPEN BEETLE *(Lina tremulæ,* Fab.).—Mr. Norman Criddle, of Aweme, Man., writes : 'These beetles, which three or four years ago were so enormously abundant and did so much harm by stripping the aspen poplars, are once more on the increase. They were especially destructive to the young shoots of the aspens, causing many young trees to die.'

In 1900 and 1901 this bettle was so abundant and destructive on the prairies that many miles of beautiful aspen poplars so useful in that country for firewood and shade, were stripped bare of foliage, and a great many of the trees died. This was particularly the case in the Tiger Hills, Man., and in the Moose Mountain and Qu'Appelle districts, N.W.T.

WILLOW BEETLES.—For the last three years willows in the prairie provinces and in British Columbia have been very much injured by the small chrysomelid beetle, *Galerucella decora,* Say. This is a small brown beetle, soft, and rather flat in shape, which, both in the perfect and larval states, feeds on various kinds of willows, stripping the green surface of the leaves and leaving the bushes seared and brown. Mr. Criddle says: 'Willows at Aweme were completely stripped by these beetles and their larvæ. Later in the season, aspen poplars (*P. tremuloides*) were also attacked by the same beetles to such an extent that any one knocking a tree would shake down countless numbers from the leaves, which sounded, as they fell on the dead leaves beneath, like a shower of rain. These insects pass the winter beneath the dead leaves, and attack the trees as soon as they come into leaf the following spring. Many trees were killed by them some years ago.'

The VANCOUVER ISLAND OAK-LOOPER [*Therina (Ellopia) somniaria,* Huslt].—As stated in my report for 1890, the beautiful oaks on Vancouver Island are periodically stripped, every few years, by hordes of the caterpillars of a geometrid moth. 1904 saw one of these visitations. Mr. J. R. Anderson writes: 'The Oak Looper (*Ellopia somni-*

*aria*) appeared in vast numbers in some places on Vancouver Island this year. Strange to say, in certain localities they were entirely absent, but in others they were so numerous that they consumed every particle of their natural food, and they would then attack other trees. In one place, which I was called to inspect, I found that they had attacked even the fruit on apple trees, eating away a layer of the skin and large holes into the interior near the stem. They were also denuding the apple trees of their leaves. There were hundreds on one tree which stood beneath an oak. The larvæ had defoliated the oak tree, then let themselves down in the usual manner, and were on the apple tree in hundreds eating the foliage and fruit. Other trees, as cherry, elm, &c., farther away were also attacked, but not so much as those near the oaks.'

This variation in the food habits of this insect can, I think, only be considered as exceptional. The natural food of the species in Vancouver Island is the picturesque oak, *Quercus jacobi*, R. Br., which grows round the southern end of Vancouver Island. Among the caterpillars forwarded by Mr. Anderson, some parasitized specimens were found, from which was raised a parasite which has been kindly identified by Mr. W. H. Harrington, as *Pimpla Ontario*, Cress. Another parasite, the species usually responsible for the sudden reduction in the numbers of this species, is *Ichneumon cestus*, Cr., a yellowish brown ichneumon fly about three-eighths of an inch long, with one black band across the abdomen, and was found in considerable numbers by Mr. A. W. Hanham, who writes:—

'Victoria, B.C., October 25.—The moths of the Oak Looper (*E. somniaria*) have this autumn been a sight to see. Out the Cadboro Bay road large oak trees were covered with the moths a couple of weeks ago, particularly on the underside of the branches and close to the trunks. There were numbers of a reddish brown ichneumon, all of one species, which were flying about the trunks of the trees. I bottled several of these, which I send you.'

The specimens forwarded by Mr. Hanham were *Ichneumon cestus*, Cr.

The White-marked Tussock Moth [*Hemerocampa (Orgyia) leucostigma*, S. & A.] —This common pest of city shade trees, which was referred to at some length in my last report, continues to injure shade trees in some of our cities. The most effective remedies are the collection of the egg masses in winter and the spraying of the trees with arsenical poisons in spring before the caterpillars (Plate II., fig. 9) have grown much and injured the leaves. The Toronto civic authorities are this year taking active measures to clear out the infestation, which for many years has injured the appearance of the beautiful horse chestnut trees for which Toronto is celebrated. A reasonably large sum of money has been voted for the collection and destruction of the eggs during the present winter; and there is every reason to hope that by this means private individuals may be stirred up to do their duty in the public interest by destroying the eggs on their own trees in winter and then spraying the foliage in summer for a year or two.

Walking Stick Insect (*Diapheromera femorata*, Say).—A remarkable outbreak of the Walking Stick Insect, which is worthy of record, is reported by Mr. J. B. Williams, of Toronto. This is usually a rather uncommon insect; but Mr. Williams found it in such numbers in the Niagara Glen that thousands might have been collected on oak and butternut trees during September. These trees are ordinary food plants for this curious insect, which belongs to the Phasmidæ, a division of the Orthoptera, the same order as contains the locusts and grasshoppers.

## THE APIARY.

The Apiary, as in the past, has been under the management of Mr. John Fixter, the farm foreman, whose report I append herewith. The same experiments which have been carried on for some years have most of them been repeated on account of the large amount of interest which has been evinced in the subject by correspondents and visitors to the Central Experimental Farm. The services of Mr. Fixter have been asked for at a great many meetings of bee-keepers, and, whenever his duties at the Central Experimental Farm would permit of it, he has attended these meetings and given addresses.

### *REPORT OF MR. JOHN FIXTER.*

#### Season of 1904.

The honey crop in the Experimental Farm Apiary has been a fairly good one, giving an average yield of 63 pounds per colony.

In many parts of the Dominion the honey crop was light, owing chiefly to the very heavy losses of the past winter. Many colonies of bees perished from cold, while they had abundance of stores in their hives. The continued long spells of severe weather prevented them from breaking their clusters to reach their stores. Losses were greater in outside than in inside wintering, although many perished inside, either from insufficiency of stores or from confinement in cool, damp and badly ventilated cellars.

Experiments have shown that bees can be successfully wintered in a good cellar, even if it is damp, providing it is well ventilated. Many colonies died also during the spring after being set out, owing to the cold, backward season.

The number of colonies, which was 35 in the spring, was increased by swarming to a total of 50 when the hives were put into winter quarters on November 23.

Meetings were attended at the following places in Ontario :—Merivale, Metcalfe, Crossland, Phelpston, Minesing, Grenfell, New Lowell, Stayner, Elpin, McDonald's Corners, Balderson, Innisville, Drummond Centre, Locust Hill, Markham, Gananoque, Toronto and Barrie; and in the province of Quebec at Shawville, Buckingham and Venosta.

#### Experiments, 1903-1904.

##### I. CELLAR WINTERING.

*Description of the Bee Cellar.*—The cellar is below a private house. The walls are of stone and the floor of cement. The bee-room, 11 feet 6 inches wide by 15 feet long and 7 feet high, allows three tiers of shelves and two passages. It is boarded off from the remainder of the cellar by a partition which extends all around the chamber, and far enough from the stone wall to allow of an air space. Should a person have enough bees to fill the cellar the boarding could be left out. Under the cement floor a layer of one foot of stones of different sizes acts as a drain and keeps the cellar perfectly dry. The lowest shelf is 18 inches from the floor, the second 20 inches in the clear above, and the third 20 inches above that. Neither the hives on the third or uppermost shelf nor the uprights supporting the shelves touch the ceiling, so that no vibration can reach the hives from above. This chamber is thoroughly ventilated, as is also the whole cellar.

Before entering the bee room is a smaller compartment with a door leading to the outside and another leading to the bee-room. Both rooms have sliding ventilators in the doors, so that outside air may be let in at will. Ventilation is carefully attended to, and sudden changes of temperature are avoided; for this, a thermometer which is always kept in the cellar, is watched. The best temperature for the bee cellar has been found to be from 42 to 48 degrees Fahrenheit. This arrangement has given entire satisfaction. In former years there was not proper ventilation, and the cellar was always damp. Since the concrete floor has been laid and the ventilators have been put in, the cellar has been much drier and cleaner. It is also rat and mouse proof, which is a very great advantage.

*Experiment No. 1.—The tops of the hives replaced by chaff cushions and the brood chambers raised at the back.*

Six colonies were put into winter quarters in the cellar and placed on the shelves. Under the back end of each hive was placed a three-inch block; each hive was, besides, raised from its bottom board by a one-inch block being placed at the back so as to ensure free ventilation. All front entrances were left wide open; the wooden covers were all removed and replaced with cushions made of chaff 4 inches thick, sufficiently wide and long to lap over the hive two inches. Temperatures were taken once each week all through the winter and were kept very even, from 44 to 48 degrees. The bees were quiet, only a very slight hum being noticeable up to February, when the temperature having risen to 48, the bees began to get uneasy and made considerable hum. Cold air was carefully let in during the night by opening the slides in the doors and closing them in the morning; this, of course, lowered the temperature, and the bees quieted down. During the past winter every colony in this experiment was perfectly dry and clean, and all came out in excellent condition. Average weight of each hive when put into winter quarters, 58½ pounds; when taken out on April 22, 49¼ pounds per hive, showing that each hive had lost 9¼ pounds on an average.

*Experiment No. 2.—Tops replaced by chaff cushions and the brood chambers raised in front.*

Six colonies were put into the cellar and placed on the shelves, a three-inch block being placed only in front, between the bottom board and the brood-chamber, making the full entrance three inches high across the whole front. The wooden covers were removed and replaced with a chaff cushion. Temperature the same as in Experiment No. 1. During the whole winter all the colonies in this experiment were perfectly dry and clean and showed no uneasiness of any kind. The bees could be seen hanging in a quiet cluster below the frames any time during the winter. The average weight when put into winter quarters on November 23 was 59 pounds 12 oz.; when taken out on April 22, 51 pounds 8 oz., showing that each hive had lost on an average 8 pounds 4 ounces.

*Experiment No. 3.—Tops replaced by propolis quilts.*

Six colonies were put into the cellar and placed on the shelves, with the bottoms of the hives left on, just as they were brought in from the bee-yard. The wooden covers were removed and nothing left on except a tightly sealed propolis quilt; the natural entrance was left wide open. Temperature of cellar same as in Experiment No. 1. During the entire winter the bees kept perfectly dry, and only a very slight hum could be heard. There were but very few dead bees on the bottom board, and no sign of dysentery. On examination when set on their summer stands all the hives were found to be in first-class condition. The average weight when put into winter quarters November 23 was 59 pounds 15 oz.; when taken out on April 22, 51 pounds 3 oz., showing that on an average each had lost 8 pounds 12 oz.

*Experiment No. 4.—Tops and bottoms of hives left on.*

Six colonies were put into the cellar and placed on the shelves, with tops and bottom boards of the hives left on, just as they were brought in from the bee-yard.

They were watched for dampness, mould, or dysentery, also to compare the amount of honey consumed. Temperature of cellar the same as in Experiment No. 1. During December and January all were very quiet. During February there was considerable humming. Drops of water were noticed along the entrances of three hives. There were but very few dead bees on the bottom board and no sign of dysentery. On examination when set on their summer stands, two of the hives had considerable moulded combs. The average weight when put into winter quarters, 58 pounds 10 oz.; when taken out on April 22, 49 pounds 3 oz., showing that the average loss of each hive was 9 pounds 7 oz.

II.—WINTERING BEES IN DAMP CELLARS.

Many letters are received inquiring whether a damp cellar is a fit place to winter bees in. An experiment was conducted during the winter of 1902-3, with three colonies of bees. During last winter it was thought advisable to try the same experiment (A) with a larger number of colonies—six—and another (B), also with six colonies with a larger amount of moisture.

In both experiments the six colonies were selected, all of about equal strength, and all in Langstroth hives, weighing on an average 58 pounds each at the beginning of the experiment. The wooden covers were removed from the hives and replaced with propolis quilts ; the bottom of each hive was loosened from the brood chamber, and a block two inches square was placed at each corner between the bottom board and the brood chamber, insuring free ventilation from the bottom of each hive. The cellar was kept at a very even temperature of 44 to 48 degrees, and was well ventilated during the whole winter. The six hives in each experiment were resting on the edges of seven pails of water, the full surface of the water being exposed.

A.—The bees could be seen hanging below the frames in a quiet cluster all winter. The hives were all examined once each week, and at no time did there appear to be any sign of uneasiness from the extra moisture. There were scarcely any dead bees on any of the bottom boards nor any sign of dysentery, and all came out in excellent condition. The colonies were set out on their summer stands on March 20; the day being fine and warm, all began to fly at once. The average weight of the six colonies when set on their summer stands was 44¼ pounds each. From March 20 to April 5, the weather was cool, and no flying took place up to the latter date, which was a good bright warm day. After this the bees had to remain in their hives until April 22, when the weather became warm again. They then built up rapidly and were in excellent condition for the honey flow.

B.—A second experiment was tried in which the amount of moisture in the atmosphere of the cellar was increased in the following way: Besides the seven pails of water placed on the floor with the six hives resting on the edges of these pails, allowing the full surface of the water to be exposed, six inches of sand was spread on the cellar floor between the pails and covering six inches of the floor outside of the pails. There was also a large cotton sheet spread over the six hives. The sand and sheet were kept thoroughly saturated with water which was poured on them once each week during the winter.

The bees in this test were more uneasy than in the experiment first described where no sand or cotton covering was used, having to keep up fanning for ventilation. There were also a great many more dead bees on the bottom boards and several hives had drops of water along the entrance, but there was no sign of dysentery. On March 20, the day being fine, the colonies were removed to the bee-yard, where all began flying at once. The average weight of the six colonies when set on their summer stands, was 44¼ pounds each. From March 20 to April 22 the bees had but one good flight. After April 22 the weather became considerably warmer; the colonies began building up rapidly, and were in excellent condition for the clover bloom.

The average strength of the six colonies that had the extra moisture was not as great as in the former test, but as soon as they got fine weather they gained rapidly.

Care was taken that the colonies in both tests had plenty of unsealed stores before fruit bloom and between fruit and clover bloom. This was done by uncapping one side of a frame of honey nearest to the cluster, allowing the bees to use up the honey for food and providing space for the queen to lay her eggs. Although so much moisture was in close proximity to the colonies, a great deal of the success of this experiment is no doubt due to the good cellar in which it was tried, the cellar having stone walls, cement floors, good ventilation and the temperature being easily regulated. This goes to show that good ventilation and even temperature have a great deal to do with successful wintering. An excellent plan for ventilating is to have sliding ventilators in the doors, so that much or little air may be let in as desired. Also connect an extra stove pipe, provided with a damper, to the regular heating stove. This may be done by means of a T, or an extra flue will answer. Allow the pipe to extend into the cellar. This plan of ventilating has proved very successful.

### III.—INSULATING HIVES FOR OUTSIDE WINTERING.

For this experiment, the hives were insulated against the winter cold by air cushions in the following manner. Slats 1 inch thick were nailed at intervals all around the hive, on these was tacked one layer of thick brown building paper and then a layer of oiled paper, which increases durability and also keeps out vermin. In order to provide extra protection to the hive, a box six inches wider and six inches longer was placed over this with an opening cut at the entrance, 1 inch by 2 inches, all other openings being closed. The wooden covers of each hive were removed and replaced with a chaff cushion 3 inches thick, the latter placed on the propolis quilt, and lapping over the sides of the hive; two layers of paper were then put on top of the cushion and a second cushion added, which had the top of the outside box over it. This experiment, first tried during the winter of 1902-3 with two hives, was repeated last winter for the second time with four colonies in Langstroth hives. These were all four placed in a large packing case, one foot larger each way than the hives, which were six inches apart in the case, with six inches of cut straw on the bottom of the case for the hives to rest upon. The six-inch space between the hives was packed with cut straw, as well as the one-foot space all around and on top of the hives. The entrances of two of the hives faced each other, and two hives faced west. The entrance to the hives was kept clear of snow all winter to ensure free ventilation. The hives were in a corner well sheltered from cold winds.

No sound could be heard from these colonies all winter. On March 22 the bees made their appearance, many flying briskly, going out and returning. From March 22 to April 22 the bees had but one good flight. On April 22 they were then examined. Very few dead bees were found on the bottom boards; the combs were dry and clean and there were no signs of dysentery. The hives were then removed from the packing case and placed on their summer stands. The average weight of the hives when put into winter quarters was 62½ pounds; when put on their summer stands, 49¼ pounds, showing that each hive had lost 13 pounds 4 ounces. The weather after this date (April 22) being bright and warm, the bees built up rapidly and were in excellent condition for the honey flow.

### IV.—EXPERIMENTS TO DETERMINE WHICH BEES WOULD CONSUME MOST OF, HONEY OR SUGAR, WHILE CONFINED IN THEIR WINTER QUARTERS.

**Eight colonies in Langstroth hives were selected for this experiment; all of as nearly equal strength as could be secured. On September 1 their natural stores were** removed from both sets. On September 2 all were weighed as follows:—

**(a.) The four colonies fed sugar syrup: No. 1 weighed 30 lbs. 7 oz.; No. 2, 31 lbs. 12 oz.;** No. 3, 31 lbs. 10 oz.; No. 4, 31 lbs. 3 oz.; average of weight, 31 lbs. 4 oz.

**(b.) The four colonies fed extracted honey: No. 1, weight, 30 lbs. 9 oz.; No. 2, 31 lbs. 10 oz.; No. 3, 30 lbs. 12 oz.; No. 4, 31 lbs. 1 oz.; or an average of 31 pounds.**

Miller feeders were placed in empty section supers, close to the top of the brood frames, any part of the brood frames not covered by the feeder being covered by a propolis quilt cut so as to allow the bees a passage through it. By keeping the feeder well packed around, except where the bees enter, the heat is kept in and at the same time the bees cannot daub themselves with the liquid. In both experiments the bees had a constant supply of syrup and honey. Both the honey and the syrup were supplied to the bees at about blood heat. The syrup was made of the best granulated sugar, two parts to one of water by weight. The water was first brought to a boil, then the boiler was set back on the stove and the sugar having been poured in, the mixture was stirred until all was dissolved.

The four colonies fed sugar syrup when put into winter quarters November 24, weighed as follows:—

No. 1, 61 lbs. 4 oz.; No. 2, 62 lbs. 9 oz.; No. 3, 62 lbs. 7 oz.; No. 4, 62 lbs.; or an average of 62 lbs. 1 oz. each.

The four colonies fed extracted honey when put into winter quarters on November 24, weighed as follows:—

No. 1, 62 lbs. 13 oz.; No. 2, 62 lbs. 14 oz.; No. 3, 62 lbs.; No. 4, 62 lbs. 5 oz.; or an average of 62 lbs. 8 oz. each.

The four colonies fed sugar syrup when taken from their winter quarters March 22, weighed as follows:—

No. 1, 47 lbs, 3 oz.; No. 2, 49 lbs. 4 oz.; No. 3, 51 lbs. 5 oz.; No. 4, 51 lbs. 8 oz; average, 49 lbs. 13 oz.

The four colonies fed extracted honey when taken from their winter quarters March 22, weighed as follows:—

No. 1, 50 lbs. 9 oz.; No. 2, 53 lbs. 1 oz.; No. 3, 51 lbs. 12 oz.; No .4, 51 lbs. 2 oz.; average, 51 lbs. 10 oz. Difference in favour of the honey feeding, 1 lb. 13 ounces per colony.

When the hives were put into winter quarters and placed on the shelves in the cellar, the wooden covers were raised at one end ½ an inch, while the sealed propolis quilt was left undisturbed. The hives were all given extra ventilation at the bottom by placing at the entrance a wooden block between the bottom board and the brood chamber, thus raising the front of the brood chamber 3 inches extra. During the balance of November and December very slight humming could be heard; during January and February scarcely any appreciable hum could be heard. During the whole winter there was no sign of uneasiness of any kind, and very few dead bees were found about the entrance; the bottom boards were quite clean and there was no sign of dysentery in either experiment. All came out in first-class condition and built up rapidly for the honey flow.

### V.—EXPERIMENT WITH QUEEN EXCLUDERS IN HIVES FOR THE PRODUCTION OF EXTRACTED HONEY.

Eight colonies were taken for this test—4 in Langstroth hives, 4 in Heddon hives.

Two colonies in each case had queen excluders between the brood chamber and the extracting frames; thus, every pound of honey secured was pure.

The two remaining colonies in each set had no queen excluders. The queen in every instance went up into the extracting frames where eggs were laid and young brood raised. This latter plan is practised by too many who call themselves bee-keepers. It is impossible to extract honey from frames where brood is present without throwing out the young larvæ at the same time. There are also many who do not use any surplus cases, especially those who use the old box hive. They take their honey out of the brood chamber after smoking or killing the bees. This practice is to be strongly condemned, as the honey taken out of a brood chamber, or out of extracting frames where brood is present is not fit for human food.

On November 8, all colonies were weighed and found to be in good condition. They were then put into their winter quarters.

### Introducing Queens.

Eight queens have been introduced during the season, four on the Benton plan and four with frames of brood taken from several hives. All queens belonging to the colonies that were to receive the imported queens, were removed 24 hours before introducing the new queens.

#### One Method—'Benton Introducing Cage.'

The Benton mailing and introducing cage is ordinarily used in this country. It consists of an oblong block of wood with three holes bored nearly through, one of the end holes being filled with good candy, and the other two being left for the occupancy of the bees and queen. On the back of the cover are printed directions for introducing a new queen into a hive, and at each end of the cage is a small hole bored through the end of the block of wood, but which in the mails is stopped by a cork. One hole is for the admission of the bees and queen preparatory to mailing, and the other for the liberation of the queen, by the bees eating out the candy in the course of 20 to 30 hours, thus releasing her in a natural way. When the cage is received, the cork covering the candy is to be removed, as well as the wooden cover over the wire cloth. The cage is then carefully placed on top of the frames, so that the wire cloth be over the space between two frames in the centre of the brood-nest. The queen will then be released by the bees in the manner explained.

I would advise all to have extra cages for introducing, so that no disease may be brought in with the queen. See that the cage you introduce with is thoroughly cleaned, and have fresh food made from your own honey placed in the cage in readiness. Then remove the queen and bees from the cage they were received in, to the one prepared for them and follow the above directions.

#### *How to Make Honey and Sugar Thick for Feeding.*

Take good thick honey and heat (not boil) it until it becomes very thin, and then stir pulverized sugar into it. After stirring in all the sugar the honey will absorb, take the mixture out of the vessel, and thoroughly knead it with the hands. The kneading will make it more pliable and soft, so that it will absorb or take up more sugar. For summer use it should be worked, while mixing in a little more sugar, until the dough is so stiff as to be hard to work; it should then be allowed to stand for a day or two; and, if still so soft as to run, a little more sugar should be kneaded in. A good deal will depend upon the season of the year; there should be more sugar in proportion to the honey in warm weather than in cool weather.

#### Another Method of Introducing Queens.

Select a strong colony, remove the wooden cover of the hive, and place a fine wire netting over the tops of the brood frames to shut in the bees; place on top of this wire cloth a brood chamber with four frames of well sealed brood, selected from different hives, with young bees just hatching out, but with no unsealed brood. Put the queen in this brood chamber, which should then be closed bee-tight, and kept over the strong colony four or five days. By that time a respectable force of young workers will have hatched; the hive may now be placed on the stand where it is to remain, the entrance being made large enough for only one bee to pass at a time, as a precaution aganist robbing. The entrance may be widened as the colony gets stronger. This latter plan has never failed with me.

JOHN FIXTER.

# DIVISION OF BOTANY.

## THE RUSTS OF GRAIN CROPS.

The losses from the attacks of different kinds of rusts on the cereal crops of the Dominion during 1904, were considerable, and have been reported from every part of the Dominion. In Manitoba and the North-west Territories rust on grain is very seldom heard of; but during the past autumn just about the time the grain was ripening the climatic conditions were such that rust developed to an alarming extent. The parasites which cause this disease are always present to a certain degree on grain crops as well as on several kinds of the wild prairie grasses, and this year they spread on the grain crops and were the cause in some places of great loss to farmers. There was so much interest created among settlers in the West that I was requested to prepare an article upon the subject for the Montreal *Family Herald and Weekly Star,* which was published in the issue of November 30 last. As it is of general interest and a great many inquiries have been made for a popular description of the disease and its cause, I reproduce the article herewith.

### *THE RUST OF WHEAT.*

The subject of the rusts of grain crops is of special interest just now, owing to the unusual epidemic of these destructive parasites in the large wheat fields of parts of Manitoba and the eastern North-west Territories during the past season.

The loss from this cause was undoubtedly considerable; but there was no such wholesale or widespread destruction of the wheat crop in the prairie provinces, as was described in some United States and English newspapers. I have had opportunities of examining samples of rusted straw from many localities, which have been kindly sent in by Mr. David Horn, Chief Inspector of Grain, at Winnipeg, by the agricultural papers and by several correspondents. As a report on the whole of these samples, it may be said that, although some were seriously affected by rust, not one of them was as badly rusted as crops are frequently found to be in eastern Canada, which are nevertheless thought to be worth cutting for grain.

In passing through the Territories and Manitoba in the second week of August, although the crop was rather late and green, I saw no appearance of rust, nor did I hear any complaints of its occurrence at that time. The first reports were received about the 20th August. Early in September several items in the newspapers showed that there was much anxiety as to the extent of the loss which might occur. The localities where most harm was done, were in the Red River valley, in south-western Manitoba and in eastern Assiniboia. In the Regina district a few crops are said to have been so badly rusted that they were burned. The rust in these fields appears to have been noticed on the leaves and heads about the middle of August. On the 18th of that month there was a hailstorm, accompanied by rain; and immediately afterwards the rust spread rapidly.

In Manitoba, for fear of further injury, some crops of wheat were cut too green to be of use for grain, or were made into hay. Under the circumstances, and, as the season turned out, this was a wise course; for it has been found by Mr. Shutt, the Chemist of the Experimental Farms, that straw attacked by rust makes far better feed for stock even than clean straw, because the presence of the parasite causes the retention in the straw of the nutritious principles which after the seeds are formed are transferred from the straw into the grain.

### THE EFFECT UPON THE WHEAT PLANT.

The physiological effect upon the wheat plant by the presence of the rust parasite is better understood by a consideration of the life history of the minute plants which are known as rusts. The term Rust, as applied to cereals, describes a disease due to the attacks of several different parasitic fungi belonging to the Uredineæ, a family which includes the most destructive parasites of cultivated and wild plants; and it must not be forgotten that rust is a plant, and, although so minute that a strong microscope is required to examine it, it is just as much a true plant with a definite life history of its own, as the wheat, oats, grasses, &c., upon which it grows.

The general belief that rust comes with rain, fog, or heavy dew after a hot day, is in the main correct; but the moisture and hot air are not actually the cause of the trouble; they merely act as the carriers of it and provide the conditions necessary for its injurious propagation.

The rust which was answerable for nearly all the injury in the West last season, was the Black Stem Rust. There are about a dozen different kinds of rusts which occur on wheat, oats and barley in this country. The commonest of these are the Orange Leaf Rust (*Puccinia rubigo-vera*) or Spring Rust, and the Black Stem Rust (*Puccinia graminis*), or Summer Rust, which attack all kinds of small grains, and the Crown Rust, or Orange Leaf Rust, of oats *(Puccinia coronata),* which does not occur on wheat or barley. Each of the first two named species has distinct specialized forms which attack wheat, oats and barley and some other grasses, but which very seldom infest plants belonging to other grains than those upon which they developed. For instance, spores of the Black Stem Rust of wheat will not produce readily on either barley or oats the corresponding rusts of those plants and *vice versa.* The two common rusts of wheat occur in all parts of the world, where that staple crop is grown; and in almost every instance it has been found that the Black Stem Rust is by far the more injurious of the two. The Orange Leaf Rust appears earlier in the season and is the more conspicuous; but the later-developed Black Stem Rust attacks its host in a much more vulnerable spot, namely on the stem, the channel up which the nutritious principles are carried from the vegetative system of the plant to be stored up in the seed. Developing on the stem, it arrests and feeds upon these important elements, thus causing starved and shrunken grain. The Orange Leaf Rust of oats is a different species from the Orange Leaf Rusts that occur on the other small grains; and like them has a red rust or spring form and a dark-coloured or summer form; but the Black Stem Rust of oats is merely a specialized form of the species (*Puccinia graminis*), which is also found on wheat, barley and rye, as well as on many different kinds of grasses.

### THE GROWTH OF THE PARASITE.

In the case of the Black Stem Rust, the growth of the parasite is the same, whatever its host plant may be. It passes the winter in a resting condition on the old stems of the previous year. In the fields this will be chiefly on the stubble. The winter-spores or seed-bodies germinate early in spring and produce another kind of spores, which are exceedingly light, and are borne from place to place by the faintest breath of wind. These, alighting on the growing grain plants, produce, later, what is known as the red-rust or uredo stage of the fungus, to be followed in autumn by the resting winter-spores of Black Stem Rust. The sequence of this development is as follows: As soon as the minute spores of the first germination are carried on to a leaf of a growing plant, they germinate and throw out very slender tubes, which enter the tissues of the host plant in the same way that roots penetrate the soil. Here they feed at the expense of their host, and in time produce large numbers of reddish brown spores, which burst through the tissues and cause the red-rust stage, which again, later on in the season, is followed by the black-rust stage, which consists of the profuse production of another kind of spores, brownish black in colour. These are the teleutospores, and are the means of carrying the parasite over the winter. These black winter-spores frequently appear in this species in the same spots on the stem, where the red-rust stage was earlier in the season, but do not germinate until the following spring.

### RUST AND THE BARBERRY.

In addition to these two forms of the Black Stem Rust, there is another stage which has been the subject of much controversy. This comes from the spores of the first generation in spring falling upon the leaves of some species of barberry, where they give rise to a curious fungus, known as Barberry Cluster-cup. After a time this matures and pours out enormous numbers of spores which are carried in all directions by the air and fall upon grain plants, where they give rise to Red Rust. Strange to say, this remarkable fact in the life history of rust was discovered very many years ago, and laws looking to the extermination of the barberry plant date back to 1660, when an Act having this object in view was passed in France.

It is not, however, absolutely necessary for Rust to have its first stage on the barberry, although experiments have shown beyond doubt that it does sometimes occur on that plant. The theory has been advanced that growing in this way in one of its stages on the barberry gives the parasite greater vigour; but it is beyond question that the Black Stem Rust can continue to grow in localities where no barberries are grown, and it is also known to occur in specialized forms on many of the wild prairie grasses. Among the samples of grasses sent to me from Manitoba with the rusted wheat, were specimens of the Skunk-tail grass, or Squirrel-tail (*Hordeum jubatum*), which bore well developed pustules of Black Stem Rust, similar to those which occur on wheat and cultivated barley. The Skunk-tail grass is a very bad weed of the West, and certainly increases in hay lands, owing to a habit farmers have of leaving this grass uncut when mowing, so that it ripens and distributes its seeds. If it were cut down at the same time as hay, the unripe seeds would soon dry up, or might be easily burnt after the hay was carried. Mr. Mark A. Carleton, Cerealist of the United States Bureau of Plant Industry, who has made extensive investigations of rusts, writes as follows:—

'It is positive now from experiments made by this department that the Rust of *Hordeum jubatum* will easily transfer to wheat and barley, and therefore it would decrease the chance of infection of a wheat field, if this grass could be kept out of the wheat, or if the wheat were sown away from its influence.'

### REMEDIES.

Little can be done as a remedy against rusts; but, as the parasite passes the winter on the old straw, land left for seeding on stubble should be burnt over carefully before seeding, and the ploughing down of stubbles for summer-fallow should be done as early as possible in the season, so as to prevent as much as may be the distribution of the first generation of spores. Rusted straw fed to cattle is said to distribute the fungus in grain crops from the spores being carried through with the manure. Fresh manure, therefore, should not be used in fields where grain is to be grown. The investigations which have been carried on in Australia, have run largely towards the discovery of varieties of grain which may be more or less exempt from the attacks of rust. Although probably no variety has yet been found entirely free from these parasites, still much has been learned as to the comparative immunity of some kinds, and Mr. Carleton points out that the investigations are said incidentally to have resulted in Australia now having varieties of wheat which are vigorous, true to name, and of exceptional quality for the particular region in which they are grown.

Ever since the institution of the Experimental Farms, much attention has been paid in our experiments with cereals to the problem of rust-resistance. Seed grain has been obtained from all parts of the world. The Australian and many other varieties said to be of special quality have been secured and experimented with, with a view to ascertaining the rust-resisting power of each. A vast amount of useful information will be found by looking through the annual reports of the Experimental Farms, where in the tables of yields of varieties, a special column is devoted each year to the amount of injury by rust on every variety of wheat and oats grown at the different Branch Farms. The result of these experiments, as stated above, is that no variety of wheat or oats, so far, has been found which is perfectly free from rust, although by constant selection those varieties are being separated, which have the greatest power to resist the attack of the parasites.

It may be mentioned here that up to the present time experiments in spraying grain fields with Bordeaux mixture and other fungicides for the prevention of rust have not been attended with any success.

### ENCOURAGING FEATURES.

There are some features of the rust epidemic of 1904 which may well be borne in mind by western farmers.

1. The extent of injury this year was much influenced by the unusual season, owing to which all crops were later than usual. The spring was late, cool and dry, followed by hot weather, which suddenly changed at harvest time to dull, wet weather of long duration. The result of these conditions was that, at the time when wheat and oats should have been ready to cut, which was the exact time when the rust appeared this year, not only were grain crops in an exceptionally late and succulent state, but the atmospheric conditions, which were very unusual for the region, were just such as would allow of the rapid development of parasitic fungi.

2. Such an extensive outbreak of rust is without any precedent in the history of the Canadian West.

3. As in ordinary seasons rust has been almost unknown in the West, such extensive injury as was experienced in 1904, must be considered as exceptional and not likely to occur again for many years.

J. FLETCHER.

## PERMANENT PASTURES.

The following table gives the yields from the permanent pasture experimental plots for the past four years:—

| Number. | Seed sown per Acre. — Mixtures Nos. 1–17, sown May 4, 1901. Sainfoin, No. 18, sown May 1, 1903. | | | | Cured Hay, per Acre. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1904. | | | | Total. | | | | | |
| | Grasses. | | Clovers. | | June 24. | | August 12. | | 1904. | | 1903. | | 1902. | |
| | | Lbs. | | Lbs. | Tons. | Lbs. | Tons. | Lbs. | Tons. | Lbs. | Tons. | Lbs. | Tons. | Lbs. |
| 1 | Timothy.........<br>Meadow Fescue....<br>Orchard Grass.....<br>Kentucky Blue.....<br>Red Top.......... | 6<br>4<br>2<br>1<br>1 | Alfalfa............<br>Alsike...........<br>Mammoth Red...<br>Common Red.....<br>White Dutch...... | 2<br>2<br>1<br>1<br>2 | 3 | 880 | 2 | 3 | 5 | 883 | 4 | 520 | 4 | 40 |
| 2 | Meadow Fescue....<br>Timothy..........<br>Canadian Blue.....<br>Orchard Grass......<br>Red Top........... | 6<br>3<br>2<br>3<br>3 | Alfalfa............<br>Alsike...........<br>White Dutch......<br>....................<br>.................... | 4<br>1<br>1 | 3 | 960 | 2 | 101 | 5 | 1,061 | 3 | 1,560 | 4 | 660 |
| 3 | Timothy...........<br>Awnless Brome....<br>Orchard Grass..... | 5<br>4<br>2 | Alfalfa..........<br>Alsike............<br>.................... | 6<br>3 | 3 | 1,021 | 1 | 1,320 | 5 | 341 | 4 | 770 | 5 | 120 |
| 4 | Meadow Fescue....<br>Orchard Grass.....<br>Kentucky Blue.... | 6<br>2<br>1 | Common Red.....<br>Alfalfa...........<br>White Dutch...... | 4<br>3<br>1 | 3 | 1,079 | 1 | 1,381 | 5 | 460 | 4 | 320 | 5 | 1,520 |
| 5 | Timothy..........<br>Upright Brome.... | 6<br>4 | Alfalfa...........<br>Mammoth Red.... | 6<br>4 | 3 | 1,282 | 1 | 1,339 | 5 | 621 | 4 | 840 | 4 | 960 |
| 6 | Timothy........... | 10 | Common Red. ... | 6 | 3 | 880 | 1 | 840 | 4 | 1,720 | 2 | 880 | 4 | 760 |
| 7 | Timothy........... | 10 | Mammoth Red.... | 6 | 3 | 120 | 1 | 520 | 4 | 640 | 1 | 1,520 | 3 | 1,200 |
| 8 | Orchard Grass..... | 18 | Alsike............ | 5 | 1 | 1,680 | | 1,892 | 2 | 1,572 | 2 | 80 | 2 | 1,200 |
| 9 | Orchard Grass..... | 18 | Common Red. ... | 8 | 2 | 360 | 1 | 160 | 3 | 520 | 2 | 1,600 | 3 | 1,280 |
| 10 | Meadow Fescue.... | 20 | Common Red..... | 8 | 2 | 240 | | 1,997 | 3 | 237 | 2 | 680 | 3 | 40 |
| 11 | Timothy........... | 12 | Mammoth Red.... | 8 | 2 | 1,980 | | 1,912 | 3 | 1,922 | 2 | 1,400 | 3 | 1,760 |
| 12 | Timothy......... | 12 | Common Red. ... | 8 | 3 | 320 | 1 | 70 | 4 | 390 | 2 | 1,920 | 3 | 20 |
| 13 | Timothy..........<br>Awnless Brome.... | 5<br>10 | Common Red. ...<br>Mammoth Red.... | 5<br>5 | 2 | 1,840 | 1 | 1,240 | 3 | 1,080 | 2 | 1,840 | 4 | 300 |
| 14 | Awnless Brome.... | 25 | .................... | | 1 | 1,881 | | 840 | 2 | 721 | 1 | 1,360 | 3 | 1,020 |
| 15 | Awnless Brome.. . | 15 | Common Red..... | 8 | 2 | 1,889 | 1 | 320 | 4 | 209 | 3 | 360 | 4 | 760 |
| 16 | Timothy.......... | 8 | Mammoth Red... | 8 | 3 | 1,652 | 1 | 129 | 4 | 1,781 | 3 | 1,160 | 3 | 340 |
| 17 | ..................... | | Sainfoin.......... | 40 | 3 | 1,998 | 2 | 1,400 | 6 | 1,398 | 4 | 1,160 | 3 | 1,160 |
| 18 | ..................... | | Alfalfa............ | 15 | 2 | 840 | 1 | 837 | 3 | 1,677 | | | | |

# REPORT OF THE EXPERIMENTALIST.

(Chas. E. Saunders, B.A., Ph.D.)

Dr. Wm. Saunders,
Director Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to submit herewith, the second annual report of the Division of Cereal Breeding and Experimentation.

The cross-fertilising and the selecting of desirable types among cereals occupied much time during the early summer; and, the comparative study of the different varieties of cereals, field roots, &c., as they reached maturity, was the chief work of the later part of the season.

Some attention was also given, during your absence on your annual visit to the branch farms, to the new varieties of hardy, hybrid crab-apples which are being produced for the northern parts of the Dominion.

Good progress has been made during the year in the enlargement of the museum collection of cereals, which is proving of great value.

In the month of December, 1903, I attended the first meeting of the American Breeders' Association at St. Louis, where I presented a paper entitled: 'Some Observations on Heredity in Wheat.'

On the same trip, visits were paid to some of the wheat-testing laboratories in Chicago, Minneapolis and Brookings (South Dakota). Much kindness was received from Prof. Jas. H. Shepard of the South Dakota Experiment Station, who explained in detail the methods used by him in his studies on the milling qualities of the macaroni wheats.

During the winter, much time was spent in the careful study of a large number of selected heads of wheat and other grains for the purpose of starting improved strains of some of the most important varieties. Hand selection of threshed grain from the plots of some of the best sorts of wheat, in order to eliminate certain undesirable types of seed, has also been carried on; while the whole of the grain for the experimental plots was, as usual, carefully hand picked before being sown.

The purchase of a roller-process flour mill for the grinding of small quantities of wheat has enabled me to commence an investigation into the quality of Canadian wheats.

I am much indepted to Mr. George Fixter, for his valuable work as foreman in charge of the experimental plots, and to Miss M. Hager, for the great care with which she performed the work of seed selection in the difficult cases which were entrusted to her.

I am indebted also to Professor C. A. Zavitz, of Guelph, for seed of a strain of Early Yellow Soja beans, to Professor J. H. Shepard of Brookings, for an excellent sample of macaroni made at the South Dakota Experiment Station, to the Sheffield-King Milling Company of Faribault, Minn., for a large sample of patent flour made from macaroni wheat (which proved very good for bread making), to the Lake of the Woods Milling Company and to the Ogilvie Flour Mills Company for fine samples of the products of their mills, to the United States Department of Agriculture for some new varieties of barley, to Mr. C. Boije of Finland, for new sorts of oats, and to Mr.

A. McMullen of the Guinness Laboratories, Dublin, for some extremely interesting samples of Irish barley.

I have the honour to be, sir,
Your obedient servant,
CHARLES E. SAUNDERS,
*Experimentalist.*

## CROSSING OF CEREALS.

Owing to the fact that so many cross-fertilised seeds were obtained in 1903, it was not deemed desirable to devote quite so much attention to this part of the work this year. A smaller number of crosses was therefore attempted, but most of these were of unusual interest. The results were quite satisfactory. The work of cross-fertilising was begun on June 20 and continued until July 6. Eleven different crosses were accomplished in wheat, giving 85 seeds, four in barley giving 28 seeds, and one in oats giving one seed. Some mixed crosses (wheat with barley) were also attempted but the seeds obtained were not plump and may not germinate when planted.

The cross-fertilised seed produced in 1903 was sown on April 25. In no case were the seeds put in closer than 4 inches apart each way. This allowed space for the study of each plant by itself. The oats, barley and peas were sown at greater distances apart. Most of the seed germinated well. The following figures give the number of plants harvested: Peas, 20; wheat and emmer, 416; barley, 18; oats, 4. This makes a total of 458 new varieties of grain. Most of these made very strong growth, many of the plants of wheat attaining a height of nearly five feet. The unusual severity of rust, however, very materially reduced the yield of grain. Nevertheless, if the seed germinates well next season, it should give several thousand new varieties; for experience has shown that every seed from an original cross-bred plant produces a new variety of grain.

## SELECTION OF PROMISING TYPES OF CEREALS.

The selection of the most promising types from mixed seed found in commerce and from the newer cross-bred sorts produced at this Farm was continued this year with unusual care. Altogether nearly 300 selected strains were sown, and of these about 200 were harvested, a number of them having been rejected during the growing season on account of their lateness or for some other cause. Among these new strains are several very promising types, which are sufficiently distinct to be ranked as new varieties. The best of these will be brought into the uniform test plots as soon as possible.

The cross-bred varieties of wheat described in the report for last year (Preston, Stanley, Huron, Percy and Laurel) were subjected to very careful re-selection, sufficient seed being obtained in each case to sow the one-fortieth acre plot. This has now given a small stock of grain, greatly improved in character, to serve as the foundation for improved strains of these varieties. Early Riga, Downy Riga, Riga and Bishop were also re-selected in a similar manner. White Fife, a variety seldom met with in a condition at all approaching purity, was also treated in the same way

## RUST-RESISTING VARIETIES.

Rust in cereals has attracted more than the usual amount of attention during the past season, the damage from this disease having been greater in some sections of the country than is generally the case. It seems desirable, therefore, to call attention to the efforts which have been and are being made at the Dominion Experimental Farms to discover rust-resisting varieties of cereals. For many years careful notes have been made at the Experimental Farms on the extent to which each variety of grain has suffered; and this information has been published in the tables in the annual reports. Many new sorts of cereals (especially wheat) have been obtained from Europe, Asia, Northern Africa, the United States and Australia in the search for rust-resisting sorts. In addition to these, many cross-bred varieties have been produced at this farm (by crossing ordinary wheats with macaroni wheats and wheats with emmers) in the hope of obtaining exceptionally strong types. A careful study of single plants of certain varieties is also being carried on, to see whether individuals can be found to be used as the mother plants of rust-resisting strains.

These lines of investigation have not yet been followed long enough to reach very striking results, but the work is being continued on a larger scale than before.

## DESCRIPTION OF CROSS-BRED VARIETIES OF WHEAT.

The following new varieties of wheat produced at this farm are here described for the first time. They are all being propogated as rapidly as possible, but are not yet available for general distribution. It should be noticed that Early Riga, Downy Riga, Riga and Bishop are valuable chiefly on account of their earliness. They are not recommended for cultivation in districts where the ripening season is long.

The measurements given in the descriptions apply to the grain as grown at Ottawa.

*Early Riga.*—Parentage, Gehun (female) crossed with Onega (male). Kernels red, rather small. Heads beardless, rather small, usually about 3 inches long. Chaff yellowish, smooth and downy mixed. Straw stiff, but not above medium height, usually about 42 inches long. Ripens very early, about 12 days before Red Fife. Gives a rather small yield, especially in seasons when rust is unusually severe. Makes excellent flour.

As this variety is a mixture of two distinct types, easily distinguished by the hairiness or smoothness of the chaff, it has been separated into the two varieties described below.

*Downy Riga.*—Obtained from Early Riga by selection of the heads having downy chaff.

*Riga.*—Obtained from Early Riga by selection of the heads having smooth chaff.

*Bishop.*—Parentage, Ladoga (female) crossed with Gehun (male). Kernels yellowish, of about medium size. Heads beardless, usually about 3½ inches long, rather blunt. Chaff yellowish, smooth. Straw moderately stiff, usually about 43 inches long. Ripens quite early, about 8 days before Red Fife. Gives a fair yield. Makes very good flour. This variety resembles White Fife in some respects, but is distinguished by its rather blunt head, its much greater earliness and its somewhat smaller yield. (White Fife usually ripens with Red Fife).

*Red Preston.*—The original Preston wheat gave two types of heads, some having yellowish chaff and others red chaff. The name Preston is now being used to designate only the type with yellowish chaff, as described in the Report of the Experimental Farms for 1903, page 219. The name Red Preston is given to the type having red chaff. In other respects Red Preston resembles Preston.

## DOUBLE ROWS AND OTHER SMALL PLOTS OF CEREALS.

Well-known varieties of cereals which have been rejected from the uniform test plots as undesirable for general cultivation are retained for reference purposes and are grown annually in the double rows. These rows are 33 feet long and about 6 inches apart; and each pair of rows is separated from the neighbouring pairs by a space of about 2 feet. In these double rows are also sown all the new varieties of grain, of which there is only a very small quantity of seed on hand. When a larger amount of seed is available a small plot is sown, but the yield per acre is not usually estimated when the plot is less than one-fortieth of an acre in extent.

An alphabetical list of the principal varieties grown in the double rows and other small plots, during the past season, is here given. The total number of these was 157. Those sorts which are given under letters and numbers are new varieties produced at this farm, but not yet named.

*Spring Wheat.*

6 B 2 (Red Fife × Polish).
6 E " "
6 T " "
7 D (Red Fife × Roumanian).
7 E " "
8 C (Red Fife × Goose).
8 E " "
8 H 1 " "
9 A 1 (Common Emmer × Colorado Wheat).
9 D 1 " "
9 D 2 " "
9 G " "
9 H 1 " "
9 K 2 " "
10 C (Colorado Wheat × Common Emmer).
10 F " "
Alpha.
Banat.
Bearded March.
Beaudry.
Campbell's White Chaff.
Cape.
Cartier.
Cassel.
Chiddam March.
Club.
Crown.
Early Sonora.
Galician.
Gurke.
Herisson Beardless.
Hungarian Mountain.
Hungarian Red.
Hungarian White.
Japanese.
Japhet.
Ladoga.
Naples.
Norval.
Persian Black.
Pringle's Defiance.
Progress.
Red Bearded.
Red Preston.
Red Swedish.
Rideau.
Robin's Rust Proof.
Rye Wheat.
Sicilian.
Strubes.
Summer Cob.
Touzelle.
Victoria.

*Macaroni or Durum Wheat.*

Adjini Red.
Adjini Yellow.
Arneutka,
Italian.
Madonna.
Mahmoudi Red.
Mahmoudi Yellow.
Mishriki.
Polish.
Red Indian.
Sleaford.
Sorentino.

*Emmer and Spelt.*

Black Bearded Spelt.
Double Emmer.

*Oats.*

Abyssinia.
Aitken Black.
Australian.
Bayonet.
Bergs (black).
Beseler.
Black Mesdag.
Bonanza.
Brandon White.
Brandon Yellow.
Brown Algerian.
California Prolific (black).
Clydesdale.
Cream Egyptian.
Cromwell.
Dinauer.
Doncaster Prize.
Early Archangel.
Early Blossom.
Early Gothland.
Early Maine.
Eureka.
Fichtel Mountain.
Flying Scotchman.
Holland.
King.
Leutenwitzer.
Liberty.
Miller.
Newmarket.
New Zealand.
Norwegian Black.
Oderbruch.
Prince Royal.
Rennie's Prize White.
Russell.
Salines.
Scarboro.
Scottish Chief.
Selchower.
Sheffield Standard.
Tobolsk.
Tunis (brown).
Victoria Prize.
White Russian.
White Schonen.
White Wonder.
Zhelannii.

*Six-row Barley.*

Blue Short Head.
Excelsior.
Foyston.
Hulless White (beardless).
Petschora.
Phœnix.
Small Blue Naked.
Success (beardless).
Surprise.
Vanguard.

*Two-row Barley.*

| | | |
|---|---|---|
| Black Two-row. | Improved Thanet. | Nepean. |
| Duckbill. | Italian. | Prize Prolific. |
| Erfurt White. | Jewel. | Rigid. |
| Gambrinus. | Kinver Chevalier. | Triple Naked (beardless). |
| Hofbrau. | Large Naked. | Victor. |

*Peas.*

| | | |
|---|---|---|
| Alma. | Elephant Blue. | New Potter. |
| Bright. | Fergus. | Norwegian Grey. |
| Bruce. | French Canner. | Oddfellow. |
| Centennial. | Harrison's Glory. | Perth. |
| Creeper. | Maple. | Trilby. |
| Elder. | Multiplier. | |

## UNIFORM TEST PLOTS OF CEREALS, FIELD ROOTS AND FODDER CORN.

The standard and new varieties of cereals which are obtainable commercially are annually grown in plots of one-fortieth of an acre, along with the cross-bred sorts produced at the Farms and a number of other varieties obtained from various sources. The field roots and fodder corn are grown in similar plots, and the yield per acre is estimated from the crop obtained from two rows, each 66 feet long. The object of these tests is to determine the relative productiveness, earliness, &c., of the different varieties. Those which for a series of years are found to be distinctly inferior are rejected, and strong efforts are made to keep the list within as small bounds as possible without omitting anything which may ultimately prove of value.

The number of these larger plots grown during the past season was as follows:— Spring wheat, 98; macaroni wheat, 14; winter wheat, 20; emmer and spelt, 11; oats, 80; six-row barley, 47; two-row barley, 28; winter barley, 1; pease, 34; spring rye, 1; winter rye, 4; soja beans, 3; horse beans, 2; field beans, 4; flax, 7; turnips, 40; mangels, 32; carrots, 20; sugar beets, 16; Indian corn, 50; mixed grain, 8; making a total of 520 plots. These represent about 410 varieties, duplicate plots being necessary, for special reasons, in some cases.

Some of the varieties mentioned in the Report of the Experimental Farms for 1903, have been discontinued on account of lateness, small yield, or for other defects.

## PREPARATION OF LAND FOR THE UNIFORM TEST PLOTS.

The system of cultivation adopted for the land devoted to the experimental plots is necessarily somewhat different from that which is generally considered advisable in ordinary farming; but it is worthy of mention that abnormally large quantities of fertilising material are not employed. The land used for the plots consists of three separate fields, and a three-year rotation is practised. Each field receives every third year a dressing of fresh barn-yard manure. This has been applied in the past at the rate of only twelve tons per acre, but this amount has been found insufficient whenever the manure has not been of the highest strength. The quantity is therefore being increased to 18 tons per acre. This is at the rate of 6 tons per acre for each year. While this is a somewhat larger quantity of barn-yard manure than is used in ordinary farming, it must be remembered that there is no opportunity in this case for the ploughing under of sod or for allowing the land to be used sometimes for pasture, as is the common practice. For these reasons it seems necessary to apply the manure in somewhat greater quantities than usual, though it cannot be fairly claimed that the land is unduly enriched by this method. The manure is spread on the ground and ploughed under in spring. This field is then used for roots, fodder corn and other hoed crops. In the autumn, after the harvest is over, the land is ploughed about seven inches deep, and is left in that condition until the following spring, when it is cultivated twice with a two-horse cultivator and harrowed twice with a smoothing harrow. Cereals are then sown. After the grain is harvested the land is ploughed about three or four inches deep, to start the shed grain and any weed seeds present, and is again ploughed a few weeks later about seven inches deep. In the following spring it is prepared as before and cereals are again sown. It is not, however, the practice to sow the same cereal twice in succession on the same piece of land.

## SELECTION OF SEED FOR UNIFORM TEST PLOTS.

In order to obtain the seed for the uniform test plats in the best condition, and as nearly as possible in a state of absolute purity, selected heads are gathered by hand from each plot just before the grain is cut. About eight pounds of heads are harvested in this way. During the winter these selected samples are carefully threshed and cleaned by hand; and the grain to be sown the next season is thus brought to a very high standard of purity. This method has been used for several years with wheat and barley; and is being continued with these grains. In oats, however, the selection of heads is not usually carried out unless the grain in the plot shows signs of being mixed. It is much more difficult to select the heads of oats; and the plots are always injured more or less while the work is being done, on account of the growth of the oats being very thick.

In all cases, when the seed for the plots is not obtained by hand selection in the field, the crop from the plot is thoroughly screened and carefully hand-picked before being sown the next season.

## WEATHER.

Spring opened late, but the rather unusually cool weather during the month of May gave ample opportunity for the root growth of cereals wherever the seed had germinated well. On some soils, however, the crops made poor progress during this month. June and July were favourable months, but August and September were wet and rather cold. On the whole the season was a good one, except for the unusual severity of rust on cereals. Late-maturing varieties and all plots sown rather late suffered most, wheat being in some cases badly shrivelled in consequence.

## SPRING WHEAT.

The following varieties of spring wheat were added to the plots this season :—

*Riga.*—See 'Description of Cross-bred Varieties of Wheat.'

*Downy Riga.*—See 'Description of Cross-Bred Varieties of Wheat.'

*Pearl.*—This is a beardless wheat with large, round, red kernels. It was obtained from Sweden. It proved late in ripening and suffered severely from rust.

*Saumur.*—Obtained from France under the name of *Saumur de Mars.* The kernels of the imported grain were rather large, red and soft. It gave a very poor yield this season.

Two other sorts, *Pithiviers* and *Red Prolific,* obtained from France, proved entirely unsuited to our conditions.

Several varieties have been dropped from the uniform plots this year. Only one of these, however, is of importance : the variety known as White Connell. A careful study showed that White Connell is an impure strain of White Fife. It was, therefore, rejected.

All kinds of wheat were affected by rust this season, but the injury was most severe in the case of those varieties which were late in ripening, whether the lateness was due to a delay in sowing or to the habits of the varieties. The results this year serve to emphasise most strongly the importance of early sowing for wheat.

The sowing of the wheat plots was begun on April 27, but owing to unfavourable weather, was not completed until May 2.

All the plots were one-fortieth of an acre, except in the case of Pearl, where the amount of seed on hand was only sufficient for one-eightieth of an acre.

The seed was used at the rate of 1½ bushels to the acre.

The yield per acre is expressed in 'bushels' of 60 pounds.

SPRING WHEAT—TEST OF VARIETIES.

| Number. | Name of Variety. | Date of Ripening. | | No. of Days maturing. | Length of Straw, including Head. | Character of Straw. | Length of Head. | Yield per Acre. | | Weight per measured bushel after cleaning. | Rusted. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Inches. | | Inches. | Bush. | Lbs. | Lbs. | |
| 1 | Byron* | Aug. | 1 | 96 | 39 to 41 | Stiff | 3¾ to 4¼ | 27 | 20 | 63 | Badly. |
| 2 | Australian No. 28 | " | 10 | 100 | 44 " 46 | " | 3½ " 4¼ | 27 | 20 | 60 | " |
| 3 | Newdale* | " | 3 | 93 | 45 " 47 | " | 3½ " 4 | 26 | 20 | 61 | Slightly. |
| 4 | Weldon* | " | 9 | 99 | 44 " 46 | " | 3½ " 4 | 26 | 20 | 59½ | Badly. |
| 5 | Australian No. 21 | " | 10 | 100 | 43 " 45 | " | 3¾ " 4¼ | 25 | 40 | 60½ | " |
| 6 | Hastings* | " | 2 | 97 | 42 " 44 | " | 3 " 3¾ | 25 | 20 | 62 | " |
| 7 | Admiral* | " | 5 | 95 | 41 " 43 | " | 3½ " 4 | 25 | .. | 61¾ | " |
| 8 | Spence* | " | 4 | 94 | 47 " 49 | " | 3½ " 4 | 24 | 40 | 63½ | " |
| 9 | Bishop* | " | 1 | 91 | 36 " 38 | " | 3 " 3½ | 24 | 40 | 62½ | Slightly. |
| 10 | Chester* | " | 3 | 93 | 39 " 41 | " | 3½ " 4 | 24 | 40 | 61¼ | Considerably. |
| 11 | Australian No. 12 | " | 9 | 99 | 45 " 47 | " | 3½ " 4 | 24 | 20 | 61½ | Badly. |
| 12 | Benton* | " | 4 | 99 | 43 " 45 | " | 3¾ " 4¼ | 23 | 40 | 60¼ | " |
| 13 | Advance* | " | 4 | 99 | 40 " 42 | " | 3½ " 4¼ | 23 | 40 | 61½ | Considerably. |
| 14 | Redpath* | " | 9 | 99 | 48 " 50 | " | 3½ " 4¼ | 23 | 40 | 59 | Badly. |
| 15 | Nixon* | " | 4 | 99 | 42 " 44 | " | 3¼ " 3¾ | 23 | 20 | 60 | Considerably. |
| 16 | Herisson Bearded | " | 4 | 99 | 39 " 41 | " | 1¾ " 2¼ | 23 | .. | 63½ | Badly. |
| 17 | Orleans* | " | 4 | 99 | 44 " 46 | " | 3¾ " 4½ | 23 | .. | 60¼ | Considerably. |
| 18 | Plumper* | " | 3 | 93 | 39 " 41 | " | 3½ " 4¼ | 23 | .. | 63½ | Badly. |
| 19 | Red Fern | " | 8 | 98 | 43 " 45 | " | 3¾ " 4¼ | 22 | 40 | 61½ | " |
| 20 | Dawson* | " | 9 | 99 | 48 " 50 | " | 3¾ " 4½ | 22 | 20 | 59½ | " |
| 21 | Preston* | " | 2 | 97 | 38 " 40 | " | 3¼ " 4 | 21 | 20 | 61½ | Considerably |
| 22 | Laurel* | " | 8 | 98 | 42 " 44 | " | 3¼ " 4 | 21 | 20 | 56½ | Badly. |
| 23 | Clyde* | " | 8 | 98 | 41 " 43 | " | 3½ " 4¼ | 21 | .. | 60 | " |
| 24 | Crawford* | " | 2 | 92 | 38 " 40 | " | 3½ " 4 | 20 | 20 | 61½ | Slightly. |
| 25 | Countess* | " | 3 | 93 | 44 " 46 | " | 3¼ " 4 | 19 | 40 | 61¼ | Badly. |
| 26 | Colorado | " | 3 | 93 | 42 " 44 | " | 3 " 3¾ | 19 | 40 | 62 | Considerably. |
| 27 | Ebert* | July | 28 | 92 | 38 " 40 | " | 3¼ " 3¾ | 19 | 20 | 62 | " |
| 28 | Pringle's Champlain | Aug. | 3 | 98 | 38 " 40 | " | 3½ " 4¼ | 19 | .. | 61 | Badly. |
| 29 | Dayton* | July | 30 | 94 | 40 " 42 | " | 3 " 3¾ | 19 | .. | 61¼ | " |
| 30 | Monarch | Aug. | 8 | 103 | 38 " 40 | " | 3½ " 4 | 18 | 40 | 60 | Considerably. |
| 31 | Dawn* | " | 4 | 99 | 42 " 44 | " | 3½ " 4¼ | 18 | 20 | 59½ | " |
| 32 | Percy* | " | 2 | 97 | 36 " 38 | " | 3 " 3¾ | 18 | .. | 61 | " |
| 33 | White Fife | " | 9 | 99 | 40 " 42 | " | 3¼ " 4 | 18 | .. | 60 | Badly. |
| 34 | Downy Riga* | July | 28 | 92 | 39 " 41 | " | 2¾ " 3¼ | 18 | .. | 60 | " |
| 35 | Gehun | July | 29 | 93 | 40 " 42 | Medium | 2½ " 3¼ | 17 | 40 | 60 | Considerably. |
| 36 | White Russian | Aug. | 8 | 103 | 40 " 42 | Stiff | 3½ " 4 | 17 | .. | 60 | Badly. |
| 37 | Early Riga* | July | 28 | 92 | 39 " 41 | " | 2¾ " 3¼ | 17 | .. | 60 | " |
| 38 | Stanley* | Aug. | 2 | 97 | 36 " 38 | " | 3 " 3¾ | 16 | 40 | 58½ | Considerably. |
| 39 | Fraser* | July | 29 | 93 | 35 " 37 | Medium | 2¾ " 3¼ | 16 | 40 | 60¾ | " |
| 40 | McKendry's Fife (Minn. 181) | Aug. | 9 | 99 | 42 " 44 | Stiff | 3½ " 4¼ | 16 | 40 | 59 | Badly. |
| 41 | Australian No. 19 | " | 9 | 99 | 35 " 37 | " | 2¾ " 3¼ | 16 | 40 | 60½ | " |
| 42 | Rio Grande | " | 7 | 97 | 46 " 48 | " | 4¼ " 5 | 16 | 20 | 59½ | " |
| 43 | Power's Fife (Minn. 149) | " | 9 | 99 | 37 " 39 | " | 3 " 3¾ | 16 | 20 | 61 | " |
| 44 | Minnesota No. 163 | " | 11 | 101 | 43 " 45 | " | 3½ " 4¼ | 15 | 40 | 58½ | " |
| 45 | Australian No. 15 | " | 10 | 100 | 33 " 35 | " | 3¼ " 3¾ | 15 | 40 | 60½ | " |
| 46 | Riga* | " | 1 | 96 | 37 " 39 | " | 2¾ " 3¼ | 15 | 20 | 60 | Considerably. |
| 47 | Australian F | " | 8 | 98 | 36 " 38 | " | 3¼ " 4 | 15 | 20 | 59½ | Badly. |
| 48 | Red Fife | " | 8 | 103 | 37 " 39 | " | 3¼ " 4 | 15 | .. | 60 | " |
| 49 | Harold* | July | 28 | 92 | 37 " 39 | " | 2¾ " 3¼ | 15 | .. | 60 | " |
| 50 | Marvel | Aug. | 3 | 93 | 39 " 41 | " | 3½ " 4 | 14 | 40 | 59 | Considerably. |
| 51 | Wellman's Fife | " | 8 | 103 | 40 " 42 | " | 3½ " 4 | 14 | 20 | 56½ | Badly. |
| 52 | Blue Stem | " | 13 | 103 | 46 " 48 | " | 3½ " 4¼ | 14 | 20 | 57½ | " |
| 53 | Hungarian | " | 7 | 102 | 37 " 39 | Medium | 3 " 3¾ | 14 | .. | 61 | " |
| 54 | Pearl | " | 17 | 107 | 48 " 50 | Stiff | 3¾ " 4¼ | 13 | 20 | 55 | " |
| 55 | Tracey* | " | 9 | 104 | 40 " 42 | " | 3¾ " 4½ | 12 | 40 | 58 | Considerably. |
| 56 | Haynes' Blue Stem (Minn. 169) | " | 13 | 103 | 46 " 48 | " | 3½ " 4 | 12 | 40 | 58½ | Badly. |
| 57 | Huron* | " | 4 | 99 | 36 " 38 | " | 3½ " 4 | 12 | 20 | 59½ | " |
| 58 | Saumur | " | 11 | 101 | 31 " 33 | " | 2½ " 3 | 12 | 20 | 55 | " |
| 59 | Australian No. 9 | " | 7 | 97 | 36 " 38 | " | 3¼ " 4 | 11 | 20 | 56½ | " |

* Cross-bred varieties produced at the Experimental Farms are marked with **an asterisk.**

*Most Productive Varieties of Spring Wheat.*—Excluding the macaroni wheats, which are considered separately, the most productive varieties of spring wheat at this Farm for the last five years have been Preston, Huron, Herisson Bearded and Pringle's Champlain. These are all bearded varieties. Preston, Huron and Pringle's Champlain are of good quality for milling purposes.

The most productive beardless variety, during the last five years, has been White Fife. Red Fife (beardless) and Red Fern (bearded) have also given very good yields; while White Russian (beardless), Laurel (beardless), and Wellman's Fife (beardless) have proved almost equally productive.

*Earliest Varieties of Spring Wheat.*—The earliest varieties of spring wheat grown in the plots on this Farm are Harold, Ebert, Fraser, Gehun, Early Riga, Riga and Downy Riga. These sorts are not yet available for general distribution, but the best of them will be introduced as soon as possible.

Preston, Stanley and Percy are the earliest kinds which are now being sent out from the Experimental Farms. They ripen at Ottawa about six days before Red Fife.

## MACARONI OR DURUM WHEAT.

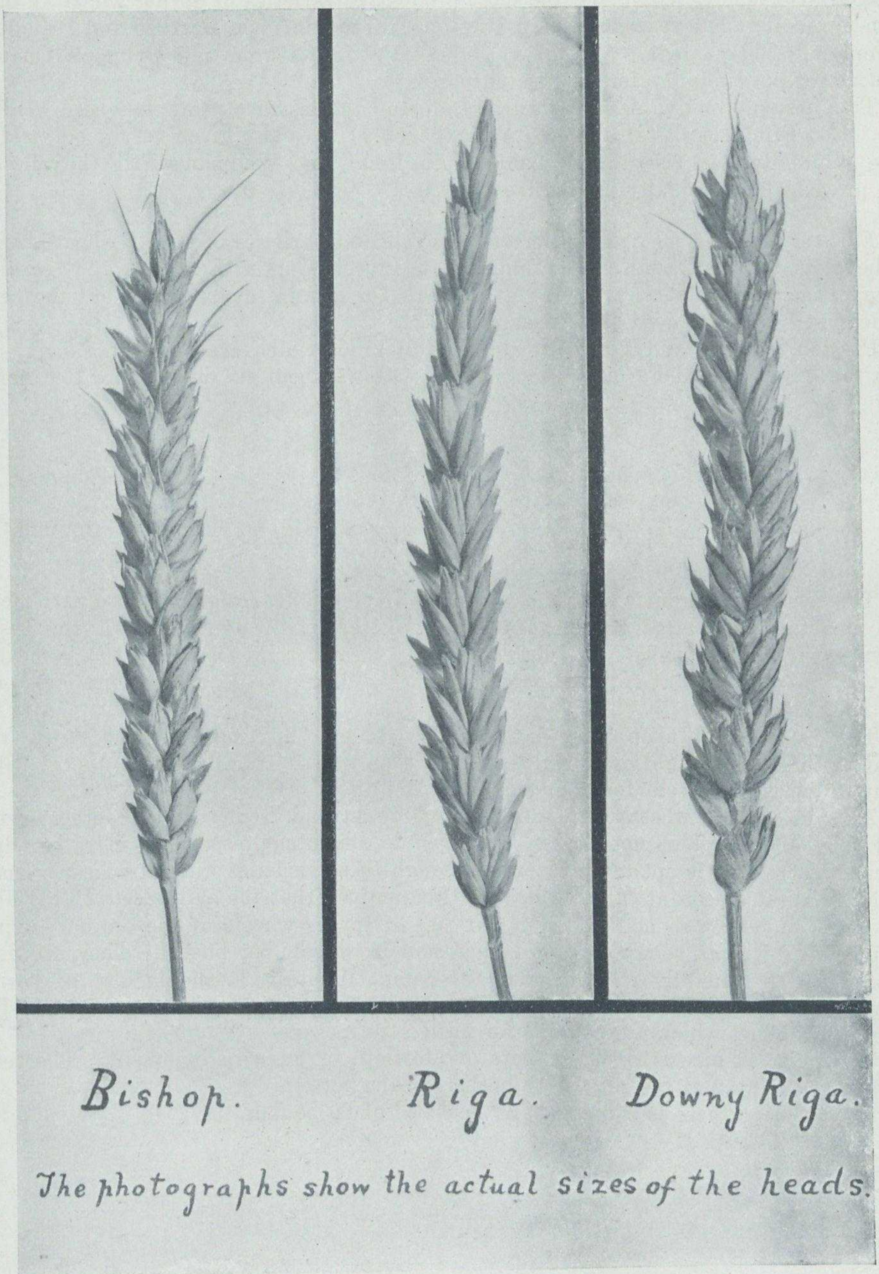
The term "macaroni" wheat is generally employed to designate those extremely hard varieties with large kernels of which 'Goose' or 'Wild Goose' is the best-known example in Canada. The different sorts of macaroni wheat are by no means identical in quality, but for commercial purposes they are generally considered as practically the same.

They are looked upon with disfavour by millers; and farmers who grow any wheat of this class should exercise great care to prevent it from becoming mixed with wheat which is to be sold for flour-making.

As a rule, these wheats suffer less from drought and from rust than other sorts. They may, therefore, in some cases, be grown to advantage, especially in rather dry districts where rust is apt to be severe. Though these varieties were attacked by rust during the past season at this Farm, it will be noticed that the evil effects of the disease were not nearly so marked as in the case of spring wheats of the ordinary type, the macaroni wheats being higher in yield and in weight per bushel. They are not, however, to be generally recommended for damp climates. It should also be borne in mind that the market price of macaroni wheat is generally lower than that paid for varieties of wheat which are popular for milling purposes.

The plots of macaroni wheat were one-fortieth of an acre in extent. The seed was sown on May 2 at the rate of 1¾ bushels to the acre.

The yield per acre is expressed in 'bushels' of 60 pounds.



Bishop. Riga. Downy Riga.

The photographs show the actual sizes of the heads.

MACARONI WHEAT—TEST OF VARIETIES.

| Number. | Name of Variety. | Date of Ripening. | No. of Days maturing. | Length of Straw, including Head. | Character of Straw. | Length of Head. | Yield per Acre. | | Weight per measured bushel after cleaning. | Rusted. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Inches. | | Inches. | Bush. | Lbs. | Lbs. | |
| 1 | Roumanian................ | Aug. 18 | 108 | 50 to 52 | Stiff...... | 2½ to 3 | 39 | 40 | 63 | Considerably. |
| 2 | Velvet Don............... | 〃 11 | 101 | 45 〃 47 | Medium.. | 2½ 〃 3 | 36 | 20 | 63¼ | 〃 |
| 3 | Goose.................... | 〃 10 | 100 | 48 〃 50 | 〃 .. | 2¼ 〃 2¾ | 35 | 20 | 63¾ | 〃 |
| 4 | Gharnovka................ | 〃 15 | 105 | 48 〃 50 | Stiff...... | 2¾ 〃 3¼ | 35 | .. | 62½ | 〃 |
| 5 | Black Don................ | 〃 10 | 100 | 45 〃 47 | 〃 ..... | 2¼ 〃 2¾ | 33 | .. | 63 | Badly. |
| 6 | Yellow Gharnovka......... | 〃 15 | 105 | 53 〃 55 | 〃 ..... | 2½ 〃 3 | 31 | 20 | 63 | Considerably. |
| 7 | Kubanka.................. | 〃 9 | 99 | 49 〃 51 | Medium.. | 2½ 〃 3 | 30 | 20 | 63½ | 〃 |
| 8 | Kahla.................... | 〃 14 | 104 | 41 〃 43 | 〃 .. | 2 〃 2¾ | 26 | 20 | 60½ | 〃 |
| 9 | Mahmoudi................. | 〃 15 | 105 | 46 〃 48 | Stiff...... | 2½ 〃 3 | 26 | .. | 59 | Badly. |
| 10 | Medeah.................. | 〃 9 | 99 | 48 〃 50 | 〃 ..... | 2½ 〃 3 | 24 | 20 | 59½ | Considerably. |
| 11 | Beloturka............... | 〃 11 | 101 | 39 〃 41 | 〃 ..... | 2¼ 〃 2¾ | 24 | .. | 64 | 〃 |

These varieties of macaroni wheat have not been grown long enough to permit the drawing of definite conclusions as to their relative yield and earliness through a series of years. Roumanian can, however, be recommended for its large yield.

POLISH OR CORN WHEAT.

Much attention has lately been given by the public to a variety of macaroni wheat called 'Polish' or 'Polonian' or 'Corn Wheat' or 'Giant Rye.' This wheat is characterized by extremely large, bearded heads and long yellowish kernels, and is altogether very striking in appearance. It has, however, been rejected from the larger test plots at this Farm on account of its uniformly very small yield, and its great susceptibility to rust. During the four years ending in 1903 the following average yields were given by Polish, Goose, Red Fife and Preston wheats :—

| | Yield per Acre. Bush. | Lbs. |
|---|---|---|
| Polish.................................. | 13 | 33 |
| Goose.................................. | 27 | 3 |
| Red Fife.................................. | 31 | 23 |
| Preston.................................. | 33 | 55 |

## WINTER WHEAT.

Several varieties of winter wheat which had not previously been tested at this Farm were added to the uniform plots this year. They were all obtained from seedsmen in America (chiefly in Ontario), except the two Russian sorts, Kharkov and Padi, which were kindly furnished by the Department of Agriculture of the United States.

*Kharkov* (Washington, No. 7786).—This is a bearded variety with rather small heads and with smooth, yellowish chaff. The kernels are red, rather small and unusually hard for winter wheat. This is a very promising variety for flour-making.

*Padi* (Washington, No. 9129).—This resembles Kharkov in almost every respect except that the heads are beardless.

*Abundance, American Banner, Red Chief, Early Windsor, Invincible* and *Prosperity* are beardless varieties; and *Silver Sheaf* is a bearded sort.

The plots of winter wheat were sown on September 10, 1903. All the plots were one-fortieth of an acre, and the seed was used at the rate of 1¾ bushels to the acre.

When winter set in the plots were looking well, but when growth commenced in spring many of the plots were thin or bare in some spots owing to winter-killing. In most cases, therefore, it was deemed advisable to estimate the yield of grain from one-eightieth of an acre only.

The yield per acre is expressed in 'bushels' of 60 pounds.

WINTER WHEAT—TEST OF VARIETIES.

| Number. | Name of Variety. | Date of Ripening. | | No. of Days maturing. | Length of Straw, includ'g Head | Character of Straw. | Length of Head. | Yield per Acre. | | Weight per measured bushel after cleaning. | Rusted. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Inches. | | Inches. | Bush. | Lbs. | Lbs. | |
| 1 | Red Velvet Chaff | July | 23 | 317 | 55 to 57 | Medium | 3-3¾ | 40 | 40 | 61½ | Considerably. |
| 2 | Turkey Red | " | 20 | 314 | 50 " 52 | Weak | 2¾-3¼ | 39 | 20 | 61 | " |
| 3 | Abundance | " | 21 | 315 | 47 " 49 | Stiff | 3½-4¼ | 39 | 20 | 61 | " |
| 4 | American Banner | " | 22 | 316 | 56 " 58 | " | 3¼-3¾ | 38 | 40 | 61 | " |
| 5 | Kharkov | " | 20 | 314 | 46 " 48 | Weak | 2 -2½ | 38 | .. | 61½ | Slightly. |
| 6 | Imperial Amber | " | 23 | 317 | 50 " 52 | " | 3¼-3¾ | 37 | 20 | 58¾ | Badly. |
| 7 | Red Chief | " | 23 | 317 | 54 " 56 | Stiff | 3 -3½ | 36 | .. | 60½ | Slightly. |
| 8 | Early Windsor | " | 27 | 321 | 55 " 57 | " | 3 -3¾ | 34 | 40 | 58½ | Badly. |
| 9 | Reliable | " | 22 | 316 | 48 " 50 | " | 3½-4¼ | 32 | .. | 63¼ | Slightly. |
| 10 | Silver Sheaf | " | 20 | 314 | 55 " 57 | Medium | 3¼-3¾ | 30 | .. | 59 | Considerably. |
| 11 | Invincible | " | 22 | 316 | 47 " 49 | Stiff | 3½-4¼ | 28 | 40 | 62½ | Slightly. |
| 12 | Buda Pesth | " | 22 | 316 | 45 " 47 | " | 3 -3½ | 26 | .. | 62 | " |
| 13 | Dawson's Golden Chaff | " | 23 | 317 | 50 " 52 | " | 3 -3½ | 26 | .. | 58¾ | Considerably. |
| 14 | Early Red Clawson | " | 22 | 316 | 41 " 43 | " | 2¾-3¼ | 25 | 20 | 61½ | " |
| 15 | Golden Cross | " | 22 | 316 | 46 " 48 | " | 2½-3 | 25 | 20 | 63½ | " |
| 16 | Surprise | " | 25 | 319 | 50 " 52 | " | 3½-4 | 24 | .. | 56½ | " |
| 17 | Prosperity | " | 23 | 317 | 46 " 48 | " | 3½-4 | 22 | .. | 62½ | " |
| 18 | Gold Coin | " | 21 | 315 | 38 " 40 | " | 3 -3½ | 19 | 20 | 60½ | Slightly. |
| 19 | Egyptian Amber | " | 25 | 319 | 40 " 42 | " | 3¼-3¾ | 19 | 20 | 59 | Badly. |
| 20 | Padi | " | 27 | 321 | 43 " 45 | " | 3¼-3¾ | 17 | .. | 59½ | " |

## STUDY OF THE QUALITY OF DIFFERENT VARIETIES OF WHEAT.

Reference was made in last year's report to the fact that the work of testing the quality of different varieties of wheat was being undertaken, and that preliminary tests of most of the valuable sorts of spring wheat had been completed. In view of the great importance of quality in wheat it seemed highly desirable that thorough investigations into this subject should be conducted at this Farm in order both to study existing varieties commonly cultivated, and also to test all the new sorts which might from time to time be produced here, or brought into Canada from other countries.

The purchase of a small roller-process flour mill made by the Allis-Chalmers Company expressly for grinding very small quantities of wheat was therefore approved by the Minister of Agriculture. This mill is now in use, and though the investigations have not, at this date, proceeded very far the great value of the apparatus has already been shown. The mill is provided with two pairs of steel rollers, one pair corrugated and the other smooth. There is also a sifting apparatus supplied with a dozen sieves of different degrees of fineness, from No. 16 wire gauze up to No. 14 bolting cloth.

With such a machine, it is possible to handle, with satisfaction, any quantity of wheat from a few ounces to several pounds, the most convenient amount being about one or two pounds. A good quality of 'straight' flour can easily be produced, sufficiently well purified to enable the experimenter to make satisfactory comparisons between the different varieties of wheat employed. If a more highly purified product is desired it is possible, by taking special care, to obtain 'patent' flour of very high grade.

The flour made by this apparatus is being subjected to chemical and mechanical analysis; and baking tests are also being carried on. The results of this work will be given to the public as soon as possible, with a view to encouraging the sowing (for flour-making purposes) of only those varieties of wheat which will give a product of high quality.

## EMMER AND SPELT.

In June of the present year a bulletin was issued on Emmer and Spelt, giving descriptions of the different varieties and some comparisons between these and other cereals in regard to productiveness and chemical composition. It is therefore unnecessary to give such details in this report.

Single Emmer (*Triticum monococcum*) is again at the head of the list this year. Its extreme lateness in ripening is, however, a strong point against it.

Common Emmer ('Speltz') has not proved as productive as some other sorts this year.

Two of the varieties reported upon last year have been dropped from the uniform plots, Ufa Emmer because it proved to be identical with Common Emmer, and Black bearded Spelt because of its very coarse hull and rather small yield.

The plots of emmer and spelt were one-fortieth of an acre. The grain was sown on May 3 at the rate of about 120 pounds per acre.

EMMER AND SPELT—TEST OF VARIETIES.

| Number. | Name of Variety. | Date of Ripening. | No. of Days maturing. | Length of Straw, including Head. | Character of Straw. | Length of Head. | Yield per Acre. | Weight per measured bushel after cleaning. | Rusted. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Inches. | | Inches. | Lbs. | Lbs. | |
| 1 | Single Emmer | Aug. 28 | 117 | 35 to 37 | Stiff | 2¾ to 3¼ | 3,060 | 29½ | Slightly. |
| 2 | Red Emmer | " 19 | 108 | 46 " 48 | " | 3 " 3½ | 2,760 | 36 | Considerably. |
| 3 | White Emmer | " 19 | 108 | 49 " 51 | " | 3 " 3½ | 2,540 | 33 | " |
| 4 | Smooth Spelt | " 19 | 108 | 47 " 49 | " | 5¼ " 5¾ | 2,260 | 26 | Badly. |
| 5 | Red Spelt | " 20 | 109 | 48 " 50 | " | 4 " 4½ | 2,240 | 26½ | " |
| 6 | Common Emmer | " 12 | 101 | 45 " 47 | " | 2 " 2½ | 2,040 | 40 | Considerably. |
| 7 | Thick Emmer | " 13 | 102 | 45 " 47 | " | 2½ " 3 | 1,980 | 34½ | " |
| 8 | White Spelt | " 15 | 104 | 48 " 50 | " | 4½ " 5¼ | 1,740 | 24 | Badly. |
| 9 | White bearded Spelt | " 12 | 101 | 48 " 50 | " | 4¼ " 5 | 1,680 | 24½ | " |
| 10 | Long Emmer | " 31 | 120 | 51 " 53 | " | 3¼ " 3¾ | 1,220 | 22½ | Considerably, |

## OATS.

The varieties of oats added to the experimental plots this season are as follows :—

*Daubeney.*—This was obtained in commerce in Ontario. It is a white oat with a loose, open head and ripens rather early.

*Garton's Abundance.*—A white oat with a loose head. Originated by Garton Bros., England. The imported seed was very plump.

*Swedish Ligowo.*—This is a strain of the well-known Ligowo oat which was obtained from Sweden and is said to be an improvement on the original variety.

*Bell.*—A black oat obtained from Sweden. The imported seed weighed 40½ lbs. per bushel.

*Whiting.*—A white oat of about medium size and with a loose head obtained from Sweden. The imported seed weighed 45½ lbs per bushel.

*Gold Rain.*—A yellow oat of medium size, obtained from Sweden. The imported grain weighed 43 lbs. per bushel. This variety has a rather small, moderately loose head, and ripens early.

*Colossal.*—A yellow oat with a loose head. Originated by Garton Bros.

*Early Angus.*—A white oat, obtained from Ireland. This did not give evidence this season of being an early variety.

*Tlola.*—A black oat from Finland, kindly sent to this Farm by Mr. C. Boije. The seed of this variety was received too late for sowing among the regular plots.

The plots of oats were sown on the 6th of May, all being one-fortieth of an acre except Swedish Ligowo, Bell, Whiting, and Gold Rain, which were one-eightieth. The cold weather in May proved unfavourable for the germination of the seed and for the growth of the young plants, especially in the lower parts of the field on which these plots were situated. Later in the season the oats were severely attacked by rust. The yield from the plots has therefore been somewhat irregular and unsatisfactory. In the case of some of the varieties the yield has been estimated from only one-half of the plot, and in the case of Bavarian, Columbus, Dixon, Golden Fleece, Prolific Black Tartarian, Swedish Select and Wallis, it seemed best not to estimate the yield at all, as it would have been quite misleading.

The yield per acre is expressed in 'bushels' of 34 pounds.

OATS—TEST OF VARIETIES.

| Number. | Name of Variety. | Date of Ripening. | | No. of Days Maturing. | Length of Straw, includ'g Head. | Character of Straw. | Length of Head. | Yield per Acre. | | Weight per measured bushel after cleaning. | Rusted. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Inches. | | Inches. | Bush. | Lbs. | Lbs. | |
| 1 | Lincoln | Aug. | 13 | 99 | 48-50 | Medium | 8 - 9 | 98 | 8 | 36½ | Badly. |
| 2 | Twentieth Century | " | 11 | 97 | 48-50 | Weak | 7½- 9 | 93 | 18 | 34½ | " |
| 3 | Wide Awake | " | 13 | 99 | 50-52 | Medium | 8½- 9½ | 89 | 14 | 36 | " |
| 4 | Garton's Abundance | " | 10 | 96 | 48-50 | " | 8¾- 9½ | 89 | 14 | 34½ | " |
| 5 | Uberfluss | " | 11 | 97 | 46-48 | " | 8½- 9¼ | 87 | 22 | 34 | " |
| 6 | Virginia White Abundance | " | 10 | 96 | 46-48 | " | 8¾- 9½ | 85 | 30 | 35 | " |
| 7 | Milford White* | " | 13 | 99 | 46-48 | Weak | 9 -10 | 85 | 10 | 33¼ | " |
| 8 | Swedish Ligowo | " | 10 | 96 | 52-54 | Stiff | 7¾- 9 | 84 | 24 | 39½ | " |
| 9 | American Triumph | " | 13 | 99 | 45-47 | Medium | 7½- 8½ | 80 | 20 | 33½ | " |
| 10 | Mennonite | " | 10 | 96 | 43-45 | " | 7 - 8 | 79 | 14 | 33¼ | " |
| 11 | Sensation | " | 15 | 101 | 47-49 | " | 8¼- 9 | 77 | 2 | 37 | " |
| 12 | Bestehorn's Abundance | " | 10 | 96 | 48-50 | Stiff | 8¾- 9½ | 77 | 2 | 35½ | Considerably. |
| 13 | Pioneer (black) | " | 15 | 101 | 37-39 | Medium | 7 - 8½ | 76 | 16 | 34¾ | Badly. |
| 14 | Anderbecker | " | 12 | 98 | 48-50 | Stiff | 8¼- 9 | 75 | 30 | 37½ | " |
| 15 | Hazlett's Seizure | " | 16 | 102 | 45-47 | " | 9½-10¼ | 74 | 4 | 33 | " |
| 16 | Holstein Prolific | " | 17 | 103 | 40-42 | Medium | 8 - 9 | 73 | 18 | 32 | " |
| 17 | Kendal Black* | " | 15 | 101 | 47-49 | Stiff | 10 -11 | 72 | 12 | 36½ | " |
| 18 | Early Golden Prolific | " | 12 | 98 | 44-46 | " | 8 - 9¼ | 72 | 12 | 33½ | " |
| 19 | White Giant | " | 16 | 102 | 45-47 | " | 9½-10½ | 71 | 6 | 33 | Considerably. |
| 20 | Golden Beauty | " | 13 | 99 | 38-40 | " | 8½- 9 | 71 | 6 | 35 | Badly. |
| 21 | Abundance | " | 10 | 96 | 46-48 | " | 8¾- 9½ | 71 | 6 | 35 | " |
| 22 | Kendal White* | " | 16 | 102 | 46-48 | " | 8½- 9½ | 70 | 20 | 33 | " |
| 23 | Milford Black* | " | 15 | 101 | 46-48 | " | 10 -11 | 70 | 20 | 36¼ | " |
| 24 | Thousand Dollar | " | 11 | 97 | 46-48 | " | 7¾- 8½ | 70 | .. | 36½ | " |
| 25 | Irish Victor | " | 15 | 101 | 44-46 | " | 8 - 9 | 70 | .. | 35 | " |
| 26 | Banner | " | 16 | 102 | 45-47 | " | 8½- 9¼ | 69 | 14 | 34 | " |
| 27 | Pense Black* | " | 16 | 102 | 44-46 | Medium | 9½-10½ | 69 | 14 | 35½ | " |
| 28 | Excelsior (black) | " | 11 | 97 | 43-45 | Stiff | 8 - 9 | 69 | 14 | 34¼ | " |
| 29 | Atlantic | " | 9 | 95 | 44-46 | " | 8½- 9½ | 68 | 28 | 37 | " |
| 30 | Golden Giant | " | 19 | 105 | 44-46 | " | 9 -10 | 67 | 2 | 30½ | " |
| 31 | Great Northern | " | 13 | 99 | 42-44 | " | 8 - 9 | 66 | 16 | 33 | " |
| 32 | American Beauty | " | 12 | 98 | 45-47 | Medium | 8½- 9¼ | 65 | 10 | 34¼ | " |
| 33 | Buckbee's Illinois | " | 13 | 99 | 36-38 | Weak | 5½- 6½ | 64 | 4 | 36 | " |
| 34 | Bell (black) | " | 14 | 100 | 50-52 | Medium | 8 - 9½ | 63 | 18 | 30½ | " |
| 35 | Whiting | " | 10 | 96 | 44-46 | Stiff | 8 - 9 | 60 | .. | 36¾ | " |
| 36 | Gold Rain | " | 9 | 95 | 44-46 | " | 8 - 9 | 58 | 28 | 38 | " |
| 37 | Scotch Potato | " | 17 | 103 | 45-47 | " | 8½- 9½ | 58 | 28 | 34½ | " |
| 38 | Danish Island | " | 19 | 105 | 48-50 | " | 8¼- 9 | 57 | 2 | 34½ | Considerably. |

*Cross-bred varieties produced at the Experimental Farms are marked with an asterisk.

OATS—TEST OF VARIETIES—*Concluded.*

| Number. | Name of Variety. | Date of Ripening. | No. of Days Maturing. | Length of Straw, includ'g Head. | Character of Straw. | Length of Head. | Yield per Acre. | | Weight per measured bushel after cleaning. | Rusted. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Inches. | | Inches. | Bush. | Lbs. | Lbs. | |
| 39 | Big Four | Aug. 16 | 102 | 45–47 | Stiff | 7½– 8½ | 54 | 24 | 33 | Badly. |
| 40 | Goldfinder | " 16 | 102 | 40–42 | " | 8½– 9½ | 54 | 4 | 33 | " |
| 41 | Olive White* | " 17 | 103 | 45–47 | " | 9½–10½ | 53 | 18 | 34 | " |
| 42 | Black Beauty | " 17 | 103 | 44–46 | Medium | 8 – 9 | 53 | 18 | 32 | " |
| 43 | Improved American | " 17 | 103 | 42–44 | Stiff | 8½– 9½ | 53 | 18 | 34 | " |
| 44 | Colossal | " 13 | 99 | 48–50 | Medium | 9½–11 | 50 | 20 | 33 | " |
| 45 | Olive Black* | " 20 | 106 | 40–42 | Weak | 8½– 9½ | 47 | 2 | 33 | " |
| 46 | Forbes* | " 20 | 106 | 44–46 | Medium | 9½–10½ | 47 | 2 | 34½ | " |
| 47 | Early Angus | " 19 | 105 | 47–49 | Stiff | 8½– 9½ | 46 | 16 | 32 | " |
| 48 | Pense White* | " 16 | 102 | 41–43 | " | 8½– 9½ | 46 | 16 | 35½ | " |
| 49 | Daubeney | " 15 | 101 | 44–46 | Weak | 8 – 9 | 45 | 10 | 32 | " |
| 50 | Tartar King | " 12 | 98 | 38–40 | Stiff | 8½– 9½ | 45 | 10 | 31½ | " |
| 51 | Sorgenfrei | " 12 | 98 | 42–44 | Medium | 7 – 8½ | 44 | 4 | 37 | " |
| 52 | Welcome | " 11 | 97 | 44–46 | " | 6½– 7½ | 43 | 18 | 35¼ | " |
| 53 | Improved Ligowo | " 16 | 102 | 40–42 | " | 6¾ - 7½ | 42 | 12 | 34 | " |
| 54 | Joanette (black) | " 20 | 106 | 36–38 | " | 7½– 8½ | 41 | 6 | 32½ | " |
| 55 | Probstey | " 17 | 103 | 44–46 | Stiff | 8 – 9 | 40 | .. | 33 | " |
| 56 | Chinese Naked | " 11 | 97 | 38–40 | " | 5½– 6½ | 32 | 12 | 50½ | " |
| 57 | Golden Tartarian | " 20 | 106 | 47–49 | Medium | 10½–11½ | 31 | 26 | 29½ | " |
| 58 | Siberian | " 19 | 105 | 45–47 | Stiff | 8½– 9½ | 31 | 6 | 33 | " |
| 59 | Waverley | " 18 | 104 | 45–47 | " | 8 – 9 | 25 | 10 | 32 | " |
| 60 | Storm King | " 19 | 105 | 40–42 | " | 10 –11 | 20 | 20 | 31 | " |

*Most Productive Varieties of Oats.*—The most productive varieties of oats at this Farm during the past five years have been White Giant, Mennonite (yellow), Hazlett's Seizure, Holstein Prolific (white and yellow, mixed), Lincoln, Banner and Uberfluss (white and yellow mixed). Columbus (yellow), Golden Beauty (yellow) Golden Giant (yellow), American Triumph, Sensation, Wide Awake and Abundance have also done very well. The most productive black oat during the past five years has been Black Beauty.

*Earliest Varieties of Oats.*—Taking the average of the returns for the past five years, Tartar King is the earliest variety of oats which has been grown on this Farm for the full period. The following varieties, which have not been grown for the full five years, are also of interest on account of their earliness : Welcome, Daubeney and Gold Rain (yellow).

## SIX-ROW BARLEY.

The following varieties were added to the uniform plots this year :—

*Escourgeon* ('Escourgeon de Printemps,' 'Carrée de Printemps').—This variety was obtained from France.

*Black Japan.*—Obtained in commerce in Ontario. This barley is distinguished by the fact that its hull is very dark in colour. The kernel itself is rather dark, but not so dark as the hull.

*Eclipse.*—This is a so-called 'six-row Chevalier' barley originated by Garton Bros., England. It does not resemble the Chevalier type.

*Bere.*—This is a variety of barley well-known in Great Britain, where it is sometimes referred to as 'four-row' barley. It, however, belongs to the six-row class. The seed for the plot arrived very late and could not be sown with the other varieties. The date of ripening and the number of days required for maturing are, therefore, not recorded this season.

The plots were all one-fortieth of an acre. The seed was sown on May 5 at the rate of 1¾ bushels to the acre. Both the yield and the quality of the grain were satisfactory.

The yield per acre is expressed in 'bushels' of 48 pounds.

SIX-ROW BARLEY—TEST OF VARIETIES.

| Number. | Name of Variety. | Date of Ripening. | No. of Days Maturing. | Length of Straw, including Head. | Character of Straw. | Length of Head. | Yield per Acre. | | Weight per measured bushel after cleaning. | Rusted. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Inches. | | Inches. | Bush. | Lbs. | Lbs. | |
| 1 | Stella* | Aug. 1 | 88 | 42-44 | Stiff | 3¼-4 | 58 | 16 | 51 | Slightly. |
| 2 | Nugent* | July 31 | 87 | 43-45 | " | 4-4½ | 50 | .. | 50½ | " |
| 3 | Baxter | Aug. 2 | 89 | 39-41 | " | 3¼-3¾ | 46 | 32 | 51 | " |
| 4 | Yale* | " 1 | 88 | 42-44 | " | 2½-3¼ | 45 | 20 | 48 | " |
| 5 | Escourgeon | " 1 | 88 | 40-42 | " | 2-2½ | 45 | .. | 54 | Considerably. |
| 6 | Sisolsk | " 2 | 89 | 40-42 | " | 3½-4¼ | 44 | 8 | 48¼ | Slightly. |
| 7 | Common | July 28 | 84 | 36-38 | " | 3¼-4 | 43 | 36 | 51 | " |
| 8 | Odessa | " 31 | 87 | 36-38 | " | 4-4½ | 43 | 16 | 49½ | " |
| 9 | Argyle* | Aug. 4 | 91 | 36-38 | " | 3-3½ | 43 | 16 | 49½ | " |
| 10 | Summit* | " 1 | 88 | 38-40 | " | 3¾-4¼ | 43 | 16 | 49½ | " |
| 11 | Claude* | " 3 | 90 | 37-39 | " | 3½-4¼ | 43 | 16 | 50 | " |
| 12 | Mensury | July 28 | 84 | 36-38 | " | 3¼-4 | 42 | 24 | 49½ | " |
| 13 | Black Japan | Aug. 3 | 90 | 28-30 | " | 2-2½ | 41 | 32 | 49½ | Considerably. |
| 14 | Blue Long Head | " 6 | 93 | 34-36 | Medium | 3-3½ | 41 | 12 | 42 | " |
| 15 | Empire* | " 3 | 90 | 36-38 | Stiff | 3½-4 | 41 | 12 | 48 | " |
| 16 | Garfield* | " 3 | 90 | 39-41 | " | 3¼-4 | 40 | 40 | 49½ | Siightly. |
| 17 | Rennie's Improved | July 28 | 84 | 34-36 | " | 3-3¾ | 40 | .. | 51½ | " |
| 18 | Bere | ...... | .... | 28 30 | Weak | 3-3½ | 39 | 8 | 45 | Badly. |
| 19 | Brome* | Aug. 3 | 90 | 37-39 | Stiff | 2¾-3¼ | 37 | 24 | 51 | Slightly. |
| 20 | Hulless Black | " 4 | 91 | 34-36 | Weak | 3-3½ | 37 | 4 | 61½ | Considerably. |
| 21 | Oderbruch | " 3 | 90 | 38-40 | Stiff | 3-3¾ | 36 | 32 | 50½ | Slightly. |
| 22 | Albert* | " 2 | 89 | 36-38 | " | 4-4¾ | 36 | 12 | 49 | " |
| 23 | Royal* | " 1 | 88 | 30-32 | " | 3¼-3¾ | 34 | 8 | 50 | " |
| 24 | Norwegian | " 4 | 91 | 34-36 | Medium | 3½-4 | 34 | 8 | 47 | " |
| 25 | Eclipse | " 4 | 91 | 35-37 | Stiff | 3-3¾ | 32 | 4 | 52 | " |
| 26 | Trooper* | July 29 | 85 | 28-30 | Medium | 3-3½ | 27 | 4 | 49½ | " |
| 27 | Silver King | Aug. 2 | 89 | 30-32 | Stiff | 3½-4¼ | 26 | 12 | 48½ | " |
| 28 | Champion (beardless) | " 3 | 90 | 35-37 | " | 3-3¾ | 22 | 24 | 42 | " |
| 29 | Mansfield* | " 13 | 100 | 32-34 | Medium | 3-3½ | 17 | 44 | 45 | Badly. |
| 30 | Chinese Hulless | " 7 | 94 | 30-32 | " | 2¾-3¼ | 14 | 28 | 59½ | " |

*Cross-bred varieties produced at the Experimental Farms are marked with an asterisk.

*Most Productive Varieties of Six-row Barley.*—Taking the average of the returns for the last five years, the varieties of six-row barley found to be the most productive at this Farm are Stella, Blue Long Head, Odessa and Mensury.

*Earliest Varieties of Six-row Barley.*—The differences in earliness to be observed among the varieties of six-row barley are not very striking. Among the earliest sorts are Mensury, Common, Odessa and Stella.

*Beardless Six-row Barley.*—The tests carried on at this Farm indicate that Champion is the best variety of beardless barley that has been grown here. It gives, however, rather a small yield. It ripens early.

*Hulless Six-row Barley.*—The most productive variety of hulless barley which has been tested at this Farm is Hulless Black. This is a bearded sort.

## TWO-ROW BARLEY.

Several additional varieties of two-row barley were included in the plots this season.

Swedish Chevalier, Princess, Primus and Hannchen are selected strains of seed from Sweden, kindly supplied to us through the courtesy of the United States Department of Agriculture.

Swan's Neck is another variety received from Sweden.

The seed of all these new sorts was very plump and heavy.

The plots of two-row barley were sown on May 4, the seed being used at the rate of two bushels to the acre. The plots were one-fortieth of an acre.

The yield per acre is expressed in 'bushels' of 48 pounds.

TWO-ROW BARLEY—TEST OF VARIETIES.

| Number. | Name of Variety. | Date of Ripening. | No. of Days Maturing. | Length of Straw, includi'g Head. | Character of Straw. | Length of Head. | Yield per Acre. | | Weight per measured bush'l after cleaning. | Rusted. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Inches. | | Inches. | Bush. | Lbs. | Lbs. | |
| 1 | Swedish Chevalier........... | Aug. 4 | 92 | 25—27 | Medium.. | 3½—4¼ | 47 | 24 | 52½ | Slightly. |
| 2 | Swan's Neck........... | " 4 | 92 | 32—34 | Stiff..... | 3¼—3¾ | 46 | 12 | 51½ | " |
| 3 | Canadian Thorpe....... | " 4 | 92 | 28—30 | " ..... | 3 —3½ | 44 | 8 | 52 | " |
| 4 | French Chevalier....... | " 5 | 93 | 31—33 | " ..... | 3¼—4 | 44 | 8 | 51½ | Considerably. |
| 5 | Princess Sialof........... | " 9 | 97 | 28—30 | Medium.. | 3¾—4¼ | 43 | 36 | 51 | Slightly. |
| 6 | Bestehorn's Kaiser ........ | " 7 | 95 | 26—28 | " .. | 3 —3½ | 43 | 16 | 50½ | Considerably. |
| 7 | Primus........... | " 4 | 92 | 31—33 | Stiff..... | 3 —3½ | 42 | 24 | 52 | Slightly. |
| 8 | Princess.................. | " 6 | 94 | 28—30 | Medium.. | 3¾—4¼ | 42 | 4 | 51 | Considerably. |
| 9 | Standwell................. | " 7 | 95 | 28—30 | " .. | 3¼—4 | 41 | 32 | 51 | " |
| 10 | Gordon*.................. | " 3 | 91 | 30—32 | Stiff..... | 2¾—3¼ | 39 | 28 | 51¼ | " |
| 11 | Invincible........ | " 8 | 96 | 27—29 | Medium.. | 3 —3¾ | 36 | 32 | 50½ | " |
| 12 | Jarvis*.................. | " 1 | 89 | 40—42 | Stiff..... | 4 —4¾ | 35 | 40 | 51½ | Slightly. |
| 13 | Brewer's Favourite......... | " 8 | 96 | 27—29 | Medium.. | 3¼—3¾ | 35 | 40 | 51½ | Considerably. |
| 14 | Newton.................. | " 8 | 96 | 26—28 | Stiff..... | 3 —3½ | 33 | 36 | 50 | " |
| 15 | Danish Chevalier........... | " 4 | 92 | 33—35 | " ..... | 4 —4½ | 32 | 44 | 51 | Slightly. |
| 16 | Fulton*.................. | " 3 | 91 | 34—36 | " ..... | 3¼—3¾ | 32 | 44 | 52½ | Considerably. |
| 17 | Clifford*................. | " 3 | 91 | 34—36 | " ..... | 3¼—4 | 32 | 24 | 52 | Slightly. |
| 18 | Hannchen ................ | " 2 | 90 | 26—28 | " ..... | 3½—4 | 32 | 24 | 53½ | " |
| 19 | Fichtel Mountain.......... | " 7 | 95 | 30—32 | Medium.. | 4 —4½ | 32 | 4 | 52 | Considerably. |
| 20 | Beaver*................. | " 1 | 89 | 39—41 | Stiff..... | 4 —4½ | 31 | 32 | 50½ | " |
| 21 | Sidney*................ | " 3 | 91 | 31—33 | " ..... | 3½—4 | 30 | 20 | 52 | Slightly. |
| 22 | Harvey*................. | " 6 | 94 | 33—35 | " ..... | 3¼—3¾ | 29 | 28 | 51½ | Considerably. |
| 23 | Pelham*................. | " 3 | 91 | 33—35 | " ..... | 3½—4¼ | 28 | 36 | 49½ | Slightly. |
| 24 | Plumage.................. | " 8 | 96 | 32—34 | " ..... | 3¼—3¾ | 28 | 36 | 49 | Considerably. |
| 25 | Maltster............... | " 13 | 101 | 25—27 | Medium.. | 2½—3 | 21 | 12 | 52½ | " |
| 26 | Logan*................... | " 10 | 98 | 31—33 | " .. | 3½—4¼ | 20 | .. | 49½ | Badly. |
| 27 | Dunham*................. | " 12 | 100 | 32—34 | " .. | 3½—4 | 15 | .. | 46½ | " |

*Cross-bred varieties produced at the Experimental Farms are marked with an asterisk.

*Most Productive Varieties of Two-row Barley.*—Taking the average of the returns for the past five years, the varieties of two-row barley found to be the most productive at this Farm are: French Chevalier, Canadian Thorpe, Beaver and Danish Chevalier.

*Earliest Varieties of Two-row Barley.*—The earliest among the more productive varieties of two-row barley grown at this Farm are: Beaver, Jarvis and Gordon. These ripen, as a rule, about two days before French Chevalier and Canadian Thorpe.

### WINTER SIX-ROW BARLEY.

A variety of six-row winter barley known as Zero, was added to the plots of autumn-sown grain in 1903. This barley was introduced by Garton Bros., England, who claim extreme hardiness for it. A plot of one-eightieth of an acre was sown on the 10th of September, 1903, though the amount of seed on hand was only sufficient for a rather thin sowing. The plot was partly winter killed, but gave a yield at the rate of 41 bushels 32 lbs. per acre. The date of ripening was July 28.

Further tests of the hardiness and productiveness of this barley are being made.

## PEASE.

The plots of pease were one-fortieth of an acre each. The seed was sown on the 4th of May at the rate of from two to three bushels per acre, according to the size of the pea. The crop produced this season was larger than the average.

A few of the less productive varieties of peas grown in previous years have been discontinued.

The yield per acre is expressed in 'bushels' of 60 pounds.

### PEASE—TEST OF VARIETIES.

| Number. | Name of Variety. | Date of Ripening. | | No. of Days Maturing. | Length of Straw, includ'g Head. | Character of Straw. | Length of Pod. | Yield per Acre. | | Weight per measured bushel after cleaning. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Inches. | | Inches. | Bush. | Lbs. | Lbs. |
| 1 | Mackay* | Aug. | 13 | 101 | 45-50 | Strong ... | 2¼-2¾ | 45 | 40 | 62 |
| 2 | Victoria* | " | 19 | 107 | 55-60 | " .... | 2½-3 | 45 | .. | 62¾ |
| 3 | Golden Vine | " | 12 | 100 | 50-55 | " .... | 2 -2½ | 42 | 20 | 63½ |
| 4 | Prince* | " | 14 | 102 | 55-60 | " .... | 2 -2½ | 42 | .. | 62½ |
| 5 | Prince Albert | " | 13 | 101 | 60-65 | " .... | 2¼-2¾ | 41 | 20 | 62 |
| 6 | Archer* | " | 15 | 103 | 45-60 | Medium.. | 2¼-2¾ | 41 | 20 | 63½ |
| 7 | Picton* | " | 12 | 100 | 40-45 | " .. | 2¼-2¾ | 41 | .. | 64 |
| 8 | King* | " | 13 | 101 | 50-55 | Strong... | 2 -2½ | 39 | 40 | 63¼ |
| 9 | Cooper* | " | 14 | 102 | 45-50 | Medium.. | 2¼-2¾ | 39 | .. | 64 |
| 10 | Nelson* | " | 11 | 99 | 30-35 | " .. | 2 -2½ | 38 | 40 | 64 |
| 11 | Prussian Blue | " | 14 | 102 | 55-60 | Strong... | 2 -2¼ | 38 | 20 | 64 |
| 12 | White Wonder | " | 9 | 97 | 30-35 | Medium.. | 2 -2¾ | 37 | 40 | 63½ |
| 13 | Agnes* | " | 12 | 100 | 45-50 | Strong... | 2¼-2¾ | 37 | 20 | 64 |
| 14 | Kent* | " | 15 | 103 | 43-48 | " .... | 2¼-2½ | 36 | 40 | 62½ |
| 15 | Field Gray | " | 10 | 98 | 25-30 | Weak .... | 1¾-2¼ | 36 | 40 | 63 |
| 16 | Wisconsin Blue | " | 15 | 103 | 45-50 | Medium.. | 2 -2½ | 35 | 20 | 64¼ |
| 17 | German White | " | 10 | 98 | 45-50 | " .. | 2 -2½ | 34 | 40 | 63 |
| 18 | Daniel O'Rourke | " | 10 | 98 | 35-40 | " .. | 2 -2½ | 34 | .. | 62¼ |
| 19 | Gregory* | " | 19 | 107 | 40-45 | Strong... | 2¼-2¾ | 34 | .. | 63¼ |
| 20 | White Marrowfat | " | 13 | 101 | 40-45 | " .... | 2½-3 | 33 | 20 | 62 |
| 21 | Canadian Beauty | " | 13 | 101 | 55-60 | " .... | 2½-3 | 32 | .. | 63 |
| 22 | Macoun* | " | 19 | 107 | 60-65 | " .... | 2 -2½ | 32 | .. | 63 |
| 23 | Black-eyed Marrowfat | " | 13 | 101 | 45 50 | " .... | 2½-3 | 31 | .. | 62 |
| 24 | Chancellor | " | 9 | 97 | 45-50 | Medium.. | 2 -2¾ | 30 | .. | 63½ |
| 25 | Arthur* | " | 11 | 99 | 50-55 | " .. | 2½-2¾ | 29 | 40 | 63½ |
| 26 | Mummy | " | 19 | 107 | 43-48 | " .. | 2¼-2¾ | 29 | 40 | 63 |
| 27 | English Gray | " | 13 | 101 | 45-50 | " .. | 2 -2½ | 29 | 20 | 62 |
| 28 | Early Britain | " | 14 | 102 | 40-45 | " .. | 2¼-2¾ | 27 | 20 | 61 |
| 29 | Pride | " | 9 | 97 | 35-40 | " .. | 2 -2½ | 26 | .. | 62 |
| 30 | Crown | " | 10 | 98 | 40-45 | Strong... | 2 -2½ | 26 | .. | 64 |
| 31 | Duke* | " | 12 | 100 | 40-45 | " .... | 2¼-2¾ | 25 | .. | 63½ |
| 32 | Pearl* | " | 11 | 99 | 45-50 | " .... | 2½-3 | 23 | .. | 62¼ |
| 33 | Carleton* | " | 13 | 101 | 45-50 | " .... | 1¾-2¼ | 22 | .. | 64 |
| 34 | Paragon* | " | 8 | 96 | 20-25 | Weak .... | 2¼-2¾ | 21 | 20 | 63 |

*Cross-bred varieties produced at the Experimental Farms are marked with an asterisk.

*Most Productive Varieties of Peas.*—Taking the average of the returns for the last five years, the varieties of peas found to be the most productive at this Farm are:—Golden Vine, Prussian Blue, Paragon, Cooper, Prince and Kent.

*Earliest Varieties of Peas.*—Chancellor appears to be the earliest ripening variety. It ripens, as a rule, about 4 or 5 days before Golden Vine and gives a good yield.

## SPRING RYE.

One plot of spring rye (one-fortieth acre) was sown on May 3, the seed being used at the rate of one and one-half bushels to the acre. The rye made strong growth and was ripe August 7 (96 days). The straw was stiff, its length (including the head) being 64 to 66 inches. The length of the heads was from 3¾ to 4½ inches. The rye was slightly attacked by rust. The yield, expressed in 'bushels' of 56 lbs., was 34 bushels 36 lbs. per acre; and the weight of the grain (after cleaning) was 58½ lbs. to the measured bushel.

## WINTER RYE.

Four varieties of winter rye were sown on September 10, 1903. The plots were one-eightieth of an acre. The seed was used at the rate of 1½ bushels per acre.

Giant and Emerald were obtained from France, Mammoth White was procured in New York State and Thousandfold in Ontario.

The yield per acre is expressed in 'bushels' of 56 lbs.

WINTER RYE—TEST OF VARIETIES.

| Number. | Name of Variety. | Date of Ripening. | No. of Days Maturing. | Length of Straw, including Head. | Character of Straw. | Length of Head. | Yield per Acre. | | Weight per Measured Bushel after Cleaning. | Rusted. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | In. | | In. | Bush. | lbs. | Lbs. | |
| 1 | Giant | July 25 | 319 | 63-65 | Weak | 4½-5¼ | 70 | 40 | 56¼ | No rust. |
| 2 | Emerald | " 25 | 319 | 63-65 | Medium | 4½-5¼ | 62 | 48 | 55 | " |
| 3 | Mammoth White | " 21 | 315 | 60-62 | Stiff | 4¼-5 | 57 | 48 | 59½ | " |
| 4 | Thousandfold | " 23 | 317 | 66-68 | " | 3¼-4 | 40 | .. | 60 | " |

## GRAIN SOWN IN DIFFERENT QUANTITIES PER ACRE ON SANDY LOAM.

These experiments were all conducted on plots of one-fortieth of an acre each. The wheat was sown May 3 and was ripe August 9. The oats were sown May 3 and were ripe August 9. The barley was sown May 3 and was ripe August 2.

The results of the tests in previous years are published, for comparison, along with the figures obtained this year.

| Name of Variety. | Quantity Sown per Acre. | Number of Days from Sowing to Harvesting. | | | | Yield per Acre. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1901. | 1902. | 1903. | 1904. | 1901. | | 1902. | | 1903. | | 1904. | |
| | | | | | | Bus. | Lbs. | Bus. | Lbs. | Bus. | Lbs. | Bus. | Lbs. |
| Preston Wheat ...... | 1 bushel.. | 100 | 108 | 108 | 98 | 10 | 20 | 24 | .. | 15 | .. | 22 | 20 |
| " " ...... | 1¼ bushels | 100 | 108 | 108 | 98 | 15 | .. | 20 | 40 | 14 | 20 | 24 | 20 |
| " " ...... | 1½ " | 100 | 108 | 108 | 98 | 19 | 40 | 15 | 20 | 20 | 40 | 20 | 40 |
| " " ..... | 2 " | 100 | 108 | 108 | 98 | 20 | 20 | 10 | 40 | 15 | 20 | 17 | 20 |
| " " ..... | 2½ " | 100 | 108 | 108 | 98 | 21 | .. | 20 | 40 | 13 | 20 | 17 | 20 |
| " " ..... | 3 " | 100 | 108 | 108 | 98 | 19 | 40 | 17 | 20 | 16 | 40 | 26 | 40 |
| Banner Oats .. ...... | 1½ " | 96 | 107 | 108 | 98 | 41 | 6 | 60 | .. | 63 | 18 | 43 | 18 |
| " " .......... | 2 " | 96 | 107 | 108 | 98 | 59 | 14 | 45 | 30 | 56 | 16 | 78 | 8 |
| " " .......... | 2½ " | 96 | 107 | 108 | 98 | 57 | 2 | 52 | 32 | 79 | 14 | 75 | 10 |
| " " .......... | 3 " | 96 | 107 | 108 | 98 | 43 | 18 | 50 | 20 | 84 | 4 | 77 | 22 |
| " " .......... | 3½ " | 96 | 107 | 108 | 98 | 31 | 26 | 50 | 20 | 88 | 8 | 92 | 12 |
| " " .......... | 4 " | 96 | 107 | 108 | 98 | 35 | 10 | 54 | 4 | 67 | 22 | 84 | 4 |
| Mensury Barley ..... | 1½ " | 84 | 95 | 105 | 91 | 35 | 35 | 40 | 40 | 61 | 32 | 35 | 40 |
| " " ..... | 2 " | 84 | 95 | 105 | 91 | 37 | 19 | 28 | 16 | 60 | .. | 49 | 8 |
| " " ..... | 2½ " | 84 | 95 | 105 | 91 | 43 | 11 | 27 | 24 | 54 | 28 | 40 | 40 |
| " " ..... | 3 " | 84 | 95 | 105 | 91 | 42 | 19 | 37 | 24 | 46 | 12 | 32 | 24 |
| " " ..... | 3½ " | 84 | 95 | 105 | 91 | 39 | 23 | 26 | 32 | 47 | 44 | 41 | 32 |
| " " ..... | 4 " | 84 | 95 | 105 | 91 | 43 | 11 | 45 | .. | 35 | 40 | 52 | 44 |

## GRAIN SOWN IN DIFFERENT QUANTITIES PER ACRE ON CLAY LOAM.

These experiments were all conducted on plots of one-fortieth of an acre each. The wheat was sown May 5 and was ripe August 8. The oats were sown May 5 and were ripe August 8. The barley was sown May 5 and was ripe July 28.

The results of the tests in previous years are published, for comparison, along with the figures obtained this year.

| Name of Variety. | Quantity Sown per Acre. | Number of Days from Sowing to Harvesting. | | | | Yield per Acre. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1901. | 1902. | 1903. | 1904. | 1901. | | 1902. | | 1903. | | 1904. | |
| | | | | | | Bus. | Lbs. | Bus. | Lbs. | Bus. | Lbs. | Bus. | Lbs. |
| Preston Wheat ....... | 1 bushel.. | 97 | 108 | 108 | 95 | 28 | 20 | 24 | 40 | 28 | 40 | 16 | 40 |
| " " ..... | 1¼ bushels | 97 | 108 | 108 | 95 | 28 | 20 | 24 | 40 | 30 | .. | 23 | 40 |
| " " ..... | 1½ " | 97 | 108 | 108 | 95 | 29 | .. | 29 | 20 | 30 | 40 | 25 | 40 |
| " " ...... | 2 " | 97 | 108 | 108 | 95 | 26 | 20 | 28 | .. | 28 | .. | 22 | 20 |
| " " ...... | 2½ " | 97 | 108 | 108 | 95 | 26 | 20 | 30 | .. | 29 | 40 | 21 | 20 |
| " " ...... | 3 " | 97 | 108 | 108 | 95 | 25 | .. | 24 | 40 | 28 | 20 | 19 | 20 |
| Banner Oats ......... | 1½ " | 92 | 111 | 110 | 95 | 58 | 28 | 63 | 18 | 72 | 32 | 64 | 24 |
| " " .......... | 2 " | 92 | 111 | 110 | 95 | 65 | 30 | 62 | 12 | 78 | 28 | 63 | 38 |
| " " .......... | 2½ " | 92 | 111 | 110 | 95 | 67 | 2 | 72 | 32 | 74 | 4 | 71 | 6 |
| " " .......... | 3 " | 92 | 111 | 110 | 95 | 64 | 24 | 67 | 2 | 80 | 20 | 65 | 10 |
| " " .......... | 3½ " | 92 | 111 | 110 | 95 | 61 | 6 | 70 | 20 | 84 | 24 | 75 | 10 |
| " " .......... | 4 " | 92 | 111 | 110 | 95 | 57 | 22 | 67 | 2 | 88 | 28 | 66 | 16 |
| Mensury Barley ...... | 1½ " | 83 | 99 | 103 | 84 | 37 | .. | 64 | 8 | 54 | 28 | 48 | 36 |
| " " ..... | 2 " | 83 | 99 | 103 | 84 | 40 | 35 | 70 | 40 | 59 | 28 | 46 | 12 |
| " " ..... | 2½ " | 83 | 99 | 103 | 84 | 44 | 3 | 68 | 16 | 48 | 16 | 52 | 24 |
| " " ..... | 3 " | 83 | 99 | 103 | 84 | 45 | 35 | 69 | 8 | 50 | .. | 56 | 12 |
| " " ..... | 3½ " | 83 | 99 | 103 | 84 | 45 | 35 | 65 | .. | 50 | .. | 51 | 32 |
| " " ..... | 4 " | 83 | 99 | 103 | 84 | 44 | 3 | 62 | 24 | 58 | 16 | 54 | 8 |

## PLOTS OF MIXED GRAIN.

It has been thought well to undertake some experiments in growing mixed grains, especially with a view to determining which varieties should be selected when two or more kinds are being sown together.

In choosing the varieties for these plots the greatest care is exercised to sow together only such sorts as are known to mature in almost the same number of days, so that they may both be ready for cutting at the same time. Only one column is given for the number of days maturing, as in every case the mixtures ripened with great uniformity.

The plots were one-fortieth of an acre, and the seed was sown on May 7, at the rate of one bushel per acre of each variety. In some instances this did not seem to be a large enough quantity of seed. It is therefore proposed to increase the amount next season.

| — | Date of Ripening. | No. of Days Maturing. | Yield per Acre. | Proportions in Crop Harvested. | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Lbs. | | | | | | |
| Wheat and Oats— | | | | | | | | | |
| Preston wheat and White Giant oats. | Aug. 13.. | 98 | 2,140 | 24 per cent wheat and 76 per cent oats. | | | | | |
| Wheat and Two-row Barley— | | | | | | | | | |
| Gehun wheat and French Chevalier barley.......... | " 5.. | 90 | 1,880 | 42 | " | " | 58 | " | barley. |
| Wheat and Pease— | | | | | | | | | |
| Huron wheat and Arthur pease.. ... | " 10.. | 95 | 1,700 | 52 | " | " | 48 | " | pease. |
| Oats and Emmer— | | | | | | | | | |
| Banner oats and Common emmer .... | " 13.. | 98 | 2,560 | 72 | " | oats | 28 | " | emmer |
| Oats and Two-row Barley— | | | | | | | | | |
| Welcome oats and French Chevalier barley.......... | " 8.. | 93 | 2,180 | 57 | " | " | 43 | " | barley. |
| Wallace oats and Princess Sialof barley.......... | " 10.. | 95 | 1,820 | 60 | " | " | 40 | " | " |
| Oats and Pease— | | | | | | | | | |
| White Giant oats and Chancellor pease | " 11.. | 97 | 2,520 | 80 | " | " | 20 | " | pease. |
| Two-row Barley and Pease— | | | | | | | | | |
| Maltster barley and Paragon pease... | " 14.. | 99 | 2,320 | 59 | " | barley | 41 | " | " |

## SOJA BEANS.

In addition to the Common Soja Bean, experiments were tried this season with a selected strain of Early Yellow Soja Bean kindly supplied by Prof. C. A. Zavitz, of the Ontario Agricultural College. All the plots were sown on May 28 and cut on October 17. The size of the plots was one-fortieth of an acre. None of the beans ripened properly.

Early Yellow Soja Bean.—The beans were sown with a hand seed drill in rows 28 inches apart, and made strong growth, reaching a height of 30 to 35 inches. Total yield of green crop, 4 tons 600 lbs. per acre.

Common Soja Bean.—Two plots of this variety were sown, the beans being put in with different distances between the rows.

Plot 1.—Sown in rows 21 inches apart; growth strong and even, leafy; average height 35 to 38 inches; total yield of green crop, 4 tons 1,200 lbs. per acre.

Plot 2.—Sown in rows 28 inches apart; growth strong and leafy; average height, 35 to 38 inches; stalks considerably stiffer than in Plot 1; total yield of green crop, 4 tons 1,400 lbs. per acre.

## HORSE BEANS.

Two plots of one-fortieth acre each were sown on May 28, with the rows at different distances apart. The plots were cut green on October 17. The beans did not ripen.

Plot 1.—Sown in rows 21 inches apart; growth strong, but rather thin; pods fairly numerous; height, 40 to 45 inches; crop all stood up well; total yield of green crop, 3 tons 1,600 lbs. per acre.

Plot 2.—Sown in rows 28 inches apart; growth very strong; pods fairly numerous; height, 40 to 45 inches; crop all stood up well; total yield of green crop, 5 tons 400 lbs. per acre.

## FIELD BEANS.

Four plots of field beans were sown this season, in continuation of some experiments which have been carried on at this Farm for several years past, but which have not previously been mentioned in the Annual Report.

The plots were one-fortieth of an acre, and the beans were sown on May 28.

The yield per acre is expressed in 'bushels' of 60 lbs.

FIELD BEANS—TEST OF VARIETIES.

| Number. | Name of Variety. | Date of Ripening. | No. of Days Maturing. | Length of Straw. | Length of Pod. | Yield per Acre. | |
|---|---|---|---|---|---|---|---|
| | | | | Inches. | Inches. | Bush. | Lbs. |
| 1 | White Field | Sept. 22.. | 117 | 23-27 | 4 -4½ | 46 | 40 |
| 2 | Marrowfat | " 22.. | 117 | 25-30 | 3½-4 | 42 | 40 |
| 3 | California Pea Bean | " 3.. | 98 | 15-17 | 3½-4¼ | 33 | 20 |
| 4 | Norwegian Brown | Aug. 27.. | 91 | 14-16 | 5 -5¾ | 26 | 40 |

## FLAX.

Uniform test plots of flax, one-fortieth of an acre each, were commenced this season for the purpose of ascertaining the relative productiveness and earliness of the different varieties. The seed of most of the kinds was obtained from France.

The seed was sown on May 28 at the rate of 60 pounds to the acre.

The yield per acre is expressed in 'bushels' of 56 lbs.

FLAX—TEST OF VARIETIES.

| Number. | Name of Variety. | Date of Ripening. | No. of Days Maturing. | Length of Plants. | Weight of Seed per measured bushel. | Yield per Acre. | |
|---|---|---|---|---|---|---|---|
| | | | | Inches. | Lbs. | Bush. | Lbs. |
| 1 | Yellow Seed | Aug. 21.. | 85 | 31-33 | 52½ | 20 | .. |
| 2 | Novarossick | " 23.. | 87 | 28-30 | 53½ | 19 | 10 |
| 3 | White Flowering | " 15.. | 79 | 27-29 | 55½ | 16 | 40 |
| 4 | Riga | " 22.. | 86 | 35-37 | 55½ | 15 | 10 |
| 5 | Russian | " 11.. | 75 | 34-36 | 54½ | 12 | 20 |
| 6 | Common | " 12.. | 76 | 31-33 | 55 | 12 | .. |
| 7 | La Plata | Sept. 6.. | 101 | 26-28 | 52 | 11 | 10 |

## TURNIPS.

Two sowings were made of each variety, the first on May 17 and the second on May 31. The seed was used at the rate of about four pounds per acre. Before sowing, the land was made up in drills two feet apart and rolled with a heavy land roller, which flattened the drills nearly one-half, leaving a firm seed bed. When the young plants were about three inches high they were thinned out, leaving them about seven inches apart in the rows.

The roots were pulled on two different dates: October 14 and October 28. The yield per acre has been calculated from the weight of roots gathered from two rows, each 66 feet long.

A good yield was obtained.

In Canada the ton contains 2,000 lbs.

TURNIPS—TEST OF VARIETIES.

| Number. | Name of Variety. | Yield per Acre from 1st Sowing, 1st Pulling. | | Yield per Acre from 2nd Sowing, 1st Pulling. | | Yield per Acre from 1st Sowing, 2nd Pulling. | | Yield per Acre from 2nd Sowing, 2nd Pulling. | |
|---|---|---|---|---|---|---|---|---|---|
| | | Tons. | Lbs. | Tons. | Lbs. | Tons. | Lbs. | Tons. | Lbs. |
| 1 | Magnum Bonum | 42 | 150 | 17 | 1,310 | 47 | 545 | 25 | 1,480 |
| 2 | Kangaroo | 40 | 850 | 17 | 980 | 45 | 255 | 27 | 945 |
| 3 | Hall's Westbury | 40 | 272 | 20 | 1,827 | 46 | 1,060 | 31 | 535 |
| 4 | Sutton's Champion | 39 | 1,860 | 24 | 15 | 41 | 1,490 | 26 | 965 |
| 5 | Imperial Swede | 39 | 45 | 19 | 32 | 44 | 1,595 | 26 | 965 |
| 6 | Halewood's Bronze Top | 37 | 1,817 | 19 | 1,765 | 41 | 1,985 | 26 | 1,625 |
| 7 | Hartley's Bronze | 37 | 1,652 | 20 | 1,910 | 45 | 1,245 | 31 | 1,030 |
| 8 | Mammoth Clyde | 36 | 1,672 | 16 | 1,990 | 39 | 705 | 25 | 1,645 |
| 9 | Jumbo | 36 | 1,342 | 18 | 1,207 | 41 | 335 | 23 | 1,025 |
| 10 | Emperor Swede | 36 | 930 | 18 | 1,290 | 38 | 890 | 22 | 1,870 |
| 11 | Good Luck | 36 | 435 | 19 | 1,022 | 37 | 1,900 | 25 | 1,315 |
| 12 | Perfection Swede | 35 | 785 | 17 | 1,887 | 45 | 915 | 26 | 1,625 |
| 13 | Drummond Purple Top | 35 | 372 | 18 | 1,125 | 41 | 500 | 28 | 1,090 |
| 14 | Carter's Elephant | 34 | 227 | 20 | 260 | 44 | 1,265 | 25 | 1,150 |
| 15 | Elephant's Master | 33 | 1,155 | 18 | 135 | 37 | 250 | 24 | 1,665 |
| 16 | Skirvings | 32 | 1,010 | 18 | 630 | 41 | 1,325 | 26 | 470 |
| 17 | Selected Purple Top | 31 | 1,607 | 18 | 217 | 41 | 170 | 25 | 655 |
| 18 | East Lothian | 31 | 205 | 15 | 360 | 37 | 1,570 | 23 | 530 |
| 19 | New Century | 30 | 885 | 17 | 1,970 | 47 | 545 | 28 | 925 |
| 20 | Bangholm Selected | 24 | 1,830 | 18 | 1,207 | 32 | 350 | 26 | 1,955 |

| | Tons. | Lbs. |
|---|---|---|
| The average yield from the 1st sowing, 1st pulling, was | 35 | 1,255 |
| The average yield from the 1st sowing, 2nd pulling, was | 41 | 1,845 |
| The average yield from the 2nd sowing, 1st pulling, was | 18 | 1,657 |
| The average yield from the 2nd sowing, 2nd pulling, was | 26 | 973 |

## MANGELS.

Two sowings were made of each variety, the first on May 17, and the second on May 31. The seed was used at the rate of about six pounds per acre. Before sowing, the land was made up in drills two feet apart and rolled with a heavy land roller to make a firm seed bed. When the young plants were about three inches high they were thinned out, leaving them about seven inches apart in the rows. The roots were pulled on two different dates: October 14 and October 28. The yield has been calculated in each case from the weight of roots gathered from two rows, each 66 feet long.

MANGELS—TEST OF VARIETIES.

| Number. | Name of Variety. | Yield per Acre from 1st Sowing, 1st Pulling. | | Yield per Acre from 2nd Sowing, 1st Pulling. | | Yield per Acre from 1st Sowing, 2nd Pulling. | | Yield per Acre from 2nd Sowing, 2nd Pulling. | |
|---|---|---|---|---|---|---|---|---|---|
| | | Tons. | Lbs. | Tons. | Lbs. | Tons. | Lbs. | Tons. | Lbs. |
| 1 | Prize Mammoth Long Red | 37 | 167 | 17 | 815 | 29 | 245 | 29 | 1,235 |
| 2 | Half Long Sugar White | 36 | 1,507 | 18 | 1,785 | 39 | 1,035 | 20 | 1,745 |
| 3 | Mammoth Long Red | 34 | 1,630 | 17 | 897 | 38 | 395 | 19 | 940 |
| 4 | Mammoth Yellow Intermediate | 34 | 722 | 17 | 1,640 | 33 | 1,815 | 18 | 135 |
| 5 | Yellow Intermediate | 32 | 1,257 | 16 | 1,907 | 32 | 1,010 | 16 | 175 |
| 6 | Giant Yellow Intermediate | 32 | 1,175 | 16 | 1,495 | 32 | 680 | 20 | 260 |
| 7 | Triumph Yellow Globe | 31 | 40 | 16 | 422 | 27 | 1,770 | 18 | 1,290 |
| 8 | Lion Yellow Intermediate | 30 | 637 | 17 | 1,310 | 29 | 1,070 | 18 | 795 |
| 9 | Prize Winner Yellow Globe | 30 | 142 | 15 | 1,762 | 22 | 880 | 16 | 670 |
| 10 | Leviathan Long Red | 29 | 1,482 | 14 | 1,452 | 34 | 1,465 | 20 | 1,085 |
| 11 | Selected Mammoth Long Red | 29 | 80 | 16 | 340 | 24 | 1,995 | 15 | 195 |
| 12 | Giant Sugar Mangel | 28 | 1,090 | 15 | 1,185 | 23 | 695 | 16 | 1,660 |
| 13 | Giant Yellow Globe | 27 | 285 | 13 | 1,390 | 20 | 920 | 13 | 1,885 |
| 14 | Half Long Sugar Rosy | 26 | 1,542 | 14 | 957 | 30 | 1,050 | 17 | 1,805 |
| 15 | Selected Yellow Globe | 24 | 1,665 | 14 | 1,287 | 24 | 1,665 | 14 | 1,370 |
| 16 | Gate Post | 24 | 1,005 | 16 | 670 | 26 | 470 | 17 | 815 |

| | Tons. | Lbs. |
|---|---|---|
| The average yield from the 1st sowing, 1st pulling, was | 30 | 1,277 |
| The average yield from the 1st sowing, 2nd pulling, was | 29 | 823 |
| The average yield from the 2nd sowing, 1st pulling, was | 16 | 582 |
| The average yield from the 2nd sowing, 2nd pulling, was | 18 | 754 |

## CARROTS.

Two sowings were made of each variety, the first on May 17, and the second on May 31. The seed was used at the rate of about four pounds per acre. Before sowing, the land was made up in drills two feet apart and rolled with a heavy land roller to make a firm seed bed. When the young plants were about three inches high they were thinned out, leaving them about five inches apart in the rows. The roots were pulled on two different dates : October 14 and October 28. The yield has been calculated in each case from the weight of roots gathered from two rows, each 66 feet long.

CARROTS—TEST OF VARIETIES

| Number. | Name of Variety. | Yield per Acre from 1st Sowing, 1st Pulling. | | Yield per Acre from 2nd Sowing, 1st Pulling. | | Yield per Acre from 1st Sowing, 2nd Pulling. | | Yield per Acre from 2nd Sowing, 2nd Pulling. | |
|---|---|---|---|---|---|---|---|---|---|
| | | Tons. | Lbs. | Tons. | Lbs. | Tons. | Lbs. | Tons. | Lbs. |
| 1 | Giant White Vosges | 24 | 1,995 | 21 | 570 | 30 | 1,545 | 22 | 1,045 |
| 2 | Ontario Champion | 24 | 840 | 16 | 1,165 | 26 | 965 | 24 | 180 |
| 3 | New White Intermediate | 24 | 592 | 18 | 1,785 | 24 | 1,335 | 20 | 755 |
| 4 | Mammoth White Intermediate | 23 | 200 | 19 | 1,600 | 27 | 1,110 | 18 | 1,785 |
| 5 | Improved Short White | 21 | 1,560 | 20 | 1,415 | 27 | 1,110 | 22 | 1,045 |
| 6 | Long Yellow Stump Rooted | 19 | 1,930 | 16 | 1,330 | 25 | 325 | 19 | 610 |
| 7 | Carter's Orange Giant | 19 | 1,022 | 17 | 1,805 | 22 | 1,870 | 21 | 1,395 |
| 8 | Half Long Chantenay | 18 | 1,950 | 13 | 1,225 | 17 | 1,310 | 13 | 70 |
| 9 | Early Gem | 18 | 300 | 17 | 1,805 | 16 | 1,495 | 18 | 1,290 |
| 10 | White Belgian | 17 | 815 | 14 | 710 | 18 | 630 | 13 | 895 |

| | Tons. | Lbs. |
|---|---|---|
| The average yield from the 1st sowing, 1st pulling, was | 21 | 520 |
| The average yield from the 1st sowing, 2nd pulling, was | 23 | 1,570 |
| The average yield from the 2nd sowing, 1st pulling, was | 17 | 1,541 |
| The average yield from the 2nd sowing, 2nd pulling, was | 19 | 907 |

## SUGAR BEETS.

Two sowings were made of each variety, the first on May 17, and the second on May 31. The seed was used at the rate of about six pounds per acre. Before sowing, the land was made up in drills two feet apart and rolled with a heavy land roller to make a firm seed bed. When the young plants were about three inches high they were thinned out, leaving them about five inches apart in the rows. The roots were pulled on two different dates : October 14 and October 28. The yield has been calculated in each case from the weight of roots gathered from two rows, each 66 feet long. Though all the varieties mentioned here are commonly classed as sugar beets, it should be noted that the only ones recommended for use in the manufacture of sugar are Wanzleben, French Very Rich, and Vilmorin's Improved.

SUGAR BEETS—TEST OF VARIETIES.

| Number. | Name of Variety. | Yield per Acre from 1st Sowing, 1st Pulling. | | Yield per Acre from 2nd Sowing, 1st Pulling. | | Yield per Acre from 1st Sowing, 2nd Pulling. | | Yield per Acre from 2nd Sowing, 2nd Pulling. | |
|---|---|---|---|---|---|---|---|---|---|
| | | Tons. | Lbs. | Tons. | Lbs. | Tons. | Lbs. | Tons. | Lbs. |
| 1 | Red Top Sugar | 32 | 762 | 18 | 465 | 31 | 700 | 18 | 465 |
| 2 | Royal Giant | 31 | 40 | 18 | 135 | 31 | 535 | 18 | 795 |
| 3 | Danish Improved | 27 | 532 | 15 | 1,680 | 27 | 945 | 17 | 980 |
| 4 | Danish Red Top | 26 | 222 | 14 | 380 | 26 | 1,955 | 17 | 1,640 |
| 5 | Improved Imperial | 23 | 1,272 | 15 | 277 | 29 | 410 | 18 | 1,620 |
| 6 | Wanzleben | 21 | 982 | 15 | 1,432 | 18 | 1,785 | 16 | 505 |
| 7 | Vilmorin's Improved | 19 | 1,847 | 12 | 585 | 18 | 465 | 11 | 935 |
| 8 | French Very Rich | 17 | 1,062 | 11 | 110 | 24 | 345 | 16 | 1,990 |

| | Tons. | Lbs. |
|---|---|---|
| The average yield from the 1st sowing, 1st pulling, was.. | 24 | 1,840 |
| The average yield from the 1st sowing, 2nd pulling, was.. | 25 | 1,892 |
| The average yield from the 2nd sowing, 1st pulling, was.. | 15 | 133 |
| The average yield from the 2nd sowing, 2nd pulling, was.. | 16 | 1,866 |

## INDIAN CORN.

The corn was sown with the seed drill in rows thirty-five inches apart, and was also sown in hills thirty-five inches apart each way. When the plants were about six inches high they were thinned out, leaving them from six to eight inches apart in the rows, and leaving four or five plants in each hill. The seed was sown June 7, and the corn was cut green for ensilage September 16. The yield has been calculated from the weight of crop cut from two rows, each 66 feet long.

For the making of ensilage the corn should be cut when the kernels are in the late milk or doughy stage; but the summer at Ottawa is not always warm enough to bring the later varieties to this state of maturity before it is necessary to cut the crop to avoid frost.

Thoroughbred White Flint was omitted this season, as it was not found possible to obtain seed of this variety in good condition.

In Canada the ton contains 2,000 pounds.

INDIAN CORN—TEST OF VARIETIES.

| Number. | Name of Variety. | Character of Growth. | Height. | Leafiness. | Condition when Cut. | Weight per Acre grown in Rows. | | Weight per Acre grown in Hills. | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Inches. | | | Tons. | Lbs. | Tons. | Lbs. |
| 1 | Eureka | Strong | 100-105 | Very leafy | Early milk | 26 | 140 | 21 | 570 |
| 2 | Superior Fodder | Very strong. | 110-115 | " | " | 25 | 600 | 28 | 100 |
| 3 | Giant Prolific Ensilage | " | 105-110 | " | " | 24 | 1,500 | 22 | 1,320 |
| 4 | Salzer's All Gold | " | 100-105 | Medium | " | 23 | 420 | 26 | 1,680 |
| 5 | Red Cob Ensilage | " | 105-110 | " | " | 21 | 1,780 | 23 | 970 |
| 6 | White Cap Yellow Dent | Medium | 85- 90 | Very leafy | " | 21 | 1,780 | 23 | 530 |
| 7 | Early Butler | Strong | 90- 95 | Leafy | " | 19 | 910 | 17 | 1,750 |
| 8 | Mammoth Cuban | Very strong. | 100-105 | Very leafy | Late milk | 18 | 1,730 | 19 | 1,380 |
| 9 | Pride of the North | " | 105-110 | Medium | Early milk | 18 | 850 | 20 | 370 |
| 10 | Early Mastodon | Strong | 100-105 | Leafy | " | 18 | 520 | 14 | 820 |
| 11 | North Dakota White | Medium | 65- 70 | " | " | 17 | 1,530 | 18 | 520 |
| 12 | Cloud's Early Yellow | Strong | 95-100 | " | " | 17 | 980 | 17 | 870 |
| 13 | King Philip | Medium | 70- 75 | Medium | Late milk | 17 | 320 | 19 | 830 |
| 14 | Champion White Pearl | Strong | 95-100 | Leafy | Early milk | 16 | 1,330 | 15 | 140 |
| 15 | Compton's Early | Medium | 75- 80 | Medium | " | 16 | 835 | 19 | 1,820 |
| 16 | Longfellow | " | 65- 70 | Leafy | Late milk | 15 | 1,240 | 17 | 1,200 |
| 17 | Evergreen Sugar | " | 75- 80 | Very leafy | " | 15 | 1,240 | 16 | 120 |
| 18 | Angel of Midnight | Strong | 70- 75 | Leafy | Early milk | 14 | 1,590 | 17 | 1,200 |
| 19 | Selected Leaming | " | 100-105 | " | " | 12 | 750 | 13 | 290 |

The average yield from the rows was 19 tons 109 pounds per acre, and from the hills, 19 tons 1,183 pounds per acre; showing an advantage, this season, of 1,074 pounds per acre in favour of the corn grown in rows.

INDIAN CORN SOWN AT DIFFERENT DISTANCES.

Three varieties were chosen for this test: Champion White Pearl, Selected Leaming, and Longfellow. The seed was sown June 7 and the corn was cut for ensilage September 16. Sixteen rows of each variety were sown, that is, four rows at each of the distances mentioned, and the yield per acre has been calculated from the weight of crop obtained from the two inner rows in each case. The length of the portions of the rows cut for weighing was 66 feet.

| Name of Variety. | Distance between the Rows. | Character of Growth. | Height when Cut. | Condition when Cut. | Yield per Acre. | |
|---|---|---|---|---|---|---|
| | In. | | In. | | Tons. | Lbs. |
| Champion White Pearl | 21 | Very strong. | 90—95 | Early milk | 22 | 1,927 |
| " " | 28 | " | 105—110 | " | 18 | 660 |
| " " | 35 | " | 105—110 | " | 19 | 1,050 |
| " " | 42 | " | 105—110 | " | 21 | 488 |
| Selected Leaming | 21 | " | 95—100 | " | 22 | 1,360 |
| " | 28 | " | 100—105 | " | 17 | 686 |
| " | 35 | " | 100—105 | " | 20 | 1,030 |
| " | 42 | " | 100—105 | " | 20 | 1,548 |
| Longfellow | 21 | Medium | 70—75 | Late milk | 17 | 209 |
| " | 28 | " | 80—85 | " | 16 | 7 |
| " | 35 | " | 80—85 | " | 14 | 1,810 |
| " | 42 | " | 80—85 | " | 16 | 1,652 |

It will be seen that, in every case, the largest yield was obtained from the rows which were closest together; though the corn in these rows was not so tall as in the others.

## FIELD PLOTS OF POTATOES.

As the experimental plots of field roots and fodder corn do not occupy the whole of the field in which they are placed, it is usual to fill the remaining space with potatoes, such varieties being grown as are likely to be of service in the annual distribution of samples from this Farm.

The area devoted to the different varieties varies considerably.

The potatoes were planted May 28 and dug October 8. A satisfactory crop was obtained. A certain amount of rot was noticed, the varieties chiefly affected being Carman No. 1, Uncle Sam, Bovee and Canadian Beauty.

The yield per acre is expressed in 'bushels' of 60 lbs.

| Number. | Name of Variety. | Yield per Acre. | |
|---|---|---|---|
| | | Bush. | Lbs. |
| 1 | Dr. Maercher | 435 | 9 |
| 2 | Burnaby Mammoth | 421 | 25 |
| 3 | Country Gentleman | 408 | .. |
| 4 | Carman No. 1 | 372 | 8 |
| 5 | Late Puritan | 342 | .. |
| 6 | American Wonder | 340 | 48 |
| 7 | Uncle Sam | 324 | 33 |
| 8 | Swiss Snow-Flake | 314 | 24 |
| 9 | Money Maker | 309 | 34 |
| 10 | Reeve's Rose | 309 | 24 |
| 11 | Early White Prize | 289 | .. |
| 12 | State of Maine | 261 | 51 |
| 13 | Bovee | 246 | 5 |
| 14 | Canadian Beauty | 220 | 2 |
| 15 | Dreer's Standard | 210 | 35 |
| 16 | Everett | 202 | 8 |
| 17 | Early Andes | 194 | 20 |
| 18 | Maule's Thoroughbred | 191 | 24 |
| 19 | Penn Manor | 183 | 25 |
| 20 | Vick's Extra Early | 125 | .. |

# REPORT OF THE POULTRY MANAGER

(A. G. GILBERT.)

OTTAWA, December 1, 1904.

To DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the pleasure of submitting to you herewith the seventeenth annual report of the Poultry Department of the Central Experimental Farm.

The work of the past year has been marked by important features and results, principally confirmatory of experimental research, began some years ago. New lines of investigation and experiment have been undertaken, in the prosecution of which it is hoped to secure much useful and instructive data. Some of the subjects discussed in this report are :—

1. Advanced phases of poultry keeping.
2. Some features of the egg and poultry markets.
3. Reasons for the high price of strictly new laid eggs in summer.
4. Effects of early moulting on the summer egg supply.
5. Delay in the resumption of egg laying after the hens have moulted.
6. Early pullets required for fall layers.
7. Are fowls as good layers one season as another ?
8. Some reasons why pullets should be kept longer than one year.

The experimental work proper of the year is described in detail, and includes among other mattters :—

The treatment of the laying stock last fall so as to have them to go into winter quarters in proper condition.

Effects of various rations on groups of fowls of different ages.

Artificial and natural incubation and results.

Continued investigation into the cause or causes of so many weak germs in eggs laid in early spring by hens which were kept in warm houses and fed for egg production. Particulars are given in a number of tables.

Results of experiments to show how long after removal of the male bird from the breeding pen fertilization of the egg remains strong enough to hatch a strong chicken. The outside limit so far appears to be five days.

An important location of tuberculosis in fowls sent from British Columbia. The result of a *post mortem* examination by Dr. Higgins of the veterinary laboratory.

During the summer a poultry house, consisting of two divisions of 10 feet by 8, with scratching shed attachment 10 by 11 was erected. It is arranged and fitted according to the most approved and up-to-date designs. In the use of this house, which contains 25 pullets in each division, much valuable experience is anticipated.

On the morning of April 8 last, fire was discovered in the centre office of the main poultry building. It was fortunately extinguished before it had made serious headway, but not before 35 birds in adjoining pens had been suffocated; 75 early chickens were also burned to death, and one thousand eggs, set apart for incubator use were destroyed. This mishap caused delay in getting out early chickens and in the sending out of eggs for hatching purposes.

I have much pleasure in testifying to the ability and zeal displayed by my assistant manager, Mr. Fortier. His skill in the manipulation of the breeding stock and his care and success in the operation of the incubators and brooders were most marked. As a result of the latter, many details of value are embraced in this report.

Mr. George Deavey, I am happy to say, has shown interest and displayed energy in the discharge of his duties, with which, from long experience, he is now so well acquainted.

There were erected during this season, in addition to the poultry house mentioned, a temporary incubator room; colony houses of different sizes and design; brooders for incubators; trap nests, &c., &c. Two incubators of different patterns were also procured.

During the year addresses were delivered by the writer at Meaford, Winnipeg and at different points in Cape Breton, N.S.

Mr. Fortier delivered 43 addresses at meetings held throughout the province of Quebec during the months of January and February last. In March he attended a poultry show at St. Jerome, and another in August at Ayer's Flat. In August and September he attended poultry exhibits at Sherbrooke, Richmond and Ottawa. In the latter case the exhibit was made, during the month of September, at the annual fall show of the Central Canada Association, and consisted of an unusually attractive and instructive display, which elicited much appreciative comment.

Inquiry, both by letter and person during the year, in relation to all branches of poultry-keeping was greater than ever. It may be taken as a fair instance of the gratifying development that is rapidly taking place in the poultry branch of farm work, and which our experimental work is so well calculated to advance.

I have the honour to be, sir,
Your obedient servant,

A. G. GILBERT.

Before giving an account of the work of the past year it may be interesting and profitable to discuss certain features of poultry development which have made themselves evident during that period. It is gratifying to note that the poultry branch of farm work continues to make steady and satisfactory progress. Where fowls of the utility types are kept progress has been most rapid, and as a sequence of proper fowls and their good management results are satisfactory, because remunerative. Perhaps in no previous year has development in the more advanced phases of poultry-keeping been more apparent, more discussed and more inquired into than in the past twelve months. It may be asked what is meant by advanced phases of poultry-keeping?

### ADVANCED PHASES OF POULTRY-KEEPING.

By advanced phases of poultry-keeping are meant the thorough understanding of and putting into practice such methods of up-to-date management as experience has shown to be best calculated to enable producers to fill the requirements of the different markets of to-day to their greatest profit. A thorough and practical appreciation, then, of latest methods of management, as well as of the requirements of the market, is very necessary to success. Producers should realize that methods of poultry-keeping change from time to time, as do the requirements of the markets, and always in the way of advancement. It is to the advantage of producers to study the different features of the markets they are catering to. The city markets of to-day differ from those of even three and four years ago. There is an ever increasing call, from both home and abroad, for better things and more of them. The most suitable product receives the highest value.

### SOME FEATURES OF THE EGG AND POULTRY MARKET.

The markets of to-day may be described as follows :—

1.—A winter market with a growing demand for strictly new laid eggs for which high prices are paid more readily than heretofore. An article of guaranteed freshness, however, is required. A farmer's wife in the neighbourhood of the city writes on the 10th of November last (1904) 'that Mr. H. Gatehouse, poultry and game dealer, 806 Dorchester street, Montreal, has written offering me 40 cents per dozen for new laid eggs, but, they must not be more than 4 days old. His former limit was 10 days.' This shows a more exacting demand. It illustrates the trend of the market.

2.—A summer market imperatively calling for strictly new laid eggs with unimpaired flavour. They must also be of inviting appearance. The well-known firm of purveyors, Messrs. Bate & Son, Sparks street, Ottawa, paid as high, during midsummer last, as 25 cents per dozen to those from whom they could get eggs guaranteed strictly new laid. A member of the firm explained to the writer that these eggs were for customers 'who would take no other kind.' He added, 'and I will give now (August) 25 cents per dozen for such guaranteed strictly new laid eggs.'

3.—An Early Summer and Later Months Market for chickens of good size, correct type and in good condition, for which fairly remunerative prices are paid. The demand by the purchasing houses of Toronto heretofore has been for early 3½ to 4 months of age chickens for export. As to whether it will pay best to kill and dress those chickens for sale on a local or near city market, or to sell them alive, is a feature of the business requiring careful study. So far results go to show that, if the chicks are early and of requisite type and condition, it is best to sell them alive to one of the large purchasing firms for export. Mrs. Joseph Yuill writes 'that last spring she sold her first lot of early hatched chickens to the Canadian Produce Company of Toronto at 20 cents per lb. live weight.' But she must have had exceptional facilities for rearing the chickens at such an early season. It is to be remembered that these early chickens cannot be had except by artificial means, as pointed out in reports of previous years.

### A STRIKING FEATURE.

The new and striking feature of the above situation is the enhanced price paid for guaranteed strictly new laid eggs in the summer months, and the effect it may have on the raising of chickens. It is in the summer months that chickens are hatched on the great majority of farms. The question occurs if the eggs are consumed where are the chickens to come from ?'

The reasonable conclusion is that whatever branch of the business pays the producer best is the one he is most likely to prosecute. Apart from the inducement offered by the high prices of last summer, it does seem as if the production of eggs during the summer would commend itself to the farmer, at any rate, as it is likely to be attended with the lease trouble to him at a time of year when he is busiest. Looking at egg production by the farmer in winter the following is taken from departmental report of last year (1903) p. 245 : 'Observation has shown that there is a greater likelihood of a larger and more immediate supply of new laid eggs in winter from the farm, than of the superior quality of market poultry in later months. For the reason that so many farmers have more time in winter to care for their laying stock (and which attention is absolutely necessary) than they have in spring and early summer to devote to the hatching and rearing of chickens.' So it would seem that from both summer and winter standpoints the production of eggs is likely to be attended with the least difficulty to the farmer. We have also a skilled poultry authority, Mr. Boyer, giving the following advice to an inquirer in a recent number of the American Poultry Journal to 'confine himself to the production of eggs as being the most profitable.' It is not likely, however, that a dearth of chickens will immediately follow, and it is quite possible that the high prices of summer and autumn eggs of the past two seasons may not be permanent. But it is a significant phase of the situation and one that the student of events is bound to take cognizance of.

### WHY SUMMER EGGS HAVE BEEN SO HIGH.

It is an interesting phase and remarkable instance of the rapidity with which poultry keeping is taking place to find summer egg prices which have usually been 10 and 12 cents per dozen, attaining such values as 18, 20 and 25 cents for the same number. Eggs of the cheaper varieties were certainly to be had at the same time, but the increasing demand was for the better article. To the oft-repeated query, 'Why should new-laid eggs be so high at this season?' the reply was almost invariably given by the dealers, 'Because they are hard to get,' which was doubtless true, but it is not the only reason.

A more likely one is that consumers of the better class have found out, or, are being fast educated to the great difference there is between the clean looking, new-laid egg, with the delicious flavour it should always have, and the comparatively stale article. It is fast being realized that flavour and appearance can only come from carefully-fed and cleanly-kept fowls. Certainly in both appearance and flavour are the first quality eggs preferable to those laid by hens which have access to filthy substances, dirty water, &c., and deposit their eggs in unclean and ill-smelling nests.

Another reason may be that the more exacting demand for such carefully-selected eggs has resulted in city dealers buying from only reliable persons, who can be depended upon to send only what is wanted. These producers must be near the city market, or railway shipping point. A new laid egg stales quickly and shipments must necessarily be made frequently and in small quantities, in order to permit of the choice article being placed, as fast as possible, in the hands of the consumer. And the wideawake city purveyor finds out the number of hens the producer has, for he knows that no one with a few hens can save up eggs to make a large shipment without having the greater number of them in a stale condition. It is all important then that the producer should realize the value of and be guided by the following points:—

1. An egg, as soon—after it is laid—as possible should find its way to the consumer.

2. After being taken from the nest, the egg should be kept in a cool, sweet-smelling cellar or cupboard, and the flavour so preserved from contamination.

3. The nests in which the eggs are laid should be clean and free from odours.

4. The food of the fowls should be pure and wholesome.

5. It should be a strict rule to have no male bird with the hens which lay eggs for market. The eggs will so be unfertilized, which is desirable.

6. For breeding purposes in spring time select a suitable number of the best-shaped, best-laying and largest hens, and mate with them a male bird of good type and undoubted worth. These should be kept in separate quarters. When all the eggs desired for hatching purposes have been secured, the male bird should be disposed of and the hens kept in the breeding pen for two weeks longer before being allowed to run with the others. The above plan will do away with the necessity of having several male birds running promiscuously with the laying-hens in order 'to have eggs for hatching.'

### THE MOULTING SEASON.

Another cause which to a certain extent may be affecting the usual summer supply of eggs, is the practice, becoming rapidly more common, of having fowls moult in

July, August or September. And in this connection there is another striking instance of rapid development in improved methods. Hardly had summer moulting been shown to be possible and comparatively easy—in the months named—than we had efforts more or less successfully made to shorten the period. The moulting season is one of non-production, during which moulting hens do not lay. It is advisable then to have the season of non-production at a period at which eggs, heretofore, have been at their lowest value, viz., summer. It is also necessary to have hens moult in summer in order to have eggs in winter. It has been a common practice in past years among farmers, and the practice is yet too frequent, to have their hens lay well in spring time, summer and fall, and moult during winter, the period of high prices. With the adoption of the method of having their hens moult in summer may, possibly, come a reduced production of eggs at that season and likely an increased output in winter. In report of last year, while referring to the subject, it was remarked 'that an increased winter supply of eggs and a less number in summer might result in the evening up of prices.' The trend of the markets to-day is towards a much higher summer value. The effect on the winter market of the past two years was not noticeable. Prices were rather higher last winter than ever before.

### EFFORTS TO SHORTEN THE MOULTING PERIOD.

The moulting period usually occupies a period of 10 to 12 weeks, extending from end of July to end of September. The proprietor of a large poultry plant in the United States, and who was among the first to practice early moulting, claims to secure satisfactory results in 8 to 10 weeks. His method is to put his fowls at the beginning of July on quarter rations for ten or twelve days, meanwhile, keeping them in limited runs. At the end of this time the fowls are allowed full range and their rations increased to usual quantity. Cut bone, or, boiled livers, &c., &c., are fed, in liberal quantity two or three times per week.

A correspondent, in Nova Scotia, thought that with a diet of boiled and crushed beefheads, grain, grit, a free run, and access to grass, or, vegetables, 6 weeks should be the outside limit of the moulting period.

But developments take place quickly and we now have Mr. James Shackleton in his book on 'System in Poultry Keeping,' making the statement that it is unnecessary that hens should stop laying in order to moult. He says: 'Control of season and duration of moult are possible * * * * Perfect health and condition of fowls, freedom from damp and dirt in houses and absence of lice are essential to any control of moulting.' In a following page will be found full information as to care and treatment of the birds so as to bring on and expedite the moulting period.

### DELAY IN RESUMPTION OF WINTER LAYING AFTER MOULTING.

Another interesting phase of poultry keeping which, in connection with summer moulting, has made itself apparent in recent years is delay in the resumption of egg laying after moulting. There seems to be an unnecessary and certainly unprofitable delay in the resumption of laying after the hens have moulted and are seemingly in the very best condition. This delay has also been noticed in early pullets, which show every indication of laying, but do not. A cause for this state of affairs is now engaging the attention of the best authorities on winter egg laying. In relation to the subject, the following quotation from an editorial in 'Farm Poultry' of November 1 last, will be read with interest:—'Soon after November 1 letters will begin to come to us from all quarters and the burden of the refrain of all will be, "Why don't my hens lay?" Each writer will tell how well developed his pullets are, how they have for some time looked as if they ought to lay, how well they are housed, fed and cared for, and how perversely, in spite of all the conditions being right, nature refuses to compel the pullets to produce the proofs of that fact.' Perhaps this delay in the resumption of winter laying has been more marked in the present season than in any previous one. While there are doubtless causes, yet not apparent, close observation has shown that any of the following too common practices, is deterrant to early winter laying, viz.:—

1. In the case of pullets, neglect in care or feeding which has resulted in their becoming immature.

2. Moving hens or pullets from place to place when winter egg laying is expected. Put the birds into their winter quarters and let them remain in them, undisturbed. A run from pen to limited outside run is beneficial.

3. Overcrowding after being put into winter quarters. This applies to both hens and pullets and is more generally practised than is imagined.

4. Unnecessary exposure of pullets or newly moulted hens to cold fall rains, or, damp quarters.

5. Placing birds, suffering from colds, in laying pens instead of hospital. Neglected colds generally end in roup.

6. Lice infested fowls which, usually, is synonomous with filthy quarters.

7. Pullets from constitutionally weak, poor egg laying, or slow maturing strains of fowls.

8. A mistaken notion of economy which leads to the feeding—to growing pullets—of oats (very often of poor quality) instead of wheat, buckwheat or corn.

9. Hens improperly fed during their moult or allowed to hatch chickens late in the season.

10. Hens which have become overfat from being overfed during, or, soon after moulting.

### EARLY HATCHED PULLETS TO THE RESCUE.

For the scarcity of eggs during the months of September, October and early part of November, and which has already been commented on, the practical remedy seems to be early-hatched pullets. In order to have pullets laying in these months they would require to be hatched out in April and early May at the very latest. Farmers should certainly have no difficulty in having them at that time. Experience has shown that to have pullets laying in July or August would necessitate their being hatched in January or February, and by artificial means, for it would be almost impossible to get broody hens at that season. For this reason, pullets so hatched are not likely—for some time to come, at least—to be as numerous as those later hatched. Records of our department show the following dates at which early artificially-hatched and reared pullets began to lay :—

1. Brown Leghorn pullet, first egg in July 17, when 4 months and 20 days old.
2. Two White Plymouth Rock pullets, first eggs on July 28, when 5 months of age.
3. A Cross-bred pullet, on July 28, when 5 months old.
4. A W. P. Rock pullet, on August 1, when 5 months and 3 days old.

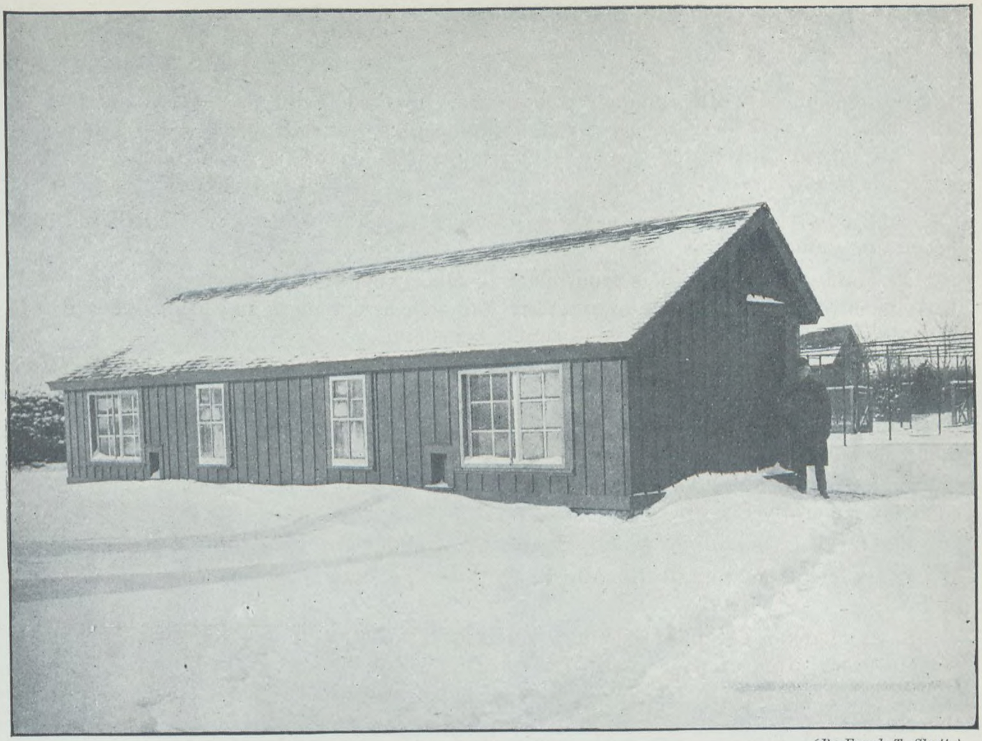
On another occasion several Barred P. Rock pullets hatched on March 26, began laying when 5 months of age, which would be at the end of August.

April and early May pullets laid at different dates in late September and October. Some of these were hatched by hens and others by incubator.

### WHAT EXPERIENCE HAS SHOWN RELATIVE TO EARLY PULLETS.

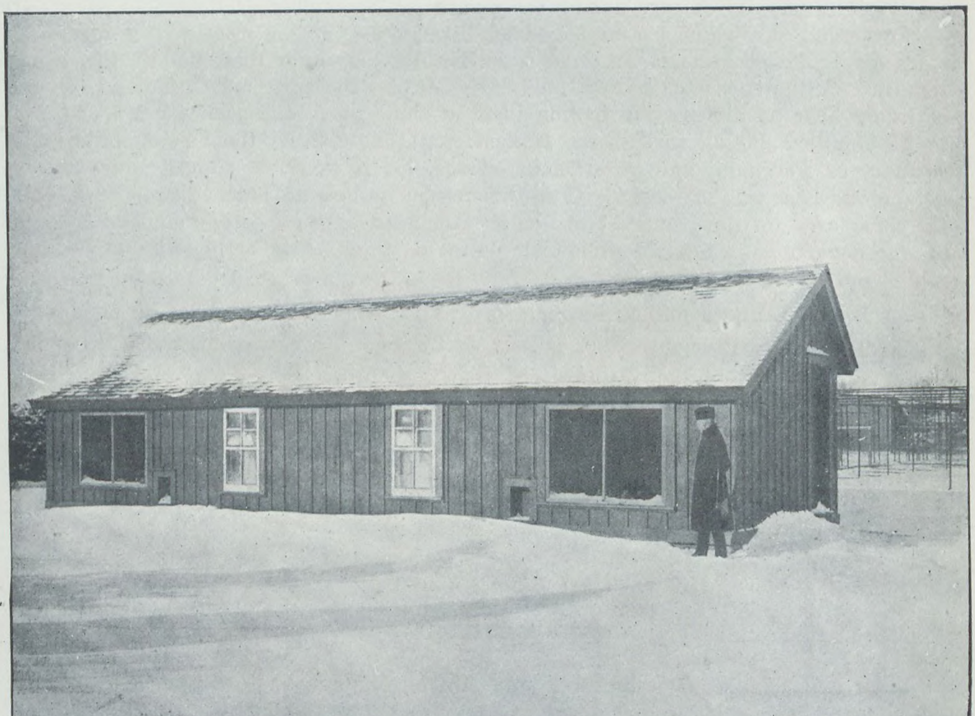
Experience in connection with the hatching of pullets, intended for early layers, leads to the following conclusions :—

Pullets to prove early layers should come from hens which have shown themselves to be early and prolific layers.



*(By Frank T. Shutt.)*

EXPERIMENTAL FARM NEW POULTRY HOUSE, WITH SHED ATTACHMENT,
SHOWING WINDOWS *closed* DURING HEAVY SNOW STORMS, AT NIGHT, OR ON VERY COLD DAYS.
WINDOWS FACE SOUTH.



*(By Frank T. Shutt)*

SAME POULTRY HOUSE, SHOWING WINDOWS OF SCRATCHING SHED *open* ON FINE BRIGHT DAYS.
THROUGH WINDOWS CLOSED OR OPEN SUNSHINE HAS EASY ACCESS TO INTERIOR.
WIRE NETTING IN FRONT OF WINDOW.

To make fall layers, pullets should not be hatched out later than second week in May. Pullets should be gently pushed from time of hatching.

Early-hatched pullets should not be fed too much stimulating food, or they will begin to moult instead of laying.

Pullets intended for early layers should have a separate run and not be crowded.

Some strains mature much more quickly than others. This applies to all varieties.

Where eggs only are desired, a pullet from one of the Leghorn, Andalusian, Minorca or Hamburgh breeds will be found to make rapid maturity.

Where early egg-laying and flesh development are required, one of the Plymouth Rock, Wyandotte, Orpington, Dorking or Faverolle varieties will be found suitable.

Every effort should be made to hatch chickens from none but the best strains, *i.e.*, the most prolific egg-layers and best market types. This may entail some extra trouble, but it is necessary to ensure the beneficial results, almost, sure to follow.

### ARE FOWLS AS GOOD LAYERS ONE SEASON AS ANOTHER ?

This is a question of great import. It is an interesting feature of poultry-keeping worth inquiring into. Records of egg-laying by pullets and hens in our department, extending over eight years, go to show that pullets which laid well during their first winter did not make as good layers the next, when hens. It was also shown that pullets which were poor layers during their first winter season did remarkably well when hens the next one. If the experience in the first instance was not offset by that of the second, it would go far to warrant the practice, on the part of many poultry keepers of holding their pullets for only one year and then disposing of them. Doubtless it will take the results of several years, yet to come, to confirm or modify the experience already noted, but meanwhile it is a phase of modern poultry-keeping worthy of remark as having made itself conspicuous on more than one occasion.

### REASONS WHY FOWLS SHOULD BE KEPT LONGER THAN THEIR FIRST YEAR.

While the practice of keeping pullets for only one year has many advocates and some good features, experience has led to the conclusion that its general adoption is not advisable in the poultry interests of the country, for the following reasons, viz.:—

Pullets, as a rule, do not lay as large eggs as they do when they are hens.

The larger egg of the hen receives the better price and is preferred by city dealers.

Hens are preferable for breeding stock, for a pullet is admittedly an immature fowl. Writing recently on this subject, an eminent breeder strongly advises, 'that the breeding pen should always be composed of two-year-old hens of undoubted merit.'

At twelve months of age a fowl is not old enough to prove her worth as an egg-layer, or as being of suitable market type.

### EXPERIMENTAL WORK OF THE YEAR.

Preparation for winter work began (as it should do in every case) in the fall. By the end of September last a number of the laying stock were well over their moult; a month later found them all in new feather and good condition. As in previous years care was taken to avoid getting these prospective winter layers in an overfat condition, which, through a desire to hasten winter laying by too heavy feeding, is often done. As noted in a previous page there is apt to be a tantalizing delay from the time the layers complete their moult until they recommence laying. It is likely, as a result of the improved methods now in vogue, that this interregnum will be shortened, and in the near future.

On November 10 the cold weather set in and the fowls went into their winter quarters. The different breeds were culled of undesirable specimens and were arranged in the pens of the different poultry houses as shown on page 255 of report of last year, 1903. As far as possible the pullets and older hens were placed in separate buildings in order to permit of a correct egg record being kept. When arranged according to varieties, or, breeds the fowls presented a healthy and pleasing appearance, the result doubtless of their having the benefit of outside run until closed in.

### THE INTRODUCTION OF SUPERIOR BREEDING STOCK.

On December 15 several new males and females of superior quality and appearance were added to those already in stock. The male birds which had been purchased at the Guelph Fat Stock Show, held in the beginning of the month, were exceptionally fine breeding stock and as they were mated with selected females, their progeny were unusually good. Those persons who purchased eggs from the hens of these matings last spring, could not have failed to be pleased at results, where good hatches were secured.

### WHEN THE PULLETS BEGAN TO LAY.

The pullets of the different varieties began to lay as follows:—

White Wyandotte pullet, November 8.

Buff Orpington pullet, November 11.

Jubilee Orpington pullet, November 11.

Silver Grey Dorking pullet, November 12.

Cross-bred pullet, November 20.

Barred P. Rock pullet, November 26.

### FIRST HENS TO LAY AFTER MOULTING.

The following hens were the first to resume laying after moulting:—

White P. Rock hen on November 6.

Rhode Island Red hen on November 7.

Barred P. Rock hen on November 9.

White Wyandotte hen on November 11.

Buff P. Rock hen on November 11.

By the middle of the month (December) winter laying had become general. The weather was unusually cold and during the holiday season—at the end of the month—the demand for new laid eggs was very great with a rather limited supply, probably due to the early and continued severity of the weather.

### EXPERIMENTAL RATIONS AND THEIR EFFECT.

In order to ascertain their worth as winter egg producers and their effect on the health of the fowls, a number of simple and cheap rations, such as could easily be procured on the farms of the country, were made up and fed to groups of birds of different ages in manner, quantity and frequency, as follows:—

*Pen No. 1 was composed of 10 Barred Plymouth Rock hens of one, two and three years of age. Their rations were:—*

A.M. ration—$\frac{3}{4}$ lb. of grain—$\frac{1}{2}$ wheat, $\frac{1}{2}$ oats.

Noon ration—1 lb. of mash, composed of $\frac{1}{3}$ shorts; $\frac{1}{3}$ ground oats; $\frac{1}{3}$ gluten meal.

**P.M.** ration—Same as morning.

The result in eggs during the months named was as follows :—

| | |
|---|---|
| **1903.** | |
| November | 19 |
| December | 37 |
| **1904.** | |
| January | 54 |
| February | 25 |
| March | 82 |
| April, up to 7th instant, inclusive | 19 |
| | 236 |

A fire which occurred in the main poultry building on the morning of April 8 necessitated the immediate liberation of the birds and they became for the time-being unavoidably mixed. This mishap prevented the continuation of the test beyond the date given. The experiments have been resumed this season under similar conditions.

*Pen No. 2, composed of 10 one, two and three-year old Barred Plymouth Rock hens were fed, as follows :—*

A.M. ration—10 ozs. of grain, of which ⅓ was oats and ⅔ wheat.

Noon ration—3 days of the week 10 ozs. of mash of same composition as in No. 1 pen. Remaining 4 days, 10 ozs. of cut bone in lieu of mash.

P.M. ration—Same as morning ration.

Result in eggs was :—

| | |
|---|---|
| **1903.** | |
| November | 10 |
| December | 48 |
| **1904.** | |
| January | 65 |
| February | 37 |
| March | 98 |
| April, up to 7th instant, included | 26 |
| | 284 |

*Pen No. 3 contained 10 White Plymouth Rock hens one and two years of age. Their food was :—*

A.M. ration—¾ of a lb. of wheat.

Noon ration—¾ lb. cut bone and 2 lbs. beets on alternate days.

P.M. ration—¾ lb. wheat.

Number of eggs laid :—

| | |
|---|---|
| **1903.** | |
| November | 25 |
| December | 31 |

1904.

| | |
|---|---|
| January | 32 |
| February | 21 |
| March | 62 |
| April, up to 7th instant, inclusive | 26 |
| | 197 |

*Pen No. 29 was composed of 9 pure-bred hens of different varieties. Their rations numbered only two per day and were :—*

A.M. ration—¾ lb. of grain, viz., ⅔ wheat and ⅓ oats.

P.M. ration— " " " "

Every day 1 lb. of beets.

Number of eggs laid :—

1903.

| | |
|---|---|
| November | 2 |
| December | 41 |

1904.

| | |
|---|---|
| January | 33 |
| February | 30 |
| March | 82 |
| April, up to 7th instant, inclusive | 5 |
| | 193 |

*Pen No. 30, composed of 9 pure-bred pullets of different varieties. Their rations were two per day, viz.:—*

A.M. ration—¾ lb. grain, composed of ⅔ oats and ⅓ wheat.

P.M. ration— " " " " "

1 lb. mangels every day

Result in eggs was :—

1903.

| | |
|---|---|
| December | 29 |

1904.

| | |
|---|---|
| January | 28 |
| February | 19 |
| March | 61 |
| April, up to 7th instant, inclusive | 19 |
| | 156 |

*Pen No. 31, contained 9 pullets of Barred P. Rock and Brown Leghorn cross. Their rations were fed twice per day :—*

A.M. ration—¾ lb. grain, composed of ⅔ oats and ⅓ wheat.

P.M. ration— " " " " "

1 lb. of roots every day.

Number of eggs laid were :—

| | |
|---|---|
| **1903.** | |
| November | 12 |
| December | 64 |
| **1904.** | |
| January | 107 |
| February | 50 |
| March | 90 |
| April, to 7th instant, inclusive | 18 |
| | 341 |

### CONTINUED INVESTIGATION INTO CAUSES OF WEAK GERMS IN EARLY SPRING EGGS.

For several years past experiments have been conducted with the object of ascertaining the cause of so many weak germs in eggs laid in early spring. The weak germs directly affect the profitable hatching and rearing of early chickens. It is, therefore, important to discover the cause, or causes, and remedy, if possible. The fowls under observation were in two groups and kept under the following conditions :—

GROUP 1.—Hens were kept in artificially warmed compartments.

They had laid fairly well from early December.

They had been gently stimulated to lay by generous feeding.

They were in numbers of 10 to 15 in pens, each 8 x 14 feet dimensions.

They were confined to these pens from early winter until spring weather permitted their getting to outside runs.

Results noted were:—

That the germs of the eggs from these hens were so weak as to die in large numbers in progress of incubation. Chickens when hatched were weak.

That the germs remained weak until the hens had opportunity, in spring, to get to outside runs and recuperate.

That the germs apparently became strong about the middle of April, and when set at, or, after that time, gave good results. See reports of previous years.

GROUP 2.—The hens in this group were in cold quarters, which were two rough divisions of a shed. Into this shed there was opportunity for limited run.

Eggs from these hens were collected soon after being laid, or they would have been frozen.

The hens were heavily fed and laid exceedingly well.

The germs of the eggs laid by these hens, in early spring, were strong and hatched 9 and 10 chickens per setting of 13 eggs. The chickens grew well.

The hens were mated with vigorous cockerels.

Results were considered in favour of fresh air and plenty of it even if it was cold.

Similar experience on the part of farmers and poultry-keepers has led to the more general adoption of the poultry-house with scratching shed attachment. Illustrations and descriptions of poultry-houses so constructed, are shown in reports of poultry department for 1902 and 1903. In these reports will also be found details of the experimental work carried on, up to that time, in connection with the germination of eggs laid in early spring.

### INCREASED OPPORTUNITY FOR FURTHER INVESTIGATION.

In order to permit of further examination into this important phase of poultry-keeping, a poultry-house of moderate dimensions with scratching room attachment and arranged and fitted in the latest and most approved methods, was erected during the past summer in close proximity to our main poultry building. A brief description of this poultry house is as follows:—

Size of building, including scratching sheds, outside measurement, 12 x 40 feet. Size of roosting rooms, inside measurement, 8 x 9·6 feet. Size of scratching sheds, inside measurement, 11 x 9·6 feet.

The walls of the building are of 2 x 3-inch studding, covered with rough boards and matched lumber with tarred paper between and battens on joints. The roosting rooms, inside walls and ceilings are sheeted with rough lumber. The partitions between roosting rooms and scratching sheds are also sheeted with two-ply rough boards with tarred paper between.

The floors of the roosting rooms, one scratching shed and passageway are of concrete. The floor of the remaining scratching shed is of sand placed on a foundation of twelve inches of rough stones. The building is painted on the outside and in the passageway inside with two coats of paint; on the other parts inside are two coats of whitewash.

A building of similar size and calculated to give almost equally good results could be constructed of rough lumber, and a floor of rough boards or earth take the place of the concrete. Whitewash could also be used on the outside in lieu of paint. The estimated cost of such a building would be about $2.75 per running foot, the lumber being calculated at $15 per thousand and shingles at $3 per thousand.

## ARTIFICIAL AND NATURAL INCUBATION—HATCHING CHICKENS AT DIFFERENT SEASONS AND RESULTS.

The work of examination into the strength of germs in eggs laid early in spring was continued last season. During the winter the male birds had been placed with the hens in Nos. 1 and 3 houses.

On February 20 last, the first incubator was filled. In previous years hens were mainly used as hatching and rearing mediums, but last season artificial hatching and brooding were generally adopted. With the object of comparison as hatching mediums a certain number of hens were used. Experience of past years has clearly shown that where mid-winter or early spring experimental work is carried on in the testing of the fertility and strength of the germs of eggs, or, hatching of chickens, artificial means are indispensable for hens as hatching mediums are impossible to be obtained in requisite numbers at that season.

When the hatching and rearing of broilers for the spring market is carried on as it is by many establishments, operations generally begin early in December or January. In such cases incubator room and brooding house or houses are imperative means to an end. In the following details of the operating of incubators of various patterns at different times and conditions, much that is interesting and instructive may be learned. To the beginner the results shown from the cooling of the eggs at shorter or longer periods according to the season; the number of times and regularity with which the eggs were turned; ventilation of the incubator; supply or non-supply of moisture; temperature of operating room (which was not well adapted for the purpose) and of the incubators and other details, cannot fail to be useful, because so much inquired about. It was not intended to have a competition of incubators of different designs, for in operation of them, our own methods of manipulation were adopted and were largely experimental. The different tests and results are given in the following tables:—

No. 1 Test.—Prairie State Incubator. Hot Air.

Filled on February 20, 1904, with eggs in quality and kind as follows:—

| Description of Eggs. | No. of Eggs. | Clear Eggs 1st Test. | Dead Germs 16th day. | Chicks dead in Shell. | Chickens Hatched. |
|---|---|---|---|---|---|
| Silver Laced Wyandottes | 20 | 3 | 7 | 2 | 8 |
| Buff Orpingtons | 14 | 3 | 8 | 3 | 0 |
| Silver Grey Dorkings | 14 | 2 | 8 | 0 | 4 |
| Faverolle | 12 | 2 | 3 | 4 | 3 |
| White Wyandottes | 9 | 2 | 7 | 0 | 0 |
| Barred P. Rock (No. 2 pen) | 8 | 0 | 3 | 3 | 2 |
| Black Hamburg | 7 | 3 | 4 | 0 | 0 |
| White Plymouth Rock | 6 | 0 | 0 | 0 | 6 |
| Total | 90 | 15 | 40 | 12 | 23 |

Birds had all the same care and feeding.
Incubator was operated in the office, the atmosphere of which was very dry.
Variation of temperature in room during hatch was from 25 to 30 degrees.
No moisture was used in either machine or room.
Time of cooling the eggs was:—
1st week 10 to 12 minutes.
2nd week 15 to 20 minutes.
3rd week 25 to 30 minutes.
Door of incubator was left open during the cooling of the eggs.
Eggs were turned once per day after cooling.

Test No. 2.—Chatham 'Red Bird' Incubator. Hot Air.

Filled on February 27, 1904, with eggs as follows:—

| Description of Eggs. | No. of Eggs. | Clear Eggs 1st Test. | Dead Germs 16th day. | Chicks dead in Shell. | Chickens Hatched. |
|---|---|---|---|---|---|
| Buff Orpington | 16 | 4 | 5 | 2 | 5 |
| Silver Grey Dorkings | 16 | 1 | 8 | 3 | 4 |
| Silver Laced Wyandottes | 15 | 2 | 2 | 1 | 10 |
| White Wyandottes | 11 | 3 | 6 | 1 | 1 |
| Faverolle | 11 | 3 | 3 | 3 | 2 |
| Barred P. Rock | 13 | 0 | 3 | 4 | 6 |
| Black Hamburg | 8 | 2 | 6 | 0 | 0 |
| Black Minorcas | 5 | 1 | 4 | 0 | 0 |
| White P. Rock | 5 | 2 | 2 | 1 | 0 |
| | 100 | 18 | 39 | 15 | 28 |

Birds were kept under same conditions with exception of Barred and White P. Rocks which were under experiment.
Incubators were placed in same office as No. 1.
Temperature of room and time of cooling the eggs same as No. 1.
Water was constantly kept in moisture pan.

TEST No. 3.—CYPHERS INCUBATOR (220-EGG SIZE). HOT AIR.

Filled on March 5, 1904, with following eggs:—

| Description of Eggs. | No. of Eggs. | Broken by Accident. | Clear —1st Test. | Dead Germs. | Dead in Shell. | Chickens Hatched. |
|---|---|---|---|---|---|---|
| Buff Orpington | 43 | 4 | 8 | 13 | 5 | 13 |
| White Wyandotte | 32 | 2 | 12 | 9 | 2 | 7 |
| Silver Grey Dorkings | 27 | 0 | 5 | 18 | 1 | 3 |
| White Leghorn | 23 | 0 | 2 | 13 | 7 | 1 |
| Barred P. Rock | 20 | 0 | 1 | 10 | 5 | 4 |
| Black Minorca | 16 | 0 | 2 | 7 | 3 | 4 |
| Rhode Island Reds | 12 | 0 | 2 | 6 | 4 | 0 |
| Faverolle | 10 | 0 | 2 | 5 | 1 | 2 |
| Silver Laced Wyandotte | 16 | 0 | 1 | 3 | 2 | 10 |
| Black Hamburg | 10 | 0 | 1 | 5 | 2 | 2 |
| Jubilee Orpington | 8 | 0 | 2 | 6 | 0 | 0 |
| Buff Leghorns | 7 | 2 | 1 | 1 | 0 | 3 |
| White Plymouth Rock | 4 | 0 | 1 | 2 | 0 | 1 |
| S. Spangled Hamburg | 2 | 0 | 0 | 2 | 0 | 0 |
| | 230 | 8 | 40 | 100 | 32 | 50 |

Incubator was placed in same office as Nos. 1 and 2, with similar variations of temperature.

Time of cooling eggs same as Nos. 1 and 2.

### *Test No. 4.—Desmoines (Hot Water) Incubator. 260-Egg Size. Filled April 26, 1904.*

This test and the following one was conducted in a new building erected as a result of the fire previously referred to. The incubator was filled with the following eggs :—

| Description of Eggs. | No. of Eggs. | Accidentally broken. | Clear 1st Test. | Dead Germs. | Dead in Shell. | Chickens Hatched. | Remarks. |
|---|---|---|---|---|---|---|---|
| Barred P. Rock | 38 | 1 | 5 | 8 | 1 | 23 | |
| White Leghorn | 45 | 2 | 5 | 5 | 3 | 30 | |
| B. P. R.—Bro-Leghorn Cross | 22 | 0 | 8 | 1 | 0 | 13 | |
| Silver Grey Dorking | 21 | 0 | 8 | 1 | 0 | 12 | |
| White Wyandotte | 18 | 0 | 3 | 2 | 1 | 12 | |
| Buff Orpington | 14 | 0 | 5 | 4 | 1 | 4 | |
| White Plymouth Rock | 15 | 1 | 0 | 4 | 0 | 10 | |
| White Wyandotte Cross | 14 | 0 | 0 | 3 | 0 | 11 | |
| Jubilee Orpington | 9 | 0 | 0 | 2 | 0 | 7 | |
| Light Brahma | 10 | 1 | 2 | 1 | 1 | 5 | |
| Black Hamburg | 10 | 1 | 2 | 1 | 0 | 6 | |
| Silver Laced Wyandotte | 5 | 0 | 0 | 0 | 0 | 5 | |
| Faverolle | 6 | 0 | 2 | 0 | 1 | 3 | |
| Black Minorca | 3 | 0 | 0 | 0 | 0 | 3 | |
| S. Spangled Hamburg | 7 | 0 | 1 | 2 | 0 | 4 | |
| | 237 | 6 | 41 | 34 | 8 | 148 | |

Eggs were turned twice per day, the first at cooling time and once afterwards.
Ventilators half open, all the time.
Doors of the incubator were left open all the time of cooling.

| No. of days. | Temp. of Room. | | Temp. of Incubator. | | Time of Cooling. | Remarks. |
|---|---|---|---|---|---|---|
| | A.M. | P.M. | A.M. | P.M. | | |
| 1 | 52 | 58 | 92 | 102 | | |
| 2 | 58 | 58 | 102 | 102 | | |
| 3 | 57 | 67 | 102 | 102 | | |
| 4 | 58 | 64 | 102 | 102 | 10 minutes. | 1st cooling and turning a.m. |
| 5 | 54 | 64 | 102 | 103 | 12 " | |
| 6 | 60 | 80 | 103 | 103 | 12 " | 1st test. |
| 7 | 65 | 82 | 103 | 103 | 14 " | |
| 8 | 52 | 85 | 103 | 103½ | 14 " | |
| 9 | 56 | 80 | 102 | 103 | 15 " | |
| 10 | 56 | 74 | 102 | 104 | 15 " | |
| 11 | 61 | 84 | 103 | 104 | 15 " | |
| 12 | 67 | 81 | 103 | 103 | 15 " | |
| 13 | 66 | 87 | 102½ | 104 | 20 " | |
| 14 | 59 | 78 | 102 | 103 | 30 " | |
| 15 | 63 | 70 | 103 | 103 | 30 " | |
| 16 | 55 | 75 | 103 | 103 | 30 " | |
| 17 | 59 | 83 | 102½ | 103 | 30 " | Last test. |
| 18 | 58 | 84 | 103 | 104 | 30 " | |
| 19 | 67 | 61 | 103 | 103 | 35 " | Last cooling. |
| 20 | 60 | 64 | 103 | 103 | | |
| 21 | 56 | 78 | 103 | 103 | | |

TEST NO. 5.—CYPHER'S INCUBATOR (220-EGG SIZE). HOT AIR.

Filled on May 14, 1904, with following Eggs. Machine was operated in new building for reason explained in No. 4.

| Description of Eggs. | No. of Eggs. | Clear Eggs. | Dead Germs. | Dead in Shell. | Chickens Hatched. | Remarks. |
|---|---|---|---|---|---|---|
| Barred P. Rocks | 31 | 14 | 0 | 2 | 15 | |
| Buff Orpington | 26 | 5 | 3 | 1 | 17 | |
| White Plymouth Rock | 21 | 0 | 5 | 4 | 12 | |
| Black Hamburg | 15 | 2 | 5 | 4 | 4 | |
| B. P. R.—Brown Leghorn Cross | 16 | 5 | 1 | 0 | 10 | |
| White Wyandotte | 15 | 8 | 1 | 2 | 4 | |
| Silver-Laced Wyandotte | 12 | 3 | 3 | 1 | 5 | |
| Faverolle | 11 | 4 | 2 | 2 | 3 | |
| White Leghorn | 14 | 1 | 3 | 1 | 9 | |
| Light Brahma | 11 | 5 | 4 | 1 | 1 | |
| Black Minorca | 7 | 1 | 1 | 1 | 4 | |
| S. Spangled Hamburgs | 7 | 2 | 4 | 0 | 1 | |
| Buff P. Rocks | 5 | 0 | 1 | 1 | 3 | |
| Silver Grey Dorking | 9 | 2 | 0 | 1 | 6 | |
| | 200 | 52 | 33 | 21 | 94 | |

Eggs were turned twice per day.
Ventilators half open all the time.
During the time of cooling eggs the incubator doors were left open.

| Days. | Temp. of Room. A.M. | Temp. of Room. P.M. | Temp. of Incubator. A.M. | Temp. of Incubator. P.M. | Time of Cooling Eggs. | Remarks. |
|---|---|---|---|---|---|---|
| 1 | ..... | 84 | ..... | 103 | | |
| 2 | 67 | 61 | 103 | 103 | | |
| 3 | 60 | 64 | 103 | 103 | | |
| 4 | 56 | 78 | 103 | 104¼ | 15 minutes. | 1st cooling of eggs. |
| 5 | 57 | 78 | 103 | 103 | 25 " | |
| 6 | 60 | 65 | 103 | 103 | 25 " | 1st test. |
| 7 | 62 | 72 | 104 | 103 | 25 " | |
| 8 | 63 | 84 | 104 | 103 | 30 " | |
| 9 | 68 | 67 | 103 | 103 | 30 " | |
| 10 | 66 | 76 | 103 | 103 | 30 " | |
| 11 | 69 | 88 | 104 | 104 | 30 " | |
| 12 | 70 | 72 | 104 | 103½ | 28 " | |
| 13 | 68 | 83 | 104 | 103 | 45 " | |
| 14 | 66 | 84 | 103 | 103 | 45 " | |
| 15 | 56 | 76 | 104 | 103½ | 45 " | |
| 16 | 58 | 78 | 103½ | 103½ | 40 " | Last time of testing. |
| 17 | 60 | 76 | 103½ | 103 | 45 " | |
| 18 | 54 | 71 | 103 | 103 | 45 " | |
| 19 | 60 | 69 | 102 | 103 | 45 " | Last time of cooling. |
| 20 | 60 | 71 | 103 | 103½ | | |
| 21 | 71 | 76 | 103 | 103 | | |

TEST No. 6.—FOUR HENS AS HATCHING MEDIUMS.

On April 20, 1904, they were given 13 eggs each of the following kinds:—

| Description of Eggs. | No. of Eggs. | Clear —1st Test. | Dead Chicks in Shell. | Chickens Hatched. |
|---|---|---|---|---|
| S. G. Dorking | 8 | 3 | 0 | 5 |
| White Leghorn | 8 | 0 | 3 | 5 |
| B. P. R.—Brown Leghorn Cross | 4 | 1 | 0 | 3 |
| Black Hamburgs | 3 | 0 | 0 | 3 |
| Buff Orpington | 3 | 0 | 0 | 3 |
| White Wyandotte | 5 | 1 | 0 | 4 |
| Barred P. Rock | 5 | 1 | 0 | 4 |
| Faverolle | 3 | 0 | 0 | 3 |
| Jubilee Orpington | 3 | 1 | 1 | 1 |
| White Plymouth Rock | 2 | 0 | 0 | 2 |
| S. Spangled Hamburg | 2 | 0 | 0 | 2 |
| Buff Plymouth Rocks | 2 | 0 | 0 | 2 |
| Light Brahmas | 1 | 1 | 0 | 0 |
| Black Minorcas | 3 | 1 | 0 | 2 |
| Totals | 52 | 9 | 4 | 39 |

TEST No. 7.—In which a number of hens were used as hatching mediums. They were set at different times during May, 1904, on the following eggs:—

| Date when set. | Description of Eggs. | No. of Eggs set. | Clear —1st Test. | Dead Germs. | Dead Chicks in Shell. | Chickens Hatched. |
|---|---|---|---|---|---|---|
| 1904. | | | | | | |
| May 2 | Light Brahmas | 10 | 2 | 0 | 2 | 6 |
| " 5 | Buff Leghorns | 36 | 10 | 1 | 1 | 24 |
| " 5 | Black Minorcas | 52 | 10 | 8 | 10 | 24 |
| " 7 | White Wyandottes | 60 | 17 | 5 | 6 | 32 |
| " 14 | S. G. Dorking | 15 | 3 | 2 | 3 | 7 |
| " 14 | Faverolle | 15 | 3 | 1 | 1 | 10 |
| | | 188 | 45 | 17 | 23 | 103 |

The number of clear eggs on May 2, 5 and 7, goes to show that the birds, in the latter part of the month of April when the eggs were collected, had not completely recovered from the effects of the fire which occurred on the 8th of the latter month. Later, the percentage of clear eggs, it will be noticed, is very much less.

MANAGEMENT OF THE SITTING HENS.

The following has been found a convenient and effective method in managing the sitters. As the hens became broody they were put in wooden cases of suitable size and without bottoms, which were placed in pens by themselves. The boxes had hinged doors in front so as to be opened, or closed as required. Comfortable nests were made of dry lawn clippings, or oat straw. Previous to putting a hen on her nest she was thoroughly dusted with insect powder and so was her nest. Experience has proved that lice infested hens are not successful sitters. The hens are allowed to sit for twenty-four and thirty-six hours on three or four china eggs. Having proved themselves reliable sitters the imitation eggs were removed and they were replaced by the valuable eggs. Borrowed sitters should always be so treated for they are generally infested with vermin and a source of contamination to nest and premises they happen to be placed in. Grain of different kinds mixed, grit and drink water were always before the sitters.

### HOW LONG DOES THE EFFECT OF FERTILIZATION LAST.

Two interesting experiments, particulars of which are given in the two following tables, were made at the conclusion of the breeding season last summer. The objects aimed at were:—

1. To find out how long after the removal of the male bird from the breeding stock was fertilization strong enough to hatch out into a healthy chicken.

2. How long after the removal of the male bird could the effect of fertilization be traced?

The questions are answered by the results in the following tests 8 and 9.

TEST No. 8.—With seven Barred P. Rock hens from which the male bird was separated on June 29, 1904. On the same day eggs were put into an incubator and thereafter, from time to time during twenty days. Details are:—

| Date. | No. of days male bird separated from hens. | No. of eggs set. | Clear eggs—1st test. | Dead germs. | Dead in shell. | Chickens hatched out. | Remarks. |
|---|---|---|---|---|---|---|---|
| 1904. | | | | | | | |
| June 29.. | ...... | 3 | 1 | 1 | ...... | 1 | Strong chicken. |
| " 30.. | 1 | 1 | 1 | ...... | ...... | .... | No results from this egg as it was clear. |
| July 1.. | 2 | 3 | 1 | ...... | ...... | 2 | Strong chicken. |
| " 2.. | 3 | 3 | 1 | ...... | ...... | 2 | " |
| " 3.. | 4 | 2 | 1 | ...... | ...... | 1 | Weak chicken. |
| " 4.. | 5 | 2 | 1 | ...... | ...... | 1 | Healthy chicken. |
| " 5.. | 6 | 3 | 1 | ...... | ...... | 2 | " |
| " 6.. | 7 | 1 | 1 | ...... | ...... | ...... | Egg without germ; no result. |
| " 7.. | 8 | 1 | ...... | 1 | ...... | ...... | Germ dead from weakness. |
| " 8.. | 9 | 1 | 1 | ...... | ...... | ...... | Egg not fertilized; no result. |
| " 9.. | 10 | 1 | ...... | ...... | 1 | ...... | Chicken partly developed; dead from weakness. |
| " 10.. | 11 | ...... | ...... | ...... | ...... | ...... | No eggs laid this day. |
| " 11.. | 12 | 1 | ...... | ...... | 1 | ...... | Chicken dead in shell evidently from weakness. |
| " 12.. | 13 | 1 | 1 | ...... | ...... | ...... | Egg without germ; no result. |
| " 13.. | 14 | ...... | ...... | ...... | ...... | ...... | No egg laid this day. |
| " 14.. | 15 | 2 | 2 | ...... | ...... | ...... | Eggs without germs; no results. |
| " 15.. | 16 | 1 | 1 | ...... | ...... | ...... | " " |
| " 16.. | 17 | 2 | 2 | ...... | ...... | ...... | " " |
| " 17.. | 18 | ...... | ...... | ...... | ...... | ...... | No eggs laid this day. |
| " 18.. | 19 | 1 | 1 | ...... | ...... | ...... | Eggs without germs; no results. |
| " 19.. | 20 | 1 | 1 | ...... | ...... | ...... | " " |
| " 20.. | 21 | 1 | 1 | ...... | ...... | ...... | " " |
| | | 31 | 18 | 2 | 2 | 9 | |

TEST No. 9.—With five White Leghorn hens. Cock bird separated from hens on June 23, 1904. Eggs put into incubator five days later and thereafter for twenty days. Details are as follows:—

| Date. | No. of days male bird separated from hens. | No. of eggs set. | Clear eggs.—1st test. | Dead germs. | Dead in shell. | Chickens hatched out. | Remarks. |
|---|---|---|---|---|---|---|---|
| 1904. | | | | | | | |
| June 28.. | 5 | 4 | 2 | ...... | ...... | 2 | Strong chickens. Eggs laid 5 days after removal of male bird from hens. |
| " 29.. | 6 | 3 | 1 | 1 | ..... | 1 | Strong chicken. |
| " 30.. | 7 | 4 | 1 | ...... | ...... | 3 | Strong, healthy chickens. Male bird away from hens seven days. |
| July 1.. | 8 | 2 | ...... | ...... | 1 | 1 | Strong, healthy chick. Male bird away from hens eight days. |
| " 2.. | 9 | 3 | ..... | ..... | .... | 3 | Chickens weak; had to be helped out of shells. |
| " 3.. | 10 | 2 | ...... | ...... | .... | 2 | Fairly strong and healthy. Male bird away from hens ten days. |
| " 4.. | 11 | 3 | 2 | ...... | ..... | 1 | Weak and infirm. Male bird away from hens eleven days. |
| " 5.. | 12 | 1 | 1 | ...... | ...... | ...... | Egg without germ. No eggs with germs after this date. |
| " 6.. | 13 | 2 | 2 | ...... | ..... | ...... | Eggs without germ. |
| " 7.. | 14 | 2 | 2 | .... | .... | ..... | " |
| " 8.. | 15 | 1 | 1 | .... | ..... | ..... | " |
| " 9.. | 16 | 2 | 2 | .... | ..... | ... | " |
| " 10.. | 17 | ...... | ...... | ..... | ...... | ...... | No eggs laid this day. |
| " 11.. | 18 | ..... | ..... | ..... | ..... | ...... | " |
| " 12.. | 19 | 1 | 1 | ...... | ...... | .... | No germ in egg. |
| " 13.. | 20 | 1 | 1 | ..... | ... | ..... | " |
| " 14.. | 21 | 1 | 1 | ...... | ... | ...... | " |
| " 15.. | 22 | 1 | 1 | .... | ...... | ... | " |
| " 16.. | 23 | 3 | 3 | ..... | ... | .... | " |
| " 17.. | 24 | 1 | 1 | ..... | ... | ..... | " |
| " 18.. | 25 | 3 | 3 | ...... | .... | ..... | " |
| | | 40 | 25 | 1 | 1 | 13 | |

It is interesting to note the result of the two tests. In the first test, No. 8, fertilization was strong enough in 6 eggs laid on the 5th day, after removal of the male bird from the breeding pen, to hatch out two healthy chickens. The last trace of fertilization is found in an egg laid eleven days after removal of the male bird. Examination of this egg, in course of incubation, showed a fairly well developed chicken dead in the shell. It had evidently died in progress of development from weak germination. No further evidence of fertilization is found in this test.

In the second case, test No. 9, strong chickens are hatched from eggs laid on the eighth day after removal of the male bird and fairly strong and healthy chicks from eggs laid on the tenth day after separation. From the three eggs laid on the eleventh day after separation a weak and infirm chicken was hatched. After this there is no trace of fertilization. Results seem to endorse the advice given in reports and correspondence of previous years, to the effect that it is not advisable to set eggs for hatching which are laid on or after the fifth day of removal of male from breeding stock.

Another interesting result which made itself evident was the comparative unimpaired condition of the unfertilized eggs at the conclusion of the 21 days' tests. These unfertilized eggs were taken from the incubator on the 22nd day, after they were put into the machine. During that time they were subject to the ordinary temperature of 103 degrees of heat usually maintained for the hatching of chickens from fertilized eggs. On examination, these unfertilized eggs were found to be in as equally good condition and flavour—if not better in numerous instances—than the majority of midsummer eggs. This strongly emphasizes the advice so frequently given in previous reports and repeated in a previous page of this one—'that farmers should make it a rule to keep no male bird with the hens which lay the eggs to be taken to market, or, sold to store or middleman.' This experience in relation to the superior keeping quality of unfertilized eggs is by no means a new one in our department. On the occasion of the two tests described above there was good opportunity for extended and correct examination and the results which were so evident in so many cases, not only go to prove the correctness of previous advice, but should be a useful warning to all who are desirous of obtaining the highest price 'for the strictly new laid egg with flavour intact,' more particularly in summer time when conditions for germ development are so favourable.

## CARE AND TREATMENT OF THE CHICKENS.

On the chickens hatching out they were allowed to remain in the incubators for 36 or 48 hours—until strong on their legs. If hatched by hens they were allowed to remain under their mothers for the same length of time. The incubator chicks were placed in brooders heated to 95 degrees. If season permitted the brooders were placed on the grass outside and the hens with their chickens were removed to small coops, also on the grass. Each of these coops had a slatted front through which the chicks could run out and in at pleasure. The brooders containing the incubator-hatched chickens were placed in small yards surrounded by portable wire netting fences of light construction. From time to time the brooders and wire fences were moved to new locations, until the chickens were old enough to run at large. When too large for the brooders the chickens were placed in colony houses situated throughout the fields allotted to the department. The same treatment was extended to the hen-hatched chickens on their attaining sufficient size to warrant their removal.

The growth of the chickens was satisfactory. Their rations and treatment were as follows:—First two days, stale bread crumbs and stale bread soak in milk and squeezed dry, the former principally for the first day. On the second or third day granulated oatmeal was given in addition. This may be varied with rice boiled dry, or cracked wheat. After a few days growth finely crushed corn has been found beneficial and was eaten with avidity. A mistake sometimes made is to overfeed the chickens during the early days of their life. As the chickens grew a mash composed of shorts, cornmeal, stale bread and a small quantity of beef scraps or meat meal was mixed with hot milk or water and when cool was fed 3, 4 or 5 times, as occasion required. Small potatoes were sometimes boiled and added to the mash with benefit. Cut bone in small pieces and fed in small quantity at first and after 14 days is one of the best stimulants to vigorous growth that can be given. So are boiled liver and raw onions cut up fine and mixed. In some cases water was furnished from the first day of the chick's life. In others, more particularly the brooder-raised chicks, no water was given at all, the moisture in the milk-soaked bread being considered sufficient. No apparent difference as a result was evident. Grit, from the first was at all times within reach of the youngsters. As the chickens increase in growth the mash was made of as economical and wholesome ingredients as could conveniently be got hold of. Whole grain, principally wheat, was given after the twelfth or fourteenth day, and was gradually increased in proportion as the first and more dainty rations were reduced. The chickens were fed regularly, and while gently pushed, none of their soft food was allowed to remain uneaten, turn sour, or become soiled.

Fed and treated as outlined the weight development of the cockerels of the utility varieties was equal to that of previous years, the average of five years being 1 lb. weight development per month at and after three months of age. The experience of many years has shown with no uncertain results, that with healthy breeding stock carefully fed and cared for chickens, the farmers of the country should find no difficulty in having a pair of Plymouth Rock, Wyandotte, Dorking, or Orpington (the last a comparatively new comer) cockerels, weigh 4 lbs. each, or 8 lbs. per pair, at the end of four months. The latter age is mentioned because it is not so easy to find a pound development per month at an earlier age (in the majority of cases), not because it is unattainable, but for the reason that proper effort is not made to secure such a result.

### MANAGEMENT OF MATURING COCKERELS.

On the young cockerels, particularly those of the Mediterranean classes, maturing, they were removed to quarters by themselves, or, they would have annoyed the growing pullets by their precocious attentions.

The larger chickens were also removed from the younger ones when circumstances permitted. This is certainly advisable, for unless removed the older chickens are apt to eat most of the food, and the younger ones are so deprived in great part, if not altogether, of the nourishing food when they most require it. This applies with particular force to late chickens which need to be pushed.

### SALE OF BREEDING BIRDS.

During the fall and early winter, a number of Barred and White Plymouth Rock, White Wyandotte and Buff Orpington cockerels were picked out and purchased by farmers and others. It is gratifying to state that the demand was in excess of the supply and may be regarded as evidence of the growing preference by the farmers of the country for birds of good quality and correct market type. There was an equally good demand for eggs for hatching purposes, in early spring and summer, from many different parts of the Dominion.

### WEIGHT OF EGGS LAID BY FOWLS OF VARIOUS BREEDS.

| Variety. | Number of eggs. | Weight. |
|---|---|---|
| White Wyandottes (selected stock) | Per dozen, | 1 lb. 13 oz. |
| " (ordinary stock) | " | 1 " 9 " |
| Black Minorcas (selected birds) | " | 1 " 12 " |
| " (ordinary birds) | " | 1 " 9 " |
| Buff Orpington (selected stock) | " | 1 " 13¾ " |
| " (ordinary) | " | 1 " 9 " |
| Light Brahmas (ordinary) | " | 1 " 10¼ " |
| Black Hamburg (ordinary) | " | 1 " 8½ " |
| Barred P. Rock (ordinary) | " | 1 " 8½ " |
| Faverolle (ordinary) | " | 1 " 8¼ " |
| Silver Grey Dorking (ordinary) | " | 1 " 7½ " |
| Silver Laced Wyandotte (ordinary) | " | 1 " 7 " |
| White P. Rock (ordinary) | " | 1 " 7 " |
| White Leghorns (ordinary) | " | 1 " 7 " |
| Brown Leghorns (ordinary) | " | 1 " 4½ " |

### GENERAL ADOPTION OF TRAP NESTS.

It will be noticed from the foregoing enumeration of the weight of eggs that in several instances they are not as heavy per dozen as outside records have shown. This may be accounted for that on the latter occasions the largest eggs were most likely picked out. In the foregoing table the eggs were taken and weighed as they came, except where it is stated that they were from birds selected, not because they were layers of eggs of extra large size, but for their good all-round points. The Wyandotte and Orpington fowls were picked out because they were of correct market types as well as good layers. And to have this combination should certainly be the aim of every breeder of the utility varieties. With the view of ascertaining which hens in our poultry houses are the best layers of the largest eggs, trap nests of various patterns have been fitted in the different pens. A few years ago experiments were conducted in our department with trap nests in a rather limited way, but sufficient to show that their use, on a large scale, necessitated increased assistance in order that the work should be correctly done. It is hoped by the more general adoption of trap nests, on the present occasion, to obtain such correct records as will result in the building up of prolific and large egg-laying strains in all varieties and in the case of utility breeds in combination with the best market types. Without such systematic procedure, experience has shown, that all other effort in the same direction is likely to be of a more or less haphazard nature.

### THE POULTRY EXHIBIT AT THE CENTRAL CANADA FAIR.

The exhibit of our poultry department at the fair of the Central Canada Association in this city last September, was very successful. The display was made in the farm building in conjunction with other departments. The intention to make the exhibit educational, as well as attractive, was not lost sight of, and with that object in view the following features were conspicuous, viz.:—

Incubators in operation and chickens hatching in them every day.

Brooders also in operation. In them were placed the chickens hatched by the incubators day by day. The chickens did remarkably well.

Hen sitting in nest box of pattern as used in poultry department.

Hen with brood of chickens hatched from eggs laid from 5 to 8 days after separation of male bird from hens.

Models of poultry house suitable for winter, also models of colony houses.

Groups of chickens from 2 to 4 months of age, showing correct market types.

Hens of different breeds and of exceptional good type and quality.

Chickens being fattened in crates, showing crate fattening.

Chickens being fattened, loose in pens.

Dressed poultry, showing birds as they should be sold on the market, or, in shops. Other specimens drawn and trussed ready for the oven.

New-laid eggs from different breeds. And other features of instruction and interest.

## DISEASES OF POULTRY.

### IMPORTANT IDENTIFICATION OF TUBERCULOSIS IN FOWLS FROM BRITISH COLUMBIA.

During the year many communications were received describing diseases and asking for remedies for the same. Numerous cases were distinguished as colds, catarrh or incipient roup and for which simple remedies were advised. In several instances the symptoms denoted serious ailment. On such occasions the letters were submitted to Dr. C. H. Higgins, Pathologist, Biological Laboratory which is situated on the Experimental Farm. Dr. Higgins expressed his willingness to examine any subjects that might be sent to him, and identify cause of ailment when possible to do so.

### LOCATION OF TUBERCULOSIS IN SICK BIRDS FROM BRITISH COLUMBIA.

Early in the month of May last, a letter was received from Mr. George Lawes, of Enderby, B.C., stating that several of his fowls were in a very emaciated condition without any reason for their being so, as they had been well fed and cared for. One or two had recently died and others seemed as if they would not last long. His letter was submitted to Dr. Higgins, who suggested that if a definite diagnosis was desired by Mr. Lawes that he be requested to send on one or more of the worst specimens. Mr. Lawes, soon after forwarded two sick fowls, and the post mortem examination of one by Dr. Higgins confirmed what from the first was suspected. A copy of his report which was made to the Veterinary Director General, Dr. J. G. Rutherford, and forwarded by that gentleman to our department, is as follows:—

'BIOLOGICAL LABORATORY,
'OTTAWA, May 30, 1904.

'No. 247. This fowl, a Buff Orpington from Geo. R. Lawes, of Enderby, B.C., was chloroformed on the 13th inst. The autopsy revealed lesions of tuberculosis, which cultures and microscopic examinations have confirmed.

'Very nearly all the tissues of the body were invaded by the lesions. The liver was about twice its normal size and contained tubercles varying in size from a pin point to a hazel nut. The spleen was about three times its normal size.

'The lesions of the intestines were of a chronic nature and were without doubt instrumental in communicating the disease to other fowls with which she associated.

(Sgd.) 'CHAS. H. HIGGINS,
*'Pathologist.'*

A copy of this report was mailed to Mr. Lawes with the statement that there was no known cure for tuberculosis among fowls, and that his birds were not likely to recover. Mr. Lawes afterwards wrote that his birds continued to die, one by one, and would likely do so until exterminated.

Such being the deadly nature of the disease it is of vital importance to the poultry keepers of British Columbia that its presence in their province and its fatal character should be known to them. From other points in British Columbia reports of a similar kind to that of Mr. Lawes were received. The correspondents were informed of the results of the examination, and advised to take immediate action upon conclusive identification of the disease, by killing off their birds at once. In one case a reply was received that doubtless the situation was serious, but he would risk consequences. Such a mistaken attitude is to be regretted, for it only postpones the inevitable and renders the stamping out of the disease more difficult.

Dr. D. E. Salmon, Chief of the United States Bureau of Animal Industry, in his book entitled 'The Diseases of Poultry,' writes as follows on the treatment of tuberculosis in a colony of fowls: 'The eradication of tuberculosis in birds from an infected premises can only be attempted with a fair prospect of success when all the birds are sacrificed. Any individuals that are preserved are liable to have ulcerations of the intestines, from which the bacilli are constantly distributed. There should consequently, be no attempt to save any birds from an infected flock. When the birds are all killed and disposed of by burning or deeply burying, the premises should be carefully disinfected.' Then follows detailed instructions as to the proper method of cleaning and disinfecting building and premises. Concluding, Dr. Salmon says: 'After the cleaning and disinfection is accomplished the premises should be opened to the sun and air for a monoth, if possible, before new birds are introduced.'

Writing of the tuberculous condition of the fowl from Enderby before being killed for examination, Dr. Higgins says: 'There can be no doubt that a fowl infected to such a marked degree must have been a constant menace to all others with which it may have come in contact as countless numbers of baccilli were present in the fæces. This is, I believe, *the first identification of tuberculosis in poultry in Canada.*

Other examinations made by Dr. Higgins are reported as follows:—

218. *A fowl from Experimental Farm Poultry Department.*—Autopsy reveals large tumour on left side of sternum, cystic, the cysts containing fluid dark in colour and gelatinous. Pericardial sac contains 20 cc. fluid. Heart muscle contains nodules,

abdominal cavity contains much semi-fluid gelatinous material. Spleen, liver, lungs and kidneys normal.

A microscopic examination reveals the structure of the tumour as a cystic myxosarcoma with metastases in the heart muscle and abdominal cavity.

219. *Buff Orpington Cock.*—Autopsy reveals ulcers in the gizzard with a congestion and thickening of the intestinal mucosa. No parasites were detected in the gizzard. Nematode worms, '*Heterakis differens*' were found in the intestines and cæca. Aside from the lesions mentioned other organs were normal.

220. *Barred Plymouth Rock (Pullet).*—Lesions similar to those noted in former case, but condition not so far advanced. Nematode worms, '*Heterakis differens*' were present in the cæca.

These two cases present an interesting condition and one not usually met with. Before stating definitely the cause, or suspected cause of the trouble, a further investigation will be necessary and other animals examined.

221. *Light Brahma (Pullet).*—This animal was infested with tape worms. '*Drepanidotaenia*'; also '*Heterakis differens*,' and the large nematode '*Heterakis inflexa*.'

To the tape worms can be ascribed the emaciated condition and general unthriftiness.

247. *Fowl sent from British Columbia.*—Dead upon arrival. Autopsy revealed an extreme impaction of the gizzard, due to six large pieces of broken crockery, the largest of which measured one and one-half centimeters by one centimeter. These were evidently swallowed to assist the digestive functions of the gizzard. No other lesions were observed microscopically.

## RATIONS OF LAST WINTER.

The rations fed to the laying stock, other, than those on experiment, during last winter were:—

*A. M. ration.*—Wheat, sometimes buckwheat in proportion of 8 to 10 pounds to every 100 fowls. This scattered, soon after daylight, in the litter on the floors of the pens.

*At* 11 *a.m.*—Steamed lawn clippings, 3 or 4 times per week. This was eaten with evident relish. It is a very beneficial way of utilizing a form of waste. Clover leaves, treated in the same way, are equally effective.

*At noon.*—A few hands full of grain, if found necessary, thrown on the floor of the pens to keep hens busy.

*P.M. ration.*—Mash as much as could be eaten up clean 3 or 4 times per week. A liberal allowance was given, for at this time there is less likelihood of injurious effect from overfeeding than at a.m. ration.

The mash was composed of two parts shorts, one part ground oats, one part gluten meal or ground barley. Occasionally small potatoes boiled were added. Sometimes mash was fed at morning ration in lieu of grain. At such time, wheat was given at p.m. ration. Grit, mangels or turnips and water were before the fowls all the time.

Variety in the composition of the rations and in the order of feeding them were found beneficial.

Experience has shown that where there is variety in rations and care in feeding them—with requisite allowance for floor space—there is little likelihood of egg eating, or feather picking.

# FLESHING CHICKENS AND FATTENING OLD HENS.

SOME OF WHICH WERE LOOSE IN PENS WITH LIMITED RUN AND OTHERS IN CRATES.

In reports of our department for the past two years will be found interesting and instructive results of the pen and crate methods of fattening chickens, which were conducted by Mr. F. T. Shutt, of the Chemical Division, and his assistants.

The experimental fleshing of chickens and fattening of old hens, during the past season, were conducted by our poultry department. Details are given in following pages.

The terms 'fleshing' and 'fattening' are used with intent, for experience has shown, that rations which are calculated to—and really do—go into 'flesh,' in the case of chickens, are frequently found in the shape of 'fat' in old hens. Experience has also shown that while flesh is desirable, fat—particularly that of old hens—is simply waste. The accumulation of fat in old hens doubtless makes increased weight and may mean a little more money to the seller, but, it is certainly loss to the purchaser, for, it is of no value to him whatever.

On the present occasion, hens of two years of age and chickens of two and three months old, were used.

The experimental fleshing of chickens in our department for several years has shown that before the best specimens can be produced the following preliminary conditions must be thoroughly understood, viz.:—

1. Chickens intended for fleshing should be of correct market types, such as can only come from the utility breeds. Hence the necessity of the parent stock being of proper breed and type.

2. Chickens should be well cared for and properly fed from time of hatching until put into pen or crate for 'finishing.'

3. The better the condition of the chickens when put into pen or crate to flesh the quicker and more complete will the 'finishing' process be.

4. Chickens which have been permitted 'to pick up their own living,' take more food, a longer period to flesh and in the end seldom make specimens that will bring the highest price.

Attention to the foregoing points will certainly bring about the best results.

In the following experiment of Pen vs. Crate, the chickens were divided into five groups and the old hens into one.

Each chicken and hen had a distinguishing number on a metal band round one of its legs.

Except where described the cross-bred chickens were of the ordinary barn-yard type.

The birds were fed twice per day and the rations were made of the consistency of thin porridge.

DETAILS OF EXPERIMENT in Fleshing Chickens in Pens and Crates. August 19, 1904.

| Pen or Crate. | No. of leg band on Chicken. | Breed. | Cockerel or Pullet. | Age. | | Weight. | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Months. | Days. | Beginning of Experiment. | | 1st Week. | | 2nd Week. | | 3rd Week. | | 4th Week. | | Average at beginning of Experiment. | | Average at close of Experiment. | | Average total gain by chicken in 4 weeks. | | Average gain by chicken in 1 week. | |
| Group No. 1. | | | | | | Lbs. | Oz. | Lbs. | Oz. | Lbs. | Oz. | Lbs. | Oz. | Lbs. | Oz. | Lbs. | Oz. | Lbs. | Oz. | Lbs. | Oz. | Lbs. | Oz. |
| Pen........ | 16 | B. Ply. Rock | C | 3 | 14 | 3 | 15 | 4 | 11½ | 5 | 6 | 5 | 14½ | 6 | 1 | | | | | | | | |
| " ........ | 25 | " | C | 3 | 14 | 4 | 5 | 4 | 14½ | 5 | 10 | 6 | 1 | 6 | 6 | | | | | | | | |
| " ........ | 37 | " | C | 3 | 4 | 3 | 7 | 3 | 12 | 4 | 1 | 4 | 5 | 4 | 9½ | 4 | $1\frac{11}{12}$ | 5 | $14\frac{5}{12}$ | 1 | 12½ | 0 | 7⅛ |
| " ........ | 52 | " | C | 3 | 19 | 4 | 14 | 5 | 7 | 6 | 0 | 6 | 8 | 6 | 11 | | | | | | | | |
| " ........ | 62 | " | C | 3 | 4 | 3 | 9½ | 3 | 15½ | 4 | 10 | 5 | 1½ | 5 | 8 | | | | | | | | |
| " ........ | 72 | " | C | 3 | 19 | 4 | 9 | 4 | 15 | 5 | 9 | 5 | 14 | 6 | 3 | | | | | | | | |
| Group No. 2. | | | | | | | | | | | | | | | | | | | | | | | |
| Crate....... | 20 | B. Ply. Rock | C | 3 | 14 | 4 | 11 | 5 | 1 | 5 | 8 | 5 | 15 | 6 | 1 | | | | | | | | |
| " ....... | 21 | " | C | 3 | 4 | 3 | 5 | 4 | 0 | 4 | 3½ | 4 | 7 | 4 | 12 | | | | | | | | |
| " ....... | 31 | " | C | 3 | 4 | 3 | 1 | 3 | 10 | 4 | 5 | 4 | 15 | 5 | 2 | 3 | 13⅙ | 5 | 8 | 1 | 10⅚ | 0 | $6\frac{17}{24}$ |
| " ....... | 63 | " | C | 3 | 14 | 3 | 8 | 4 | 0½ | 5 | 0 | 5 | 9½ | 5 | 15 | | | | | | | | |
| " ....... | 86 | " | C | 3 | 14 | 4 | 1 | 4 | 5½ | 4 | 11½ | 4 | 15½ | 5 | 3½ | | | | | | | | |
| " ....... | 95 | " | C | 3 | 14 | 4 | 5 | 4 | 14½ | 5 | 2½ | 5 | 10 | 5 | 14½ | | | | | | | | |
| Group No. 3. | | | | | | | | | | | | | | | | | | | | | | | |
| Pen........ | 91 | Crosses..... | C | 3 | 14 | 3 | 4 | 3 | 12½ | 3 | 12½ | 4 | 11 | 5 | 0 | | | | | | | | |
| " ........ | 23 | " ..... | C | 3 | 14 | 3 | 7 | 3 | 15½ | 3 | 15½ | 4 | 11 | 5 | 0 | | | | | | | | |
| " ........ | 29 | " ..... | P | 3 | 0 | 2 | 5 | 2 | 12 | 2 | 15 | 3 | 3 | 3 | 3½ | 3 | ½ | 4 | $9\frac{1}{12}$ | 1 | $8\frac{7}{12}$ | 0 | $6\frac{7}{48}$ |
| " ........ | 35 | " ..... | P | 3 | 4 | 2 | 12 | 3 | 5 | 3 | 5 | 4 | 0 | 4 | 6 | | | | | | | | |
| " ........ | 64 | " ..... | P | 3 | 14 | 3 | 0 | 3 | 8 | 4 | 1 | 4 | 5 | 4 | 9 | | | | | | | | |
| " ........ | 66 | " ..... | C | 3 | 14 | 3 | 7 | 4 | 0 | 4 | 10½ | 5 | 0 | 5 | 4 | | | | | | | | |
| Group No. 4. | | | | | | | | | | | | | | | | | | | | | | | |
| Crate....... | 18 | Crosses..... | C | 3 | 14 | 3 | 2 | 3 | 5½ | 3 | 10 | 3 | 14½ | 4 | 1½ | | | | | | | | |
| " ....... | 21 | " ..... | C | 3 | 4 | 2 | 14½ | 3 | 6 | 3 | 14½ | 4 | 4 | 4 | 7½ | | | | | | | | |
| " ....... | 40 | " ..... | P | 3 | 4 | 2 | 13 | 3 | 3 | 3 | 11½ | 3 | 14 | 3 | 14 | 3 | 1¾ | 4 | 5⅙ | 1 | $3\frac{5}{12}$ | 0 | $4\frac{41}{48}$ |
| " ....... | 68 | " ..... | P | 3 | 14 | 3 | 7 | 3 | 14½ | 4 | 6 | 4 | 11 | 4 | 12½ | | | | | | | | |
| " ....... | 87 | " ..... | P | 3 | 14 | 3 | 1 | 3 | 3½ | 3 | 8 | 3 | 10 | 3 | 10½ | | | | | | | | |
| " ....... | 91 | " ..... | C | 3 | 14 | 3 | 5 | 3 | 13 | 4 | 5½ | 4 | 14 | 5 | 1 | | | | | | | | |

CHICKENS *vs.* OLD HENS IN PEN.

| Pen or Crate. | No. of leg band on Chicken or Hen. | Breed. | Cockerel, Pullet or Hen. | Age. Months. | Age. Days. | Weight. Beginning of Experiment. Lbs. | Oz. | 1st Week. Lbs. | Oz. | 2nd Week. Lbs. | Oz. | 3rd Week. Lbs. | Oz. | 4th Week. Lbs. | Oz. | Average at beginning of Experiment. Lbs. | Oz. | Average at close of Experiment. Lbs. | Oz. | Average total gain by chicken in 4 weeks. Lbs. | Oz. | Average gain by chicken in 1 week. Lbs. | Oz. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group No. 5. | | | | | | | | | | | | | | | | | | | | | | | |
| Pen......... | 19 | B. P. Rock. | C | 2 | 29 | 2 | 10 | 3 | 1 | 3 | 12 | 4 | 0 | 4 | 3 | | | | | | | | |
| " ......... | 20 | " .. | C | 2 | 29 | 2 | 12 | 3 | 2 | 3 | 6 | 4 | 5 | 4 | 11 | | | | | | | | |
| " ......... | 29 | " .. | C | 3 | 4 | 3 | 9 | 3 | 14 | 4 | 7 | 4 | 13 | 4 | 15 | | | | | | | | |
| " ......... | 32 | " .. | C | 2 | 29 | 2 | 13 | 3 | 7 | 4 | 2 | 4 | 8 | 4 | 12 | | | | | | | | |
| " ......... | 99 | " .. | C | 3 | 4 | 3 | 11 | 4 | 3 | 5 | 0 | 5 | 7 | 5 | 9 | | | | | | | | |
| " ......... | 50 | Cross Wh. Wy. & B. L. | C | 2 | 4 | 2 | 1 | 2 | 8 | 2 | 14 | 3 | 5 | 3 | 9 | 2 | 10 | 4 | 5 | 1 | 11 | 0 | $6\frac{3}{4}$ |
| " ......... | 72 | " .. | C | 2 | 4 | 1 | 14 | 2 | 5 | 2 | 15 | 3 | 5 | 3 | 8 | | | | | | | | |
| " ......... | 28 | S. L. Wy... | C | 2 | 16 | 2 | 8 | 2 | 14 | 3 | 7 | 3 | 13 | 4 | 2 | | | | | | | | |
| " ......... | 42 | Buff Orp.... | C | 2 | 16 | 2 | 4 | 2 | 11 | 3 | 6 | 3 | 14 | 4 | 3 | | | | | | | | |
| " ......... | 87 | C.W. & B.L. | C | 2 | 16 | 2 | 6 | 2 | 12 | 3 | 5 | 3 | 11 | 3 | 14 | | | | | | | | |
| Group No. 6. | | *Old Hens.* | | | | | | | | | | | | | | | | | | | | | |
| Pen......... | 23 | Buff Orp.... | H | 2 | years. | 6 | 6 | 7 | 2 | 7 | 10 | 7 | 13 | 8 | 0 | | | | | | | | |
| " ......... | 27 | " ... | H | 2 | " | 5 | 2 | 6 | 2 | 6 | 6 | 6 | 9 | 6 | 13 | | | | | | | | |
| " ......... | 38 | R. I. R..... | H | 2 | " | 4 | 11 | 5 | 1 | 5 | 14 | 6 | 4 | 6 | 5 | | | | | | | | |
| " ......... | 90 | " ..... | H | 2 | " | 5 | 4 | 5 | 15 | 6 | 5 | 6 | 9 | 6 | 9 | | | | | | | | |
| " ......... | 11 | B. P. R .... | H | 2 | " | 5 | 12 | 6 | 1 | 5 | 15 | 5 | 12 | 5 | 8 | | | | | | | | |
| " ......... | 17 | " .... | H | 2 | " | 8 | 4 | 8 | 10 | 9 | 2 | 9 | 10 | 9 | 12 | 5 | $8\frac{3}{10}$ | 6 | 10 | 1 | $1\frac{7}{10}$ | 0 | $4\frac{17}{40}$ |
| " ......... | 1 | W. P. R.... | H | 2 | " | 5 | 7 | 5 | 14 | 6 | 2 | 6 | 3 | 6 | 3 | | | | | | | | |
| " ......... | 9 | " .... | H | 2 | " | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 4 | 6 | 2 | | | | | | | | |
| " ......... | 58 | Cross Wh. Wy. & Br. Leg. | H | 1 | " | 5 | 1 | 5 | 15 | 6 | 2 | 6 | 2 | 6 | 1 | | | | | | | | |
| " ......... | 64 | " | H | 1 | " | 4 | 8 | 4 | 11 | 4 | 14 | 5 | 0 | 4 | 15 | | | | | | | | |

Summary of Results, Pen vs. Crate. Weight, Development, Cost of Production, Profit from Sale of Carcases.

| Group No. | Pen or Crate. | Number of Chickens. | Weight. At beginning of experiment. | | Weight. At close of experiment. | | Total increase in four weeks. | | Cost of Production. Chickens. Initial weight. | | Cost of Production. Chickens. Value at 10c. per lb. | Cost of Production. Food. Amount consumed in 4 weeks. | Cost of Production. Food. Value at $1\frac{1}{4}$c. per lb. | Cost to produce one pound of increase. | Total cost of production. | Returns from sale at 13c. per lb. | Profit on six chickens. Labour not counted. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Lbs. | Oz. | Lbs. | Oz. | Lbs. | Oz. | Lbs. | Oz. | $ cts. | Lbs. | cts. | cts. | $ cts. | $ cts. | $ cts. | |
| | | | | | | | | | | | | | | | | | | *Rations for 1 and 2 Groups.* |
| 1 | Pen. | 6 | 24 | 11 | 35 | 6 | 10 | 11 | 24 | 11 | 2.47 | 39 | 49 | $4\frac{1}{2}$ | 2.96 | 4.60 | 1.64 | Ground oats, 2 parts; ground barley, 1 part; corn meal, 1 part; mixed with skimmed milk. |
| 2 | Crate. | 6 | 22 | 15 | 33 | 0 | 10 | 1 | 22 | 15 | 2.29 | 39 | 49 | $4\frac{4}{5}$ | 2.78 | 4.29 | 1.51 | |
| | | | | | | | | | | | | | | | | | | *Rations for Groups 3 and 4.* |
| 3 | Pen. | 6 | 18 | 3 | 27 | 6 | 9 | 3 | 18 | 3 | 1.82 | 36 | 45 | $4\frac{9}{10}$ | 2.27 | 3.56 | 1.29 | Ground oats, 4 parts; ground barley, 2 parts; ground corn, 1 part; meat meal, 1 part; mixed with skimmed milk. |
| 4 | Crate. | 6 | 18 | 10 | 25 | 15 | 7 | 5 | 18 | 10 | 1.86 | 36 | 45 | $6\frac{1}{10}$ | 2.31 | 3.37 | 1.06 | |
| | | | | | | | | | | | | | | | | | | *Rations for Groups 5 and 6.* |
| 5 | Pen. | 10 | 26 | 8 | 43 | 4 | 16 | 12 | 26 | 8 | 2.65 | 58 | 73 | $4\frac{1}{3}$ | 3.38 | 5.62 | 2.24 | Finely ground oats, 4 parts; ground peas, 1 part; ground corn, 1 part; meat meal, 1 part, mixed with skim milk. |
| 6 | " | 10 | 55 | 3 | 66 | 4 | 11 | 1 | 55 | 3 | 5.52 | 54 | 68 | $6\frac{1}{3}$ | 6.20 | 8.61 | 2.41 | |

Results of the foregoing experiments permit of the following deductions:—

The pullets with one exception did not make as great gains as cockerels of the same age.

Old hens which are well fed require no further treatment to make them fit for killing.

The older the hen the more readily does she take on fat rather than flesh.

The cross-bred chickens, although fed on a more nutritive ration, did not make as much weight as pure-bred ones.

The chickens which were loose in their pens with limited run, made slightly greater weight development, at cheaper cost, than those in crates.

### STOCK ON HAND.

The following list will show the number, kind and disposition of the different varieties in our poultry houses at the present date, December, 1904:—

| Pen No. | Breed. | Cock. | Hens. | Cockerels. | Pullets. | Remarks. |
|---|---|---|---|---|---|---|
| 1 | B. Ply. Rocks | 1 | 12 | ........ | ........ | |
| 2 | " | 1 | 12 | ........ | ........ | |
| 3 | Wh. " | 1 | 8 | ........ | 4 | |
| 4 | Buff Orpingtons | 1 | 12 | ........ | ........ | |
| 5 | Wh. Leghorns | ........ | ........ | 1 | 12 | |
| 6 | S. G. Dorkings | 1 | 12 | ........ | ........ | |
| 7 | Black Minorcas | ........ | ........ | 1 | 11 | |
| 8 | Wh. Leghorns | ........ | 12 | 1 | ........ | |
| 9 | Buff Leghorns | ........ | 3 | 1 | 8 | |
| 10 | Cock and cockerels | 1 | ........ | 3 | ........ | 1 S. S. Hamburg cock, 1 S. S. Wyandotte cockerel, 2 Faveroiles. |
| 11 | Blk. Minorcas | ........ | ........ | 7 | ........ | |
| 12 | Buff Leghorns | ........ | ........ | 6 | ........ | |
| 13 | Black Hamburgs | 1 | ........ | 5 | ........ | |
| 14 | Rock and Wyandottes | ........ | ........ | 6 | ........ | |
| 15 | Capons | ........ | ........ | 7 | ........ | |
| 16 | Black Hamburgs | ........ | 4 | 1 | ........ | |
| 17 | " " | ........ | ........ | ........ | 7 | |
| 18 | S. S. " | ........ | 4 | ........ | 3 | |
| 19 | Wh. Leghorns | ........ | ........ | ........ | 7 | |
| 20 | S. S. Wyandottes | ........ | 3 | ........ | 3 | |
| 21 | Rock and Wyandottes | 1 | ........ | 1 | ........ | 1 B. Ply. Rock and 1 Wh. Wyandotte. |
| 22 | Faverolles | 1 | 4 | ........ | 6 | |
| 23 | Blk. Minorcas | 1 | 5 | ........ | ........ | |
| 24 | S. G. Dorkings | ........ | ........ | 1 | 8 | |
| 25 | L. Brahmas | 1 | 3 | ........ | 3 | |
| 26 | Crosses | ........ | ........ | ........ | 10 | |
| 27 | " | ........ | ........ | 1 | 10 | |
| 28 | Buff Orpingtons | ........ | ........ | 1 | 10 | |
| 29 | Wh. Wyandottes | ........ | 10 | ........ | ........ | |
| 30 | Crosses | ........ | 12 | ........ | ........ | |
| 31 | Cockerels | ........ | ........ | 7 | ........ | 2 B. Ply. Rocks, 4 White Ply. Rocks, 1 Wh. Wyandotte. |
| 32 | Pullets (late) | ........ | ........ | ........ | 12 | 5 B Ply. Rocks, 7 crosses. |
| 33 | Late cockerels | ........ | ........ | 12 | ........ | All kinds. |
| 34 | B. Ply. Rocks | ........ | ........ | 1 | 24 | |
| 35 | Wh. Wyandottes | ........ | ........ | 1 | 24 | |

# EXPERIMENTAL FARM FOR THE MARITIME PROVINCES.

## REPORT OF R. ROBERTSON, SUPERINTENDENT.

NAPPAN, N.S., November 30, 1904.

To DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa,

SIR,—I have the honour to submit herewith my annual report of operations on the experimental farm for the maritime provinces at Nappan, N.S.

The season just passed has been the most unfavourable for farm crops of any for some years. Crops generally made a good start, but continued dry weather until the latter part of July, resulted in all farm crops being below the average. Owing to the unfavourable season, and also to the breaking of dykes in the fall of 1903, which caused the marsh to be flooded with salt water, the crop of marsh hay was very much lighter than usual. Clover sown with grain crops made a good start, but almost all died out in July due to lack of moisture. Roots also suffered greatly for want of rain. The red-backed cutworm did considerable damage, especially to the mangel crop, and many fields in the maritime provinces were practically destroyed by this pest. Pastures were exceptionally poor except in the very early part of the season.

I wish to again acknowledge my indebtedness for valuable assistance rendered by Mr. J. Thomas Coates, farm foreman, who has kept all records of crop experiments, and to Mr. R. Donaldson, herdsman, who has kept all records of live stock experiments, each doing so in a careful and painstaking manner.

### WEATHER.

The temperature during December was higher than usual, but the snowfall was greater than that for a number of years past. There was quite a fall of snow on the 1st, which, with that on the following day, amounted to about six inches, and made very good sleighing. There was rain and snow on the 3rd, and about twelve inches of snow on the 4th. This made the roads heavy for travel, but soon they were in good condition. The weather continued fine, with occasional snowfalls until the 13th, excepting the 10th, when wind and rain took off some of the snow. The 13th was mild, with rain, which took off much of the snow, making sleighing poor. On the 17th the thermometer went to zero, and on the 18th 4° below zero was registered. The weather kept cold to the 21st, when a thaw with rain took the snow all off. The 22nd was also mild, after which cooler weather continued to the 27th, when the thermometer went to 4° below zero, and 5° below on the 29th, and 2° below on the 30th. It snowed again on the 30th, making good sleighing.

January commenced with very bright cold weather on the 1st and 2nd, when the thermometer registered 10° and 14° below zero on these dates respectively. There was a heavy snow and wind storm on the 3rd and on the 4th, roads had to be broken out in many places. This was followed by light cold weather to the 10th, except a light snowfall on the 8th and 9th. The thermometer registered 11°, 14°, 12°, 2° and 5° below zero on the 3rd, 4th, 5th, 6th and 8th, respectively. From the 10th to the 17th was quite moderate, with occasional falls of snow, and a light rain on the 14th. On the 17th a snow and wind storm blocked the roads again. The weather was fine from this date to the 23rd, when it thawed and some rain fell. The thermometer registered 0°, 15°, 17° and 12° below zero on the 18th, 19th, 20th and 22nd ,respectively. There was a sleet storm on the 25th, followed by quite fine cold weather which continued to the end of the month. The thermometer registered zero on the 26th and 28th, and 3° and 8° below zero on the 29th and 31st, respectively.

February commenced with rain. The thermometer, however, fell below zero the following day, and on the 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, 9th and 10th registered 3°, 3°, 6°, 5°, 29°, 2°, 0°, 3° and 8° below zero respectively. This period was more or less windy with occasional snowfalls. From the 10th to the 14th was fine, with snow on the 15th, which drifted badly on the 16th and 17th. The thermometer registered 10°, 8° and 10° below zero on the 13th, 14th and 15th respectively. On the 19th and 21st the thermometer registered 6° and 15° below zero. There was a rain on the 22nd. The balance of the month was more or less broken by wind and snow storms, and very cold on the 27th and 28th, when the thermometer went to 19° and 16° below zero respectively. The month throughout was much colder than usual.

The thermometer went below zero only three times in March, on the 5th, 6th and 18th, when it registered 1°, 4° and 1° below zero respectively. The first of the month was quite cold, with a thaw on the 3rd, and a wind, rain and lightning on March 4th, which made quite a freshet. It froze up again and remained cold to the 7th, when it moderated, followed by a thaw and rain on the 8th and mild on the 9th. From this time to the 16th the weather was fine and quite cold. From the 16th to the 27th was more or less broken with snow and rain storms, with a thaw on the 26th which took off about all the snow and broke up sleighing. The remainder of the month was fine.

April commenced cold but fine, followed by fine moderate weather to the 9th. Rain fell on the 9th, 10th and 12th. The 14th and 15th were cold and windy, and on the 16th there was quite a fall of snow. The 17th and 18th were fine but cold, and on the 19th nearly an inch of rain fell. This was followed by an unusually heavy snow storm, accompanied by wind which made the snow drift badly. The remainder of April was fine, with warm drying winds, except the last two days, when rain fell. The rainfall for the month was 2·92 inches.

May was fine to the 17th, with the exception of the 10th, when a light rain occurred. On the 17th and 19th 1·23 inches of rain fell. The first seeding was done May 4, and continued to the 17th. From the 19th to the end of the month several small showers are recorded, but seeding continued practically uninterrupted. The month throughout was warmer than usual. Frost is recorded only four times during the month. On the 1st, 2nd, 6th and 7th there was 1°, 5°, 6° and 5° of frost respectively. Vegetation made very rapid growth and the season which appeared backward when May opened was at the close of the month as far advanced as usual. The total rainfall for the month was 1·76 inches.

The month of June was exceptionally dry and fine throughout. The rainfall on the 5th of about ¾ of an inch, and on the 22nd of nearly ½-inch were the only rains of any consequence during the month. The total rainfall for the month was 1·74 inches. The thermometer registered frost on the 9th, and 2° of frost on the 10th, which did considerable damage. The thermometer went to 80° and above three times, on the 21st, 26th and 27th, when 80°, 80° and 82° was registered, respectively. The month throughout was considerably warmer than last year. Crops suffered towards the last of the month for want of rain, and seed of late sown roots did not germinate well.

The month of July was unusually warm, and while 2·15 inches of rain fell; yet, warm drying winds following the showers, none of which were sufficient to more than wet the surface of the ground, quickly dried up the ground again and crops suffered greatly. The thermometer registered above 80° twelve times during the month. The highest temperature was on the 13th, 18th and 29th, when 83° was registered.

The month of August, while warmer somewhat than the previous year, was not as warm as usual. The thermometer only once went to 80°, and that was on the 4th. There was a light rainfall on the 1st, but the early part of the month was entirely too dry for growth, and grain crops especially ripened up prematurely. After the 11th the month was more or less broken, and the rainfall of 1·70 inches on the 21st was the first one during the season to wet the ground sufficiently for root crops to grow properly. The rainfall during the month was 3·51 inches. There was a heavy wind storm the 23rd, which did considerable damage to crops, especially corn and apples.

There was a heavy rainfall on September 3, 4 and 6, totalling 1·90 inches; also on the 25th of 1·20 inches, and other showers with these brought the month's fall of rain to 4·52 inches. The month, generally speaking, was fine and a good one for getting along with work. The temperature on the average was not as high as last season, and much lower than for the past three years. The highest temperature for the month was recorded on the 15th and 17th, of 77°. There was a heavy wind storm with some rain on the 15th. This was accompanied by very high tides, one of which was increased by the high wind prevailing, and did great damage by running over and breaking a great amount of dyke and flooding marsh lands in this section. The thermometer went to freezing on the 9th, 20th, 22nd and 29th, and there was 1° of frost on the 1st, 9° on the 23rd, and 2° on the 28th.

During the month of October there was one quite heavy rainfall on the 13th of ·97 inches, and a very heavy one on the 22nd of 2·98 inches. Outside of these the month was quite fine, with occasional showers, making the total rain for the month 5 inches. There was more or less frost during the month, and the thermometer went below freezing during 14 nights. The lowest temperature, however, was on the 8th, when 9° of frost was registered.

November commenced with a slight fall of snow, followed by cold weather until the 4th, when there was quite a heavy fall of rain, and a shower on the 6th. The following week was fine but cold, the ground not thawing sufficiently to harvest roots and plough. The 14th commenced wet, followed by snow and wind, and the temperature below freezing. The 16th was milder, followed by colder weather; some snow on the 17th, and rain on the 18th. The weather continued quite fine and moderate until the 26th, with quite a rainfall on the 24th. The 28th and 29th were cold, followed by rain and a thaw on the 30th.

RAINFALL.

| | | |
|---|---|---|
| April | 2·92 | inches. |
| May | 1·76 | " |
| June | 1·74 | " |
| July | 2·15 | " |
| August | 3·51 | " |
| September | 4·52 | " |
| October | 5·00 | " |
| November | 3·39 | " |
| Total | 24·99 | " |

## METEOROLOGICAL RECORD.

The maximum and minimum thermometrical observations for the year beginning December 1, 1903, and ending November 30, 1904 :—

| Month. | Maximum. | Minimum. |
|---|---|---|
| 1903. | | |
| December | 10th 47° above zero | 29th 5° below zero. |
| 1904. | | |
| January | 14th 42° above zero | 20th 17° below zero. |
| February | 22nd 43° " | 6th 29° " |
| March | 26th 53° " | 6th 4° " |
| April | 30th 66° " | 4th 9° above zero. |
| May | 9th 75° " | 6th 26° " |
| June | 27th 82° " | 10th 30° " |
| July | 13th, 18th and 29th, 83° above zero. | 9th 45° " |
| August | 4th 80° above zero | 30th 35° " |
| September | 15th and 17th 77° above zero | 23rd 23° " |
| October | 21st 78° above zero | 8th 23° " |
| November | 24th 49° above zero- | 29th 12° " |

## EXPERIMENTS WITH OATS.

Experiments were again continued this year with the leading sorts of oats which were grown in uniform test plots of one-fortieth acre each. Forty-two varieties were included in this test. The plots all received the same treatment and were on soil practically uniform throughout.

The ground was a sandy loam, and was previously in mangels, having been manured for that crop with 30 one-horse cart loads of stable manure per acre. The land was ploughed in the fall after the mangel crop was harvested, and this spring was harrowed twice with the springtooth, and once with the smoothing harrow. The seed was sown May 13, at the rate of 2½ bushels of seed per acre with the seed drill. The ground was also seeded down to clover and Timothy at the rate of 3 pounds Alsike clover, 7 pounds Mammoth Red clover and 12 pounds of Timothy seed per acre by means of a grass seed attachment to the grain drill. The grain used was from heads selected in the field at harvest time before cutting the various plots the previous season, except the variety, Storm King, a new variety originated by Garton Bros., England, seed of which was sent from the Experimental Farm, Ottawa.

No fertilizer was used on these plots this season. The grain started well and made fair growth to the middle of July, when the effect of the continued dry weather was quite apparent. The grain ripened up prematurely, giving a light crop of only fairly well filled oats. The straw was short but stiff, and only a few heads of smut were noticeable. Some slight rust made its appearance early in August. The following yields were obtained from these plots.

OATS—TEST OF VARIETIES.

| Number. | Name of Variety. | Date of Ripening. | No. of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Kind of Head. | Weight of Straw. | Yield per Acre. Bush. | Yield per Acre. Lbs. | Weight per Bushel. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | In. | | In. | | Lbs. | Bush. | Lbs. | |
| 1 | Swedish Select........ | Aug. 19 | 98 | 36—40 | Stiff...... | 6—8 | Branching.. | 4,280 | 72 | 32 | 38 |
| 2 | Siberian ............ | " 22 | 101 | 38—42 | " ..... | 6—8 | " .. | 3,600 | 69 | 14 | 35 |
| 3 | Golden Fleece .... .. | " 20 | 99 | 33—38 | " ..... | 5—8 | " .. | 4,160 | 68 | 8 | 35 |
| 4 | Columbus............. | " 19 | 98 | 35—40 | Medium.. | 6—7 | " .. | 2,800 | 65 | 30 | 36 |
| 5 | Banner............... | " 19 | 98 | 37—40 | Stiff...... | 6—8 | " .. | 3,600 | 64 | 4 | 35½ |
| 6 | Golden Beauty....... | " 19 | 98 | 38—42 | " ..... | 6—8 | " .. | 3,880 | 63 | 18 | 35 |
| 7 | Golden Tartarian...... | " 27 | 106 | 33—37 | " ..... | 6—9 | Sided....... | 3,520 | 63 | 18 | 34 |
| 8 | Irish Victor .......... | " 18 | 97 | 38—42 | " ..... | 6—8 | Branching.. | 3,200 | 62 | 12 | 36 |
| 9 | Holstein Prolific...... | " 20 | 99 | 37—41 | " ..... | 6—8 | " .. | 3,480 | 61 | 26 | 36 |
| 10 | Wide Awake.......... | " 19 | 98 | 38—41 | " ..... | 6—8 | " .. | 3,200 | 61 | 6 | 37½ |
| 11 | Lincoln.............. | " 22 | 101 | 33—38 | " .... | 6—8 | " .. | 3,120 | 61 | 6 | 36½ |
| 12 | Goldfinder............ | " 24 | 103 | 34—38 | " ..... | 6—8 | " .. | 3,160 | 61 | 6 | 35 |
| 13 | Waverley............ | " 18 | 97 | 40—46 | " ..... | 6—9 | " .. | 3,320 | 60 | 20 | 36 |
| 14 | Golden Giant......... | " 27 | 106 | 33—38 | " ..... | 6—9 | Sided....... | 3,880 | 60 | 20 | 33 |
| 15 | Sensation............ | " 18 | 97 | 38—43 | " ..... | 6—9 | Branching.. | 3,240 | 60 | .. | 37½ |
| 16 | White Giant.......... | " 20 | 99 | 32—38 | " ..... | 5—8 | " .. | 3,840 | 60 | .. | 34 |
| 17 | Improved American... | " 22 | 101 | 34—39 | " ..... | 5—8 | " .. | 3,920 | 60 | .. | 34 |
| 18 | Twentieth Century.... | " 18 | 97 | 36—40 | Medium.. | 7—8 | " .. | 3,040 | 59 | 14 | 37 |
| 19 | Pioneer.............. | " 17 | 96 | 35—40 | Stiff...... | 6—8 | " .. | 3,880 | 58 | 28 | 38 |
| 20 | Abundance........... | " 20 | 99 | 33—38 | " ..... | 5—8 | " .. | 3,840 | 58 | 28 | 35½ |
| 21 | Thousand Dollar...... | " 20 | 99 | 34—38 | " ..... | 5—8 | " .. | 3,520 | 57 | 2 | 37 |
| 22 | Joanette............. | " 17 | 96 | 32—36 | " ..... | 5—7 | " .. | 3,200 | 56 | 16 | 36 |
| 23 | American Beauty..... | " 19 | 98 | 39—43 | " ..... | 6—8 | " .. | 3,320 | 56 | 16 | 35 |
| 24 | Danish Island ........ | " 24 | 103 | 34—40 | " ..... | 5—8 | " .. | 3,880 | 56 | 16 | 34 |
| 25 | Improved Ligowo..... | " 18 | 97 | 34—40 | " ..... | 6—8 | " .. | 3,600 | 56 | 16 | 37 |
| 26 | Milford Black ........ | " 20 | 99 | 33—38 | " ..... | 6—8 | Sided....... | 3,720 | 55 | 10 | 38 |
| 27 | Early Golden Prolific.. | " 19 | 98 | 38—42 | Medium.. | 6—8 | Branching.. | 3,400 | 55 | 10 | 35 |
| 28 | Bavarian...... ...... | " 20 | 99 | 32—38 | Stiff...... | 6—8 | " .. | 3,840 | 55 | 10 | 35 |
| 29 | Kendal White ........ | " 20 | 99 | 32—36 | " ..... | 5—8 | Sided....... | 3,080 | 55 | 10 | 36 |
| 30 | Scotch Potato......... | " 22 | 101 | 38—42 | " ..... | 6—9 | Branching.. | 3,680 | 54 | 4 | 36½ |
| 31 | Kendal Black........ | " 20 | 99 | 35—40 | " ..... | 6—8 | Sided....... | 3,480 | 52 | 32 | 38 |
| 32 | Black Beauty......... | " 17 | 96 | 36—41 | Medium.. | 7—9 | Branching.. | 3,000 | 51 | 26 | 36 |
| 33 | Tartar King.......... | " 18 | 97 | 37—40 | Stiff...... | 6—8 | Sided...... | 3,160 | 50 | 20 | 39 |
| 34 | Storm King..... .... | " 19 | 98 | 32—38 | " ..... | 6—8 | " ...... | 3,520 | 50 | 20 | 38 |
| 35 | Pense Black ......... | " 20 | 99 | 33—38 | " ..... | 5—8 | " . . . | 3,080 | 49 | 14 | 38 |
| 36 | Buckbee's Illinois... . | " 23 | 102 | 35—40 | " ..... | 6—9 | Branching.. | 3,240 | 49 | 14 | 36 |
| 37 | Olive Black .......... | " 20 | 99 | 32—38 | " ..... | 6—8 | Sided....... | 3,280 | 48 | 8 | 38 |
| 38 | Pense White.......... | " 20 | 99 | 33—38 | " ..... | 6—8 | " ...... | 3,120 | 48 | 8 | 38 |
| 39 | Milford White... .... | " 20 | 99 | 32—37 | " ..... | 5—8 | " ...... | 2,680 | 45 | 30 | 38 |
| 40 | Mennonite............ | " 24 | 103 | 34—38 | " ..... | 6—8 | Branching.. | 3,080 | 45 | 30 | 36 |
| 41 | Olive White ......... | " 20 | 99 | 33—38 | " ..... | 6—8 | Sided....... | 2,920 | 44 | 24 | 38 |
| 42 | American Triumph.... | " 27 | 106 | 34—39 | " ..... | 6—9 | Branching.. | 3,440 | 44 | 24 | 36 |

## EXPERIMENTS WITH BARLEY.

Twenty varieties of six-rowed and fifteen varieties of two-rowed were sown May 24 in plots of one-fortieth acre each. The land was a sandy loam and was in corn the previous season, for which crop 25 one-horse cart loads of stable manure per acre was used. The ground was ploughed after the corn crop was removed, and this spring was worked up twice with the springtooth harrow and once with the smoothing harrow. The seed sown was from heads selected in the field at harvest time before the plots were cut the previous season.

The grain was sown with the seed drill at the rate of 2 bushels per acre, and 3 lbs. alsike clover, 7 lbs. Mammoth Red Clover and 12 lbs. Timothy seed was sown at the same time. No fertilizer was used this season. The seed germinated well but owing to the drought the straw was short and the yield per acre not up to the average. There was no rust, and very few heads of smut. The following table gives further information respecting this test :—

BARLEY, SIX-ROWED—TEST OF VARIETIES.

| Number. | Name of Variety. | Date of Ripening. | Number of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Weight of Straw. | Yield per Acre. | | Weight per Bushel. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Inches. | | Inches. | Lbs. | Bush. | Lbs. | Lbs. |
| 1 | Trooper | Aug. 16.. | 84 | 35—40 | Stiff..... | 2 —3 | 4,720 | 50 | .. | 48 |
| 2 | Mensury | " 18.. | 86 | 35—40 | " ..... | 2½—3¼ | 4,600 | 49 | 8 | 46 |
| 3 | Royal | 23.. | 91 | 35—40 | Medium.. | 2 —2½ | 4,440 | 49 | 8 | 48 |
| 4 | Yale | " 24.. | 92 | 35—40 | Stiff..... | 2 —3 | 3,880 | 47 | .. | 47½ |
| 5 | Oderbruch | " 16.. | 84 | 34—38 | Medium.. | 2 —3 | 4,120 | 45 | 40 | 46½ |
| 6 | Stella | " 25.. | 93 | 34—37 | Stiff..... | 2 —2½ | 4,400 | 45 | 40 | 48 |
| 7 | Rennie's Improved | 16.. | 84 | 32—36 | " ..... | 2 —2½ | 4,040 | 45 | .. | 47 |
| 8 | Empire | " 20.. | 88 | 35—40 | " ..... | 2 —3 | 4,000 | 45 | .. | 47 |
| 9 | Summit | " 25.. | 93 | 34—37 | " ..... | 2 —2½ | 3,480 | 44 | 8 | 48 |
| 10 | Brome | " 20.. | 88 | 30—33 | " ..... | 1½—2½ | 3,360 | 44 | 8 | 46 |
| 11 | Common | " 16.. | 84 | 34—37 | Medium.. | 2 —3 | 3,560 | 43 | 16 | 47 |
| 12 | Odessa | " 16.. | 84 | 34—38 | " .. | 2 —3 | 3,720 | 43 | 16 | 46½ |
| 13 | Garfield | " 20.. | 88 | 35—40 | Stiff..... | 2 —3 | 3,800 | 42 | 24 | 46 |
| 14 | Nugent | " 22.. | 90 | 33—36 | " ..... | 2 —3 | 3,840 | 41 | 32 | 47 |
| 15 | Claude | " 16.. | 84 | 32—36 | Medium.. | 2 —2½ | 3,600 | 41 | 32 | 46½ |
| 16 | Albert | " 16.. | 84 | 33—36 | " .. | 2 —3 | 3,320 | 40 | .. | 48 |
| 17 | Baxter | " 16.. | 84 | 31—35 | " .. | 2 —2½ | 3,040 | 39 | 8 | 46 |
| 18 | Champion | " 15.. | 83 | 36—42 | " .. | 2½—3½ | 4,200 | 38 | 16 | 40 |
| 19 | Mansfield | " 23.. | 91 | 33—38 | Stiff..... | 2½—3¼ | 3,240 | 37 | 24 | 46 |
| 20 | Argyle | " 19.. | 87 | 33—36 | " ..... | 2 —3 | 3,160 | 35 | 40 | 47 |

BARLEY, TWO-ROWED—TEST OF VARIETIES.

| Number. | Name of Variety. | Date of Ripening. | Number of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Weight of Straw. | Yield per Acre. | | Weight per Bushel. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Inches. | | Inches. | Lbs. | Bush. | Lbs. | Lbs. |
| 1 | Danish Chevalier | Aug. 22.. | 90 | 32—36 | Medium.. | 3 —4 | 5,000 | 57 | 24 | 50 |
| 2 | French Chevalier | " 22.. | 90 | 30—35 | " .. | 3 —4 | 3,880 | 45 | 40 | 49½ |
| 3 | Dunham | " 22.. | 90 | 35—40 | " .. | 3 —4 | 4,800 | 44 | 8 | 50 |
| 4 | Beaver | " 20.. | 88 | 32—35 | " .. | 2½—3½ | 3,800 | 42 | 24 | 50 |
| 5 | Logan | " 24.. | 92 | 35—40 | " .. | 3 —4 | 4,800 | 41 | 32 | 50 |
| 6 | Harvey | " 24.. | 92 | 32—36 | " .. | 2 —3 | 3,600 | 36 | 32 | 49 |
| 7 | Clifford | " 22.. | 90 | 36—40 | " .. | 2½—3½ | 3,640 | 35 | .. | 50 |
| 8 | Sidney | " 22.. | 90 | 30—35 | " .. | 3 —3½ | 2,880 | 32 | 24 | 49 |
| 9 | Fulton | " 24.. | 92 | 34—38 | " .. | 2 —3 | 3,680 | 32 | 4 | 50 |
| 10 | Invincible | " 24.. | 92 | 30—35 | " .. | 2½—3¼ | 3,440 | 31 | 24 | 48 |
| 11 | Standwell | " 24.. | 92 | 28—33 | " .. | 2 —3 | 2,880 | 27 | 24 | 47 |
| 12 | Newton | " 24.. | 92 | 30—34 | " .. | 2¼—3 | 2,640 | 26 | 32 | 47 |
| 13 | Canadian Thorpe | " 24.. | 92 | 34—36 | Stiff..... | 2 —3 | 2,400 | 22 | 24 | 49 |
| 14 | Jarvis | " 20.. | 88 | 30—36 | Medium.. | 2½—3¼ | 2,520 | 21 | 32 | 48 |
| 15 | Gordon | " 22.. | 90 | 32—36 | Stiff..... | 2 —3 | 1,800 | 21 | 32 | 48 |

## EXPERIMENTS WITH SPRING WHEAT.

The ground selected for the wheat plots was similar to that on which the oats were grown, and received the same treatment. The seed sown was from heads selected in the field at harvest time before cutting the various plots the previous season. The seed was sown May 12, at the rate of 1¾ bushels per acre with the grain drill, and 3 lbs. Alsike clover, 7 lbs. Mammoth Red clover, and 12 lbs. Timothy seed per acre was sown at the same time.

The plots were one-fortieth of an acre each and thirty-six varieties were included in the test. The seed started well, but owing to the effect of the continued drought the crop was light, and rust early in August did considerable damage to the straw and the grain did not fill out well. The yield per acre and other information obtained from these plots is given in the following table :—

SPRING WHEAT—TEST OF VARIETIES.

| Number. | Name of Variety. | Date of Ripening. | No. of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Kind of Head. | Weight of Straw. | Yield per Acre. | | Weight per Bushel. | Rusted. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | In. | | In. | | Lbs. | Bush. | Lbs. | Lbs. | |
| 1 | Byron | Aug. 20 | 100 | 40—44 | Stiff | 2 —3 | Bearded | 4,600 | 28 | 40 | 60 | Slightly. |
| 2 | Red Fife | " 24 | 104 | 42—47 | " | 2 —3 | Beardless | 4,800 | 28 | .. | 59 | " |
| 3 | White Fife | " 24 | 104 | 44—48 | " | 2 —3½ | " | 4,400 | 27 | 20 | 59 | " |
| 4 | Rio Grande | " 22 | 102 | 43—48 | " | 2½—4 | Bearded | 4,480 | 27 | .. | 60 | " |
| 5 | Admiral | " 22 | 102 | 44—48 | " | 2 —3 | Beardless | 3,600 | 26 | 40 | 58½ | Badly. |
| 6 | Preston | " 20 | 100 | 42—44 | " | 2 —3 | Bearded | 3,400 | 26 | .. | 59 | Slightly. |
| 7 | Australian No. 9 | " 22 | 102 | 40—45 | " | 2 —3 | Beardless | 3,040 | 26 | .. | 59 | Badly. |
| 8 | White Russian | " 24 | 104 | 44—47 | " | 2½—3½ | " | 3,920 | 26 | .. | 60 | Slightly. |
| 9 | Benton | " 22 | 102 | 42—46 | " | 2½—3½ | " | 3,720 | 25 | 20 | 59 | " |
| 10 | Wellman's Fife | " 24 | 104 | 43—48 | " | 2½—3½ | " | 4,640 | 25 | 20 | 58½ | Badly. |
| 11 | Dawn | " 22 | 102 | 32—36 | " | 2 —3 | " | 2,840 | 24 | 40 | 59 | Slightly. |
| 12 | Colorado | " 20 | 100 | 42—48 | " | 2 —3 | Bearded | 3,080 | 24 | 40 | 60½ | Medium. |
| 13 | Plumper | " 20 | 100 | 36—40 | " | 2 —3 | " | 3,840 | 24 | 20 | 60½ | Slightly. |
| 14 | Early Riga | " 18 | 98 | 38—43 | " | 2 —2½ | Beardless | 2,880 | 24 | 20 | 59 | " |
| 15 | Monarch | " 25 | 105 | 40—46 | " | 2¼—3½ | " | 2,880 | 24 | 20 | 59½ | " |
| 16 | Crawford | " 23 | 103 | 42—46 | " | 2 —3 | " | 2,960 | 24 | .. | 58½ | Badly. |
| 17 | Huron | " 22 | 102 | 42—45 | " | 2 —3 | Bearded | 3,480 | 24 | .. | 60 | Slightly. |
| 18 | Hastings | " 22 | 102 | 36—42 | Medium | 2 —3 | Beardless | 2,920 | 24 | .. | 60½ | " |
| 19 | Countess | " 22 | 102 | 40—44 | Stiff | 2 —3 | " | 2,880 | 23 | 20 | 58 | " |
| 20 | Herisson Bearded | " 22 | 102 | 40—44 | Medium | 1½—2 | Bearded | 3,920 | 23 | 20 | 60 | " |
| 21 | Chester | " 22 | 102 | 40—43 | Stiff | 2 —3 | Beardless | 3,520 | 23 | .. | 59 | " |
| 22 | Power's Fife (Minn. 149) | " 22 | 102 | 40—45 | " | 2 —3 | " | 2,880 | 22 | 40 | 59½ | " |
| 23 | Red Fern | " 22 | 102 | 42—46 | " | 2½—3½ | Bearded | 2,960 | 22 | 40 | 59 | " |
| 24 | Laurel | " 25 | 105 | 45—48 | " | 3 —4 | Beardless | 3,880 | 22 | 20 | 59 | " |
| 25 | Pringle's Champlain | " 20 | 100 | 45—48 | " | 2½—3½ | Bearded | 3,120 | 22 | .. | 60 | " |
| 26 | Advance | " 22 | 102 | 40—44 | " | 2 —3 | " | 2,520 | 21 | 40 | 59 | Badly. |
| 27 | Hayne's Blue Stem (Minn. 169) | " 24 | 104 | 40—44 | " | 2½—4 | Beardless | 2,640 | 21 | 40 | 59 | Slightly. |
| 28 | Clyde | " 22 | 102 | 38—42 | " | 2½—4 | " | 2,760 | 21 | 20 | 58 | " |
| 29 | Hungarian | " 22 | 102 | 40—42 | Medium | 2 —3 | Bearded | 3,200 | 21 | 20 | 60 | " |
| 30 | Australian No. 19 | " 22 | 102 | 36—40 | Stiff | 2 —3 | Beardless | 2,440 | 21 | .. | 59 | Badly. |
| 31 | Weldon | " 22 | 102 | 40—45 | " | 2 —3½ | " | 2,280 | 20 | 40 | 59 | Slightly. |
| 32 | Stanley | " 24 | 104 | 42—46 | " | 2 —3¼ | " | 4,240 | 20 | 20 | 59½ | " |
| 33 | Fraser | " 20 | 100 | 34—40 | Medium | 2 —2½ | Bearded | 2,680 | 20 | .. | 59 | " |
| 34 | Minnesota No. 163 | " 24 | 104 | 39—43 | Stiff | 2 —3½ | Beardless | 2,480 | 20 | .. | 59 | " |
| 35 | McKendry's Fife (Minn. 181) | " 24 | 104 | 40—45 | " | 2 —3¼ | " | 3,440 | 20 | .. | 59 | " |
| 36 | Percy | " 23 | 103 | 43—47 | " | 2 —3¼ | " | 4,080 | 18 | 40 | 58 | Badly. |

## EXPERIMENTS WITH MACARONI WHEAT.

Four varieties of Macaroni wheat were sown. These were grown in plots of one-fortieth acre each, alongside the other wheat plots. The ground was similar and received similar treatment to the wheat plots and was sown at the same time, but the crops of grain harvested were light. A well-known variety of Macaroni wheat is that called 'Goose.' The reason for putting these wheats in a separate table is on account of their inferior milling qualities, as their growth for bread-making would prove unsatisfactory. The following table gives the yield per acre and other information respecting these plots:—

MACARONI WHEAT—TEST OF VARIETIES.

| Number. | Name of Variety. | Date of Ripening. | | No. of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Kind of Head. | Weight of Straw. | Yield per Acre. | | Weight per Bushel. | Rusted. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | In. | | In. | | Lbs. | Bush. | Lbs. | Lbs | |
| 1 | Goose ............. | Aug | 22 | 102 | 33—38 | Medium | 2 —2¼ | Bearded | 2,280 | 16 | .. | 61 | Slightly. |
| 2 | Yellow Gharnovka.. | " | 24 | 104 | 36—40 | " | 2 —2½ | " . | 2,520 | 14 | .. | 61 | Very slightly. |
| 3 | Roumanian...... .. | " | 24 | 104 | 36—40 | " | 2 —2½ | " . | ...... | 13 | 20 | 62 | Slightly. |
| 4 | Mahmoudi......... | " | 24 | 104 | 30—36 | Weak.. | 1½—2½ | " . | ...... | 8 | .. | 60 | Very slightly. |

## EXPERIMENTS WITH EMMER AND SPELT.

Two varieties of Emmer and two varieties of Spelt were sown in plots of one-fortieth acre each May 12. The land was similar to and received the same treatment as that on which the other wheats were grown. These varieties are separated from the bread wheats for the reason that they are useful principally for grinding for stock feed, and from the fact that in ordinary threshing the chaff is not separated from the kernels. The yield of these plots is given in pounds for the reason that this grain in the chaff cannot fairly be compared with other sorts of wheat which are threshed clean.

EMMER AND SPELT—TEST OF VARIETIES.

| Number. | Name of Variety. | Date of Ripening. | | No. of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Kind of Head. | Weight of Straw. | Yield per Acre. | Weight per Bushel. | Proportion Rusted. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | In. | | In. | | Lbs. | Lbs. | Lbs | |
| 1 | Red Spelt.......... | Aug. | 30 | 110 | 36—42 | Stiff.... | 2 —3¼ | Beardless. | 3,120 | 1,400 | 30 | Badly. |
| 2 | White Spelt........ | " | 30 | 110 | 37—43 | " .... | 3½—5 | " . | ...... | 1,120 | 33 | " |
| 3 | Common Emmer.... | " | 22 | 102 | 28—33 | Weak... | 1½—2 | Bearded.. | 2,280 | 1,040 | 40 | Slightly. |
| 4 | Red Emmer........ | " | 30 | 110 | 35—40 | Stiff.... | 2½—3 | " .. | 2,200 | 1,000 | 35 | " |

## EXPERIMENTS WITH FIELD PEASE.

The land on which the pease were sown was a clay loam, and was previously in clover and timothy. The land was not in a fertile condition. The only fertilizing it ever received was a crop of green pease ploughed under in 1901, and an application of marsh mud in 1902. The sod was ploughed in the fall and this spring was worked up once each with the disc, spade, and springtooth harrows. No fertilizer was used. The seed was sown with the seed drill at the rate of from 2 to 3 bushels per acre according to the size of the pea. Mammoth Red clover at the rate of 10 lbs. per acre was also sown. The plots were one-fortieth acre each. Thirty-one varieties were sown May 28. The growth of vine was short, and the yield per acre small. The following particulars were obtained from these plots:—

PEASE—TEST OF VARIETIES.

| Number. | Name of Variety. | Date of Ripening. | No. of Days Maturing. | Character of Growth. | Length of Straw. | Length of Pod. | Size of Pea. | Yield per Acre. | | Weight per Bushel. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | In. | In. | | Bush. | Lbs. | Lbs. |
| 1 | Prince Albert | Sept. 5 | 100 | Strong | 35—40 | 1½—2 | Small | 36 | 40 | 60 |
| 2 | Carleton | " 5 | 100 | Medium | 32—36 | 2—2¼ | Medium | 36 | .. | 60 |
| 3 | Agnes | " 5 | 100 | Strong | 38—42 | 2—3 | Large | 34 | .. | 61 |
| 4 | Archer | " 5 | 100 | " | 36—40 | 2—2½ | Medium | 33 | 20 | 60½ |
| 5 | Nelson | Aug. 30 | 94 | Medium | 30—34 | 2—2¼ | " | 33 | 20 | 61 |
| 6 | King | " 30 | 94 | " | 35—40 | 2—2½ | " | 32 | .. | 61 |
| 7 | Macoun | Sept. 5 | 100 | Strong | 35—40 | 2—3 | Large | 31 | 20 | 60 |
| 8 | Golden Vine | Aug. 30 | 94 | Medium | 32—36 | 1½—2 | Small | 31 | 20 | 61 |
| 9 | Pride | Sept. 2 | 97 | " | 30—36 | 2—2¼ | Medium | 30 | 40 | 61 |
| 10 | Victoria | " 7 | 102 | Strong | 35—40 | 2—3 | Large | 30 | 40 | 58 |
| 11 | Prince | " 5 | 100 | " | 35—41 | 2—2½ | Medium | 29 | .. | 60 |
| 12 | Gregory | " 5 | 100 | " | 36—40 | 2—2½ | Large | 28 | 40 | 60 |
| 13 | Large White Marrowfat | " 2 | 97 | " | 36—42 | 2—3 | " | 28 | .. | 61 |
| 14 | Mackay | " 5 | 100 | " | 33—38 | 2—2½ | " | 28 | .. | 60 |
| 15 | Crown | Aug. 30 | 94 | Medium | 30—34 | 1½—2 | Small | 27 | 20 | 63 |
| 16 | Chancellor | " 30 | 94 | " | 24—28 | 1½—2 | " | 26 | 40 | 60 |
| 17 | Duke | Sept. 2 | 97 | " | 28—33 | 2—2¼ | Medium | 26 | .. | 61 |
| 18 | German White | Aug. 30 | 94 | " | 26—30 | 1½—2 | Small | 26 | .. | 62 |
| 19 | Black eyed Marrowfat | Sept. 5 | 100 | " | 35—40 | 2—3 | Large | 25 | 20 | 61 |
| 20 | Picton | " 5 | 100 | " | 30—40 | 2—2¼ | Medium | 25 | .. | 61 |
| 21 | Pearl | " 5 | 100 | " | 30—36 | 2—2¼ | " | 24 | 40 | 59 |
| 22 | Arthur | Aug. 30 | 94 | " | 30—33 | 2—2½ | " | 24 | .. | 62 |
| 23 | Wisconsin Blue | " 31 | 95 | " | 30—33 | 1½—2¼ | " | 24 | .. | 62 |
| 24 | Daniel O'Rourke | " 29 | 93 | " | 32—36 | 1½—2 | Small | 23 | 20 | 62 |
| 25 | Mummy | " 31 | 95 | " | 30—33 | 2—2¼ | Medium | 22 | 40 | 62 |
| 26 | Kent | Sept. 5 | 100 | " | 35—40 | 2—2½ | Large | 22 | 40 | 60½ |
| 27 | English Grey | Aug. 30 | 94 | " | 24—30 | 2—2¼ | Medium | 21 | 20 | 61 |
| 28 | Early Britain | " 30 | 94 | " | 28—32 | 1½—2 | " | 20 | 40 | 61 |
| 29 | Paragon | " 29 | 93 | Poor | 24—30 | 1½—2 | " | 20 | .. | 62 |
| 30 | Prussian Blue | " 30 | 94 | Medium | 28—33 | 2—2¼ | Small | 19 | 20 | 61 |
| 31 | White Wonder | " 29 | 93 | Poor | 24—26 | 2—2½ | Medium | 12 | 40 | 62 |

## EXPERIMENTS WITH BUCKWHEAT.

Five varieties of buckwheat were sown June 11, with the seed drill. The plots were one-fortieth of an acre each. They were cut September 5. The soil was a clay loam and had clover and timothy as a previous crop. The land was not in a fertile condition. The only fertilizing it ever received was a crop of green pease ploughed under in 1901, and an application of marsh mud in 1902. The sod was ploughed in the fall and worked up this spring by going over it twice with the springtooth, and once each with the spade and smoothing harness. The following yields per acre were obtained:—

BUCKWHEAT—TEST OF VARIETIES.

| Name of Variety. | Yield per Acre. | | Weight per Bushel. |
|---|---|---|---|
| | Bush. | Lbs. | Lbs. |
| Siberian or Tartarian | 29 | 8 | 49 |
| Silverhull | 22 | 24 | 50 |
| Grey | 21 | 32 | 49 |
| Rye | 21 | 32 | 52 |
| Japanese | 15 | .. | 48 |

## FIELD CROPS OF GRAIN.

Four acres of grain were sown in acre plots, May 30. The land was a light clay loam and was previously in corn, having been manured for that crop with 30 one-horse cart loads of stable manure per acre. The ground was ploughed this spring and worked up with the springtooth and smoothing harrows. The seed was sown with the seed drill. One acre was in barley, sown at the rate of two bushels of seed per acre; one acre White oats and one of Black oats sown at the rate of three bushels per acre, and one acre of mixed grain, made up of two bushels Sensation oats, one bushel of Odessa barley and one peck Golden Vine pease, sown at the rate of three bushels per acre. The land was also seeded down to clover and Timothy. The following table gives the yield per acre, and varieties used:—

| Name of Variety. | When Cut. | Weight per Bushel. | Yield per Acre. | |
|---|---|---|---|---|
| | | Lbs. | Bush. | Lbs. |
| 1 acre Odessa barley | Aug. 22 | 48 | 27 | 26 |
| 1 " Sensation oats | Sept. 3 | 37 | 56 | 25 |
| 1 " Black Tartarian oats | " 7 | 34 | 40 | 27 |
| 1 " mixed grain | Aug. 30 | 42 | 47 | 13 |

## FIELD CROP OF MIXED GRAIN—FERTILIZER EXPERIMENTS.

Six half-acre plots were sown with mixed grain. The land was in a poor state of fertility. It was previously in clover and Timothy, which sod was ploughed last fall. The seed was sown May 30, and was made up of Sensation oats, two bushels; Odessa barley, one bushel; and Golden Vine pease, one peck; mixed together and sown at the rate of three bushels seed per acre.

The ground was worked up with the spade, springtooth, and smoothing harrows, and the seed sown with the seed drill. Fertilizers were sown on four of these plots by means of a fertilizer attachment to the seeder, and two were left without fertilizers. The crop was cut August 5, and the following yield per acre obtained:—

FIELD CROP OF MIXED GRAIN—FERTILIZER EXPERIMENTS.

| Size of Plot and Fertilizer Used. | Yield per Acre. | |
|---|---|---|
| | Bush. | Lbs. |
| ½ acre; no fertilizer used | 26 | .. |
| ½ acre; Pidgeon's Fine Ground Bonemeal, 250 lbs. per acre | 35 | .. |
| ½ acre; 'Imperial' brand fertilizer, 250 lbs. per acre | 33 | .. |
| ½ acre; no fertilizer used | 28 | .. |
| ½ acre; Pidgeon's Fine Ground Bonemeal, 250 lbs. per acre | 34 | .. |
| ½ acre; 'Imperial' brand fertilizer, 250 lbs. per acre | 34 | 20 |

## FIELD CROP OF MIXED GRAIN.

One field of six acres was seeded to mixed grain, May 14. Three pounds of Alsike, 7 pounds of Mammoth Red clover and 12 pounds of Timothy seed per acre were also sown at the same time. The land is a clay loam, and was previously in clover, being in grain in 1902, and in roots in 1901, for which crop, stable manure at the rate of 25 one-horse cart loads per acre was used. The ground was in a fair state of fertility. The crop was cut August 17, and the field yielded at the rate of 45 bushels per acre, weighing 42 pounds per bushel. The field was seeded at the rate of three bushels per acre with seed made up as follows:—Snsation oats, 2 bushels; Odessa barley, 1 bushel; Golden Vine pease, 1 peck mixed together.

## FIELD CROP OF OATS ON MARSH LANDS.

Three acres of oats were sown May 16 on marsh land that had been ploughed the previous fall. This was seeded broadcast by hand and Timothy and clover seed was also sown. The dry summer was particularly disastrous to marsh grain crops. The ground became hard and dry and very little growth was made after the early part of July. On account of the dykes breaking in the fall of 1903 this land was flooded by tide water, which may also have had a tendency to decrease the yield. The grain was cut August 22, and gave a total yield of 80 bushels or an average yield of 26 bushels, 21 pounds per acre.

## FIELD CROP OF BUCKWHEAT.

Five acres of buckwheat was sown on land three acres of which had been in rape last year, and two acres in sand vetch. These two crops made light growth, and were pastured to sheep. This ground is practically new land in a poor state of fertility, and has been used as a sheep pasture for years. It was ploughed this spring and was worked up with the springtooth and smoothing harrows and seeded to buckwheat at the rate of 1¼ bushels per acre, on June 16. The crop was harvested September 7. The yield from this field was 64 bushels, or averaging hardly 13 bushels per acre.

## EXPERIMENTS WITH INDIAN CORN.

The soil chosen for the corn plots is a light clay loam. The previous crop was turnips, for which crop 35 one-horse cart loads of stable manure per acre was applied. The ground was not ploughed last fall. It was worked up this spring first with the spade harrow and then manured at the rate of 15 one-horse cart loads of stable manure per acre, which was ploughed under and again worked up with the spade harrow, followed by the springtooth and smoothing harrows. Complete fertilizer at the rate of 400 pounds per acre was sown along the rows and hills when the seed was planted.

The seed was planted in hills and rows June 1. One set of plots was in hills 3 feet apart each way, and from 4 to 6 plants were left in a hill, and the other was in rows 3 feet apart and the plants were thinned to about 6 inches apart. There were twenty varieties included in this test. The crop was harvested and weighed September 28. The yield per acre is calculated from the weight obtained from two rows each 66 feet long. The wind storm of August 23 and frost September 1 did some damage to those plots, after which they made little growth.

INDIAN CORN—TEST OF VARIETIES.

| Number. | Name of Variety. | Height. | When Tasselled. | In Silk. | Condition when cut. | Weight per acre grown in rows. | | Weight per acre grown in hills. | |
|---|---|---|---|---|---|---|---|---|---|
| | | Inches | | | | Tons. | Lbs. | Tons. | Lbs. |
| 1 | Thoroughbred White Flint.... | 85 | Sept. 20.. | ........ | Tasselling ... | 20 | 1,030 | 17 | 870 |
| 2 | Salzer's All Gold............ | 94 | Aug. 31.. | Sept. 9.. | Silked........ | 20 | 700 | 15 | 250 |
| 3 | Red Cob Ensilage........... | 98 | " 31.. | " 20.. | " ........ | 17 | 870 | 17 | 650 |
| 4 | Pride of the North .......... | 102 | " 31.. | " 20.. | " ........ | 17 | 320 | 14 | 270 |
| 5 | Superior Fodder ............ | 84 | Sept. 9.. | .......... | Tasselling .... | 17 | 100 | 15 | 30 |
| 6 | King Philip...... .......... | 90 | Aug. 15.. | Aug. 25.. | Soft glazed ... | 15 | 1,900 | 15 | 1,350 |
| 7 | Longfellow ................. | 84 | " 10.. | " 20.. | Glazed ....... | 15 | 1,680 | 14 | 1,150 |
| 8 | Eureka ..................... | 95 | " 31.. | .......... | Silked........ | 15 | 1,350 | 14 | 1,700 |
| 9 | Giant Prolific Ensilage....... | 97 | Sept. 5.. | .......... | " ........ | 15 | 800 | 13 | 1,830 |
| 10 | Evergreen Sugar ............ | 86 | Aug. 15.. | Aug. 25.. | Watery ...... | 15 | 800 | 12 | 200 |
| 11 | Angel of Midnight .......... | 86 | " 10.. | " 20.. | Glazed ....... | 14 | 1,480 | 15 | 140 |
| 12 | White Cap Yellow Dent...... | 100 | " 23.. | " 31.. | Watery ...... | 14 | 930 | 12 | 970 |
| 13 | Early Butler... ............ | 78 | " 30.. | .......... | Silked........ | 14 | 490 | 10 | 1,230 |
| 14 | Compton's Early............ | 80 | " 10.. | Aug. 20.. | Glazed ....... | 13 | 1,500 | 11 | 770 |
| 15 | Early Mastodon. ........... | 82 | " 27.. | Sept. 5.. | Silked........ | 13 | 950 | 12 | 750 |
| 16 | Cloud's Yellow Dent ........ | 96 | " 25.. | " 20.. | " ........ | 12 | 1,850 | 11 | 1,100 |
| 17 | Champion White Pearl....... | 96 | " 27.. | " 3.. | Watery ...... | 12 | 750 | 10 | 1,120 |
| 18 | North Dakota ............... | 72 | " 13.. | Aug. 27.. | Soft glazed ... | 11 | 1,650 | 10 | 350 |
| 19 | Mammoth Cuban ............ | 80 | " 27.. | Sept. 5.. | Silked........ | 11 | 1,430 | 11 | 1,850 |
| 20 | Selected Leaming.. ......... | 88 | " 25.. | " 15.. | " ........ | 10 | 350 | 8 | 1,270 |

FIELD CROP OF CORN—FERTILIZER EXPERIMENTS.

Three acres of corn was planted in rows 3 feet apart, June 10, on a soil of a light clay loam character. One-third running across one end of the field was in clover the previous year; in grain in 1902, and roots in 1901, for which crop 30 one-horse cart loads of stable manure was used per acre. One-third running across the centre of the field was in grain last year, having been manured in 1902 for roots at the rate of 35 one-horse cart loads per acre, and one-third running across the other end of the field was in roots last year, having been manured for that crop with 35 one-horse cart loads of stable manure per acre. The rows ran lengthwise of the field across each of these three differently treated pieces of the field. The two former, clover and grain stubble, were ploughed the fall previous, and the third, on which roots were grown, was not ploughed in the fall. This spring the whole field was worked up by going over it once each with the disc and spade harrows, after which stable manure at the rate of 20 tons per acre was scattered broadcast with the manure spreader and ploughed under. The ground was again gone over with the spade, springtooth and smoothing harrows, and put into good tilth.

Four varieties of corn of ¾ acres each were planted. One-third of each variety was fertilized in addition to the manure with 400 lbs. of fertilizer per acre; one-third with 200 lbs. per acre, and the other third manure only. The fertilizer was scattered broadcast and harrowed in. Each plot of ¼ acre was six rows running the entire length of the field.

The first frost on September 1, which was much earlier than usual, damaged the crop slightly; while a severe frost on September 23 of 9° did considerable damage, and very materially reduced the yield per acre. The following table gives the name of variety sown, how treated, and yield per acre:—

FIELD CROP OF CORN—FERTILIZER EXPERIMENTS.

| Name of Variety, how fertilized, size of plot, and when cut. | Yield per Acre. | |
|---|---|---|
| *Angel of Midnight.* | Tons. | Lbs. |
| Cut Sept. 27th. | | |
| ¼ acre—Manure and Bowker's 'Square' brand fertilizer, 400 lbs. per acre | 13 | 420 |
| ¼ " " " " 200 " " | 12 | 600 |
| ¼ " Manure only, 20 tons per acre | 11 | 1,560 |
| *Compton's Early.* | | |
| Cut Sept. 30th. | | |
| ¼ acre—Manure and Bowker's 'Square' brand fertilizer, 400 lbs. per acre | 12 | 40 |
| ¼ " " " " 200 " " | 11 | 1,720 |
| ¼ " Manure only, 20 tons per acre | 11 | 1,660 |
| *Longfellow.* | | |
| Cut Sept. 29th. | | |
| ¼ acre—Manure and Bowker's 'Square' brand fertilizer, 400 lbs. per acre | 11 | 760 |
| ¼ " " " " 200 " " | 10 | 1,960 |
| ¼ " Manure only, 20 tons per acre | 12 | 1,100 |
| *South Dakota.* | | |
| Cut Sept. 29th. | | |
| ¼ acre—Manure and Bowker's 'Square' brand fertilizer, 400 lbs. per acre | 12 | 300 |
| ¼ " " " " 200 " " | 12 | 1,700 |
| ¼ " Manure only, 20 tons per acre | 12 | 40 |

CORN SOWN AT DIFFERENT DISTANCES APART.

Experiments were again conducted this year with corn planted in rows at different distances apart. Three varieties of corn were used. The corn was planted June 13 and harvested October 4. The plots were each one-fortieth acre. The ground was similar to that on which the field corn was grown and received the same cultivation and the same amount of manure per acre. In addition to this 400 lbs of complete fertilizer per acre was used on these plots. The yield was as follows:—

| Name of Variety. | Distance Apart. | Yield per acre. | |
|---|---|---|---|
| | Inches. | Tons. | Lbs. |
| Selected Leaming | 42 | 5 | 293 |
| " " | 35 | 5 | 1,550 |
| " " | 28 | 7 | 350 |
| " " | 21 | 8 | 1,860 |
| Longfellow | 42 | 9 | 1,552 |
| " | 35 | 12 | 750 |
| " | 28 | 13 | 1,335 |
| " | 21 | 14 | 1,798 |
| Champion White Pearl | 42 | 7 | 758 |
| " " | 35 | 9 | 1,200 |
| " " | 28 | 11 | 1,714 |
| " " | 21 | 12 | 1,756 |

## EXPERIMENTS WITH TURNIPS.

The land chosen for the turnip plots was in grain the previous season, having been in roots in 1902, for which crop 30 one-horse cart-loads of stable manure per acre was used. It was ploughed in the fall and worked up this spring once with the spade harrow and manured at the rate of 25 one-horse cart-loads of stable manure per acre and ploughed. This was worked up with the spade harrow again and once with the springtooth. Complete fertilizer at the rate of 400 lbs. per acre was sown broadcast, and harrowed in with the smoothing harrow. The ground was run into rows 24 inches apart. The rows were raked off by hand, and the plots planted with the Planet Jr., seed drill No. 5. The plants were thinned to about one foot apart in the rows. The soil was a light clay loam. The plots were sown May 30, and a duplicate set planted June 13. Twenty varieties were included in the test. The crops on both sets of plots were pulled October 24, and the yield per acre calculated from the weight obtained from 2 rows each of 66 feet long. Continued dry weather from the time of sowing up to July 21 resulted in the plants making poor progress. Some plants were destroyed by cut-worms. The latter part of the season was favourable for growth.

TURNIPS—TEST OF VARIETIES.

| Number. | Name of Variety. | Yield per Acre 1st Plot Sown. | | Yield per Acre 1st Plot Sown. | | Yield per Acre 2nd Plot Sown. | | Yield per Acre 2nd Plot Sown. | |
|---|---|---|---|---|---|---|---|---|---|
| | | Tons. | Lbs. | Bush. | Lbs. | Tons. | Lbs. | Bush. | Lbs. |
| 1 | Perfection Swede | 40 | 335 | 1,339 | 15 | 34 | 1,300 | 1,155 | .. |
| 2 | Jumbo | 39 | 375 | 1,306 | 15 | 35 | 785 | 1,179 | 45 |
| 3 | Good Luck | 38 | 1,880 | 1,298 | .. | 35 | 125 | 1,168 | 45 |
| 4 | Carter's Elephant | 38 | 1,220 | 1,287 | .. | 32 | 350 | 1,072 | 30 |
| 5 | Hartley's Bronze | 38 | 625 | 1,277 | 5 | 34 | 475 | 1,141 | 15 |
| 6 | Emperor Swede | 37 | 1,900 | 1,265 | .. | 35 | 950 | 1,182 | 30 |
| 7 | Selected Purple Top | 37 | 1,735 | 1,262 | 15 | 30 | 1,875 | 1,031 | 15 |
| 8 | Kangaroo | 37 | 745 | 1,245 | 45 | 33 | 1,980 | 1,133 | .. |
| 9 | Drummond Purple Top | 37 | 250 | 1,237 | 30 | 31 | 1,855 | 1,064 | 15 |
| 10 | Magnum Bonum | 36 | 1,425 | 1,223 | 45 | 34 | 145 | 1,135 | 45 |
| 11 | Mammoth Clyde | 35 | 1,775 | 1,196 | 15 | 33 | 825 | 1,113 | 45 |
| 12 | Hall's Westbury | 35 | 950 | 1,182 | 30 | 33 | 1,650 | 1,127 | 30 |
| 13 | Sutton's Champion | 35 | 785 | 1,179 | 45 | 33 | 1,155 | 1,119 | 15 |
| 14 | Halewood's Bronze Top | 35 | 455 | 1,174 | 15 | 33 | .. | 1,100 | .. |
| 15 | Imperial Swede | 34 | 1,300 | 1,155 | .. | 31 | 700 | 1,045 | .. |
| 16 | Skirvings | 33 | 1,980 | 1,133 | .. | 28 | 925 | 948 | 45 |
| 17 | Bangholm Selected | 32 | 1,175 | 1,086 | 15 | 28 | 255 | 937 | 35 |
| 18 | Elephant's Master | 31 | 1,855 | 1,064 | 15 | 33 | 495 | 1,108 | 15 |
| 19 | New Century | 31 | 205 | 1,036 | 45 | 31 | 1,525 | 1,058 | 45 |
| 20 | East Lothian | 30 | 1,545 | 1,025 | 45 | 29 | 575 | 976 | 15 |

FIELD CROP OF TURNIPS—FERTILIZER EXPERIMENTS.

Seven acres of turnips were sown June 10 and 14 on soil of a light clay loam character. The soil was the same as that on which the field corn and mangels were grown. One-third running across one end of the field was in clover the previous year, in grain in 1902, and roots in 1901, for which crop 30 one-horse cart-loads of stable manure per acre was used. One-third running across the centre of the field was in grain last year, having been manured in 1902 for roots at the rate of 35 one-horse cart-loads per acre, and one-third running across the other end of the field was in roots last year, having been manured for that crop with 35 one-horse cart-loads of stable manure per acre. The rows ran lengthwise of the field across each of these three differently treated pieces of land. The pieces on which clover and oats were grown were ploughed last fall, and the root piece was not ploughed until this spring. This spring the whole field was worked up by going over it once each with the disc and spade harrows, after which stable manure at the rate of 20 tons per acre was scattered broadcast with the manure spreader and ploughed under. The ground was again gone over with the spade, springtooth, and smoothing harrows and put into a good state of tilth.

Five acres were sown with a different variety for each acre. One-third of each acre was fertilized in addition to the manure (20 tons per acre) with Bowker's square brand complete fertilizer, at the rate of 500 lbs. per acre; one-third 250 lbs. per acre, and another one-third of each manure only. Two additional acres were sown with one variety. On one-third of each acre there was added to the manure fertilizers at the rate of 1,000 lbs. per acre; one-third of each acre at the rate of 500 lbs. per acre, and one-third of one acre was left for manure only, and one-third of the other acre was given an additional coat of 20 tons stable manure per acre, making a total of 40 tons. Each plot was 8 rows running the entire length of the field, or one-third of an acre. The first part of the summer was so extremely dry that the roots made poor growth. They made fair growth after the first of August. The cutworm also did considerable damage. The following table gives the name of variety sown, how treated, date of harvesting and yield per acre:—

FIELD CROP OF TURNIPS—FERTILIZER EXPERIMENTS.

| Name of Variety, how Fertilized, size of Plot, and date when pulled. | Yield per Acre. | | Yield per Acre. | |
|---|---|---|---|---|
| | Tons. | Lbs. | Bush. | Lbs. |
| *Hartley's Bronze Top.* | | | | |
| (Pulled October 21.) | | | | |
| ⅓ acre—Manure and Bowker's 'Square' brand fertilizer, 500 lbs. per acre.. | 28 | 55 | 934 | 15 |
| ⅓ " " " " 250 " .. | 27 | 1,725 | 928 | 45 |
| ⅓ " " alone, 20 tons per acre... | 24 | 285 | 804 | 45 |
| *Purple Top Swede.* | | | | |
| (Pulled October 20.) | | | | |
| ⅓ acre—Manure and Bowker's 'Square' brand fertilizer, 500 lbs. per acre.. | 20 | 785 | 679 | 45 |
| ⅓ " " " " 250 " .. | 21 | 1,770 | 729 | 30 |
| ⅓ " " alone, 20 tons per acre... | 21 | 630 | 710 | 30 |
| *Carter's Elephant.* | | | | |
| (Pulled November 16.) | | | | |
| ⅓ acre—Manure and Bowker's 'Square' brand fertilizer, 500 lbs. per acre.. | 25 | 1,015 | 850 | 15 |
| ⅓ " " " " 250 " .. | 26 | 935 | 882 | 15 |
| ⅓ " " alone, 20 tons per acre... | 24 | 1,140 | 819 | .. |
| *Kangaroo.* | | | | |
| (Pulled October 19.) | | | | |
| ⅓ acre—Manure and Bowker's 'Square' brand fertilizer, 500 lbs. per acre.. | 21 | 405 | 706 | 45 |
| ⅓ " " " " 250 " .. | 20 | 770 | 679 | 30 |
| ⅓ " " alone, 20 tons per acre... | 18 | 285 | 604 | 45 |
| *Empress Swede.* | | | | |
| (Pulled October 21.) | | | | |
| ⅓ acre—Manure and Bowker's 'Square' brand fertilizer, 500 lbs. per acre.. | 19 | 565 | 642 | 45 |
| ⅓ " " " " 250 " .. | 19 | 976 | 649 | 36 |
| " " alone, 20 tons per acre... | 17 | 1,760 | 596 | .. |

FIELD CROP OF TURNIPS—FERTILIZER EXPERIMENTS.—*Concluded.*

| Name of Variety, how Fertilized, size of Plot, and date when pulled. | Yield per Acre. | | Yield per Acre. | |
|---|---|---|---|---|
| | Tons. | Lbs. | Bush. | Lbs. |
| *Purple Top Swede.* | | | | |
| (Pulled November 7.) | | | | |
| [illegible] acre—Manure and 'Thomas' Phosphate Powder, 1,000 lbs per acre....... | 28 | 250 | 937 | 30 |
| [illegible] " " " " 500 " ....... | 28 | 925 | 948 | 45 |
| [illegible] " " alone, 20 tons per acre.................................... | 26 | 1,175 | 886 | 15 |
| *Purple Top Swede.* | | | | |
| (Pulled November 2.) | | | | |
| [illegible] acre—Manure and Pidgeon's 'Intense' brand fertilizer, 1,000 lbs. per acre. | 26 | 1,850 | 897 | 30 |
| [illegible] " " " " 500 " .. | 24 | 1,230 | 820 | 30 |
| [illegible] " " alone, 40 tons per acre.................................... | 27 | 1,275 | 921 | 15 |

## EXPERIMENTS WITH MANGELS.

The ground selected for the mangel plots was a light clay loam. It was in clover the previous year, in grain in 1902, and in roots in 1901, for which crop 30 one-horse cart loads of stable manure per acre was used. The clover sod was ploughed last fall and this spring was worked up with the spade harrow and manured with 25 one-horse cart loads of stable manure per acre, which was ploughed in and worked up with the spade and springtooth harrows. Complete fertilizer at the rate of 400 lbs. per acre was sown broadcast and harrowed in with the smoothing harrow, after which rows were run 24 inches apart. The plots were sown May 30, and a duplicate set on June 13. The rows were raked off and the seed sown with the Planet Jr., hand seed drill. The crop was harvested October 12. The yield per acre has been determined from the weight obtained from two rows, each 66 feet long. The mangel crop suffered considerably from the ravages of the cutworm. The early-sown plot of Prize Winner Yellow Globe was so badly destroyed that reliable weights could not be obtained. The continued dry weather until after the middle of July also prevented satisfactory growth, while the latter part of the season was fairly suitable.

MANGELS—TEST OF VARIETIES.

| No. | Name of Variety | Yield per Acre. 1st Plot Sown. | | Yield per Acre. 1st Plot Sown. | | Yield per Acre. 2nd Plot Sown. | | Yield per Acre. 2nd Plot Sown. | |
|---|---|---|---|---|---|---|---|---|---|
| | | Tons. | Lbs. | Bush. | Lbs. | Tons. | Lbs. | Bush. | Lbs. |
| 1 | Yellow Intermediate.......................... | 40 | 1,015 | 1,350 | 15 | 31 | 1,525 | 1,058 | 45 |
| 2 | Mammoth Yellow Intermediate............... | 36 | 435 | 1,207 | 15 | 30 | 1,380 | 1,023 | |
| 3 | Lion Yellow Intermediate..................... | 33 | 660 | 1,111 | | 31 | 535 | 1,042 | 15 |
| 4 | Giant Yellow Intermediate .................... | 33 | 495 | 1,108 | 15 | 27 | 285 | 904 | 45 |
| 5 | Giant Sugar Mangel............................ | 28 | 1,090 | 951 | 30 | 24 | 530 | 808 | 50 |
| 6 | Half Long Sugar White........................ | 26 | 305 | 871 | 45 | 25 | 490 | 841 | 30 |
| 7 | Half Long Sugar Rosy......................... | 25 | 1,810 | 863 | 30 | 24 | 510 | 808 | 30 |
| 8 | Leviathan Long Red............................ | 25 | 490 | 841 | 30 | 21 | 900 | 715 | |
| 9 | Giant Yellow Globe............................ | 22 | 1,870 | 764 | 30 | 22 | 550 | 742 | 30 |
| 10 | Selected Yellow Globe......................... | 22 | 1,540 | 759 | | 21 | 735 | 712 | 15 |
| 11 | Prize Mammoth Long Red...................... | 21 | 1,395 | 723 | 15 | 24 | 1,005 | 816 | 45 |
| 12 | Selected Mammoth Long Red.................. | 20 | 1,085 | 684 | 45 | 20 | 590 | 676 | 30 |
| 13 | Gate Post.......................................... | 20 | 425 | 673 | 45 | 25 | 1,480 | 858 | |
| 14 | Mammoth Long Red............................. | 19 | 1,600 | 660 | | 18 | 630 | 610 | 30 |
| 15 | Triumph Yellow Globe......................... | 19 | 280 | 638 | | 19 | 610 | 643 | 30 |
| 16 | Prize Winner Yellow Globe................... | | | | | 15 | 855 | 514 | 15 |

### FIELD CROP OF MANGELS—FERTILIZER EXPERIMENTS.

Four acres of mangels were sown June 4 and 9 on soil of a light clay loam character. This land was adjoining that on which the corn and turnips were grown. One-third running across one end of the field was in clover the previous year, in grain in 1902, and in roots in 1901, for which crop 30 one-horse cart loads of stable manure per acre was used. One-third running across the centre of the field was in grain last year, having been manured in 1902, for roots, at the rate of 35 one-horse cart loads per acre, and one-third running across the other end of the field was in roots last year, having been manured for that crop with 35 one-horse cart loads of stable manure per acre. The rows ran lengthwise across each of these differently treated pieces of the field. The pieces on which clover and oats were grown last year were ploughed in the fall, but the root piece was not ploughed until this spring. This spring the whole field was worked up by going over it once each with the disc and spade harrows, after which stable manure at the rate of 20 tons per acre was scattered broadcast with the manure spreader and ploughed under. The ground was again gone over with the spade, springtooth, and smoothing harrows, and put into a good state of tilth.

Four varieties of mangels were sown. One-third acre of each was fertilized, in addition to the manure, with 500 pounds of fertilizer per acre. One-third with 250 pounds of fertilizer per acre in addition to the manure, and the other third, manure only. The fertilizer was scattered broadcast before the land was run up into rows 24 inches apart. The seed was sown with the hand seed drill in bunches one foot apart. Each plot was one-third acre, or eight rows running the entire length of the field. This field did not make a satisfactory growth, owing to the extremely dry weather prevailing during the first part of the season. The later growth was fair. The cutworm did considerable damage. The following table gives results obtained.

### FIELD CROP OF MANGELS—FERTILIZER EXPERIMENTS.

| Name of Variety, how Fertilized, size of Plot and date when pulled. | Yield per Acre. | | Yield per Acre. | |
|---|---|---|---|---|
| | Tons. | Lbs. | Bush. | Lbs. |
| *Mammoth Long Red.* | | | | |
| (Pulled October 13.) | | | | |
| ⅓ acre—Manure and Bowker's 'Square' brand fertilizer, 500 lbs. per acre... | 14 | 80 | 468 | .. |
| ⅓ " " " " 250 " .. | 13 | 1,795 | 463 | 15 |
| ⅓ " " alone, 20 tons per acre.... | 12 | 585 | 409 | 45 |
| *Giant Yellow Half Long.* | | | | |
| (Pulled October 17.) | | | | |
| ⅓ acre—Manure and Bowker's 'Square' brand fertilizer, 500 lbs. per acre... | 17 | 1,985 | 599 | 45 |
| ⅓ " " " " 250 " .. | 15 | 30 | 500 | 30 |
| ⅓ " " alone, 20 tons per acre.... | 12 | 1,605 | 426 | 45 |
| *Giant Yellow Globe.* | | | | |
| (Pulled October 18.) | | | | |
| ⅓ acre—Manure and Bowker's 'Square' brand fertilizer, 500 lbs. per acre... | 14 | 530 | 475 | 30 |
| ⅓ " " " " 250 " .. | 12 | 1,395 | 423 | 15 |
| ⅓ " " alone, 20 tons per acre.... | 11 | 1,775 | 396 | 15 |
| *Giant Yellow Globe and Mammoth Long Red.* | | | | |
| (Seed mixed before planting.) | | | | |
| ⅓ acre—Manure and Bowker's 'Square' brand fertilizer, 500 lbs. per acre... | 11 | 965 | 382 | 45 |
| ⅓ " " " " 250 " .. | 12 | 855 | 414 | 15 |
| ⅓ " " alone, 20 tons per acre.... | 10 | 625 | 343 | 45 |

## EXPERIMENTS WITH SUGAR BEETS.

Eight varieties of sugar beets were tested. These were on plots adjoining the mangel plots and received the same treatment in every particular. The dry weather prevailing during the early part of the season also prevented this crop from making good growth. The seed was sown May 30, and duplicate plots were sown June 13. The plots were each two rows, 66 feet long. The crop was harvested October 12. The following table gives the yield per acre obtained.

SUGAR BEETS—TEST OF VARIETIES.

| No. | Name of Variety. | Yield per Acre. 1st Plot Sown. | | Yield per Acre. 1st Plot Sown. | | Yield per Acre. 2nd Plot Sown. | | Yield per Acre. 2nd Plot Sown. | |
|---|---|---|---|---|---|---|---|---|---|
| | | Tons. | Lbs. | Bush. | Lbs. | Tons. | Lbs. | Bush. | Lbs. |
| 1 | Red Top Sugar | 26 | 140 | 869 | .. | 27 | 1,440 | 924 | .. |
| 2 | Royal Giant | 24 | 1,830 | 830 | 30 | 20 | 425 | 673 | 45 |
| 3 | Improved Imperial | 23 | 355 | 772 | 35 | 21 | 75 | 701 | 15 |
| 4 | Wanzleben | 22 | 880 | 748 | .. | 18 | 1,455 | 624 | 15 |
| 5 | Danish Improved | 20 | 1,910 | 698 | 30 | 19 | 775 | 646 | 15 |
| 6 | Danish Red Top | 20 | 95 | 668 | 15 | 20 | 755 | 679 | 15 |
| 7 | Vilmorin's Improved | 18 | 795 | 613 | 15 | 16 | 1,330 | 555 | 30 |
| 8 | French Very Rich | 14 | 1,205 | 486 | 45 | 12 | 1,575 | 426 | 15 |

## EXPERIMENTS WITH CARROTS.

Ten varieties of carrots were under test. They were grown in plots adjoining the turnip plots and received the same treatment in every particular. The seed was sown May 30, and duplicate plots were sown two weeks later, June 13. Each plot was two rows 66 feet long. The carrots also failed to make good growth owing to the dry weather prevailing during the first part of the summer. The crop was harvested October 25, and the following yields were obtained.

CARROTS—TEST OF VARIETIES.

| Number. | Name of Variety. | Yield per Acre. 1st Plot Sown. | | Yield per Acre. 2nd Plot Sown. | | Yield per Acre. 1st Plot Sown. | | Yield per Acre. 2nd Plot Sown. | |
|---|---|---|---|---|---|---|---|---|---|
| | | Tons. | Lbs. | Bush. | Lbs. | Tons. | Lbs. | Bush. | Lbs. |
| 1 | Mammoth White Intermediate | 21 | 1,890 | 731 | 30 | 18 | 1,620 | 627 | .. |
| 2 | Carter's Orange Giant | 20 | 1,910 | 698 | 30 | 19 | 1,105 | 651 | 45 |
| 3 | White Belgian | 20 | 260 | 671 | .. | 18 | 1,445 | 624 | 5 |
| 4 | Long Yellow Stump-rooted | 19 | 1,765 | 662 | 45 | 18 | 1,950 | 632 | 30 |
| 5 | New White Intermediate | 18 | 1,290 | 621 | 30 | 17 | 1,145 | 585 | 45 |
| 6 | Giant White Vosges | 18 | 960 | 616 | .. | 16 | 340 | 539 | .. |
| 7 | Ontario Champion | 18 | 630 | 610 | 30 | 18 | 960 | 616 | .. |
| 8 | Half Long Chantenay | 18 | 465 | 607 | 45 | 17 | 1,970 | 599 | 30 |
| 9 | Early Gem | 17 | 1,475 | 591 | 15 | 16 | 1,330 | 555 | 30 |
| 10 | Improved Short White | 16 | 1,660 | 561 | .. | 14 | 710 | 478 | 30 |

## EXPERIMENTS WITH POTATOES.

The land on which the potatoes were grown was a clay loam. The previous crop was clover. The ground was manured early in the fall with stable manure at the rate of 20 one-horse cart loads per acre and at once ploughed under. In the spring this was gone over with the spade and springtooth harrow and ploughed. It was again worked once each with the spade, springtooth and smoothing harrows. Rows were run 30 inches apart and about 4 inches deep and potato fertilizer at the rate of 400 lbs. per acre scattered along the rows before planting. The sets were dropped one foot apart in these rows and covered with the plough. The tubers were cut so as to have from 2 to 3 eyes in each set. The drills were harrowed down once before the plants were above the ground and again drilled up in a few days and the soil kept loose with the cultivator until the vines were quite large. The field was hoed once by hand. The plots were sprayed with Bordeaux mixture and Paris green on July 20, August 5 and August 26. There was no blight noticeable on these plots and the tubers were free from rot. Forty-five varieties were included in the test. They were planted May 31 and dug September 1 and 3. Each plot was two rows, each 66 feet long. They yielded as follows :—

POTATOES—TEST OF VARIETIES.

| Number. | Name of Variety. | Quality. | Total Yield per Acre. | | Yield per Acre of Marketable. | | Yield per Acre of Unmarketable. | | Form and Colour. |
|---|---|---|---|---|---|---|---|---|---|
| | | | Bush. | Lbs. | Bush. | Lbs. | Bush. | Lbs. | |
| 1 | Vick's Extra Early | Good | 495 | .. | 429 | .. | 66 | .. | Long, round, white. |
| 2 | Carman No. 1 | " | 462 | .. | 374 | .. | 88 | .. | Flat, round, white. |
| 3 | Irish Cobbler | " | 439 | .. | 356 | 24 | 83 | 36 | Round, white. |
| 4 | Pearce | " | 424 | 36 | 358 | 36 | 66 | .. | Long, pink and white. |
| 5 | Green Mountain | " | 418 | .. | 319 | .. | 99 | .. | Flat, round, white. |
| 6 | Country Gentleman | " | 418 | .. | 316 | 48 | 101 | 12 | Long, pink and white. |
| 7 | Delaware | " | 413 | 36 | 323 | 24 | 90 | 12 | Flat, round, white. |
| 8 | Rochester Rose | " | 409 | 12 | 352 | .. | 57 | 12 | Oblong, pink. |
| 9 | Rose No. 9 | Medium | 400 | 24 | 330 | .. | 70 | 24 | " |
| 10 | State of Maine | Good | 398 | 12 | 316 | 48 | 81 | 24 | Round, white. |
| 11 | Everett | " | 396 | .. | 297 | .. | 99 | .. | Flat, round. white. |
| 12 | General Gordon | " | 396 | .. | 308 | .. | 88 | . | Oblong, pink. |
| 13 | Early St. George | " | 391 | 36 | 275 | .. | 116 | 36 | " |
| 14 | Clay Rose | Medium | 385 | .. | 323 | 24 | 61 | 36 | Round, pink. |
| 15 | I. X. L | Good | 385 | .. | 259 | 36 | 125 | 24 | Long, pink and white. |
| 16 | Pingree | " | 374 | .. | 332 | 12 | 41 | 48 | Oblong, white. |
| 17 | Early Norther | " | 374 | .. | 290 | 24 | 83 | 36 | Long. pink and white. |
| 18 | Prolific Rose | " | 369 | 36 | 275 | .. | 94 | 36 | Oblong, pink. |
| 19 | Maule's Thoroughbred | " | 367 | 24 | 308 | .. | 59 | 24 | Long, pink. |
| 20 | Uncle Sam | " | 363 | .. | 281 | 36 | 81 | 24 | Round, white. |
| 21 | Empire State | " | 363 | .. | 286 | .. | 77 | .. | Long, white. |
| 22 | Dreer's Standard | " | 356 | 24 | 264 | .. | 92 | 24 | Round, white. |
| 23 | Bovee | " | 354 | 12 | 255 | 12 | 99 | .. | Oblong, pink and white. |
| 24 | Early Envoy | " | 352 | .. | 264 | .. | 88 | .. | Long, pink. |
| 25 | Enormous | " | 352 | .. | 279 | 24 | 72 | 36 | Round, white. |
| 26 | Penn Manor | " | 352 | .. | 259 | 36 | 92 | 24 | Long, dark pink. |
| 27 | Burnaby Seedling | " | 345 | 24 | 257 | 24 | 88 | .. | Long, pink and white. |
| 28 | Seedling No. 7 | Medium | 343 | 12 | 281 | 36 | 61 | 36 | Oblong, pink. |
| 29 | Early Sunrise | Good | 341 | .. | 264 | .. | 77 | .. | Long, round, pink. |
| 30 | Early White Prize | " | 341 | .. | 255 | 12 | 85 | 48 | Long, white. |
| 31 | Early Michigan | " | 341 | .. | 231 | .. | 110 | .. | Oblong, white. |
| 32 | Rawdon Rose | " | 336 | 36 | 244 | 12 | 92 | 24 | Round, pink and white. |
| 33 | Cambridge Russet | " | 334 | 24 | 253 | .. | 81 | 24 | Oblong, white. |
| 34 | Canadian Beauty | " | 332 | 12 | 257 | 24 | 74 | 48 | Long, pink and white. |
| 35 | Money Maker | " | 331 | .. | 237 | 36 | 92 | 24 | Long, white. |
| 36 | Late Puritan | " | 323 | 24 | 233 | 12 | 90 | 12 | Long, pink and white. |
| 37 | Early Andes | " | 321 | 12 | 248 | 36 | 72 | 36 | Round, pink. |
| 38 | American Giant | Medium | 319 | .. | 224 | 24 | 94 | 36 | Long, pink. |
| 39 | Swiss Snowflake | Good | 314 | 36 | 176 | .. | 138 | 36 | Oblong, white. |
| 40 | Reeves' Rose | " | 312 | 24 | 246 | 24 | 66 | .. | Long, pink. |
| 41 | Sabean's Elephant | " | 308 | .. | 228 | 48 | 79 | 12 | Long, white. |
| 42 | Early Rose | " | 299 | 12 | 228 | 48 | 70 | 24 | Long, pink. |
| 43 | Holborn Abundance | Medium | 297 | .. | 171 | 36 | 125 | 24 | Oblong, white. |
| 44 | American Wonder | Good | 253 | .. | 198 | .. | 55 | .. | Long, white. |
| 45 | Carman No. 3 | " | 242 | .. | 213 | 24 | 28 | 36 | Flat, round, white. |

EXPERIMENTS TO TEST THE VALUE OF BUG DEATH AS COMPARED WITH PARIS GREEN AND BORDEAUX AND PARIS GREEN ON POTATOES.

Experiments were again conducted to test the comparative value of Bug Death, Paris green and Bordeaux Mixture and Paris green. The plots were alike in treatment of soil, date of planting, &c. The variety, Carman No. 1, was used. The soil was similar on all these plots and was treated in the same way. The plots were each 1-33 of an acre.

On one plot two applications of Bug Death were given, one on July 20 and one August 5. Four pounds of Bug Death was dusted on the plants at each application. The vines were quite large and this amount just nicely covered the leaves. It was applied in the early morning when the dew was on. Bugs were just commencing to feed at the time of the first application, and very few were noticed at the time of second application.

Paris Green and water at the rate of 1 oz. to 10 gallons of water, and one quart of lime water added, was applied by means of a spray pump to one plot, July 20 and August 5. At the time of the second application, about as many bugs were present on this plot as on the plot where Bug Death was used.

Poisoned Bordeaux Mixture, made of 4 lbs. bluestone, 4 lbs. lime, 4 ounces of Paris green and 40 gallons of water, was sprayed on a third plot July 20, August 4 and August 26. As many bugs were noticed at the time of the second application as were on the other two plots. No bugs were present at the time of the third application.

The Bug Death was quite as effective in killing the bugs as either the Paris green or poisoned Bordeaux. No blight was noticeable on any of these plots. The following yields per acre have been calculated from the weight of tubers taken from each of these plots of 1-33 of an acre:—

| How treated. | Yield per acre. Bush. | Lbs. |
|---|---|---|
| Bordeaux and Paris green | 356 | 24 |
| Bug Death | 340 | 16 |
| Paris green | 319 | .. |

MATERIALS USED AND COST PER ACRE.

*Bug Death Plot.*

| | |
|---|---|
| Ist application, 132 lbs. per acre, at 7c. per lb. | $ 9 24 |
| 2nd application, 132 lbs. per acre, at 7c. per lb. | 9 24 |
| | $18 48 |

*Paris Green Plot.*

| | |
|---|---|
| 4 lbs. Paris green at 25 cts. per lb. | $ 1 00 |

*Bordeaux and Paris Green Plot.*

| | |
|---|---|
| 50 lbs. bluestone at 8 cts. per lb. | $ 4 00 |
| 50 lbs. rock lime at 1 ct. per lb. | 50 |
| 4 lbs. Paris green at 25 cts. per lb. | 1 00 |
| | $5 50 |

## EXPERIMENTS WITH SOJA BEANS AND HORSE BEANS.

Experiments were again conducted with Soja beans and Horse beans to test their relative value as forage crops, and also the yield per acre when grown in rows at different distances apart. The plots were 1-10 acre each. The soil was a clay loam in a good state of fertility. The seed was sown June 13. Many of the plants of both these plots were destroyed by the cutworms. The 'Black Dolphin' aphis destroyed the remaining plants of Horse Beans, and a frost September 1 killed the Soja Beans, making it impossible to obtain any reliable data from either of these plots.

## EXPERIMENTS WITH ALFALFA.

A one-fortieth acre plot of Alfalfa was sown early in June, 1902, with barley as a nurse-crop. The nurse-crop was cut early in August. The plants only made fair growth and during the following winter were all killed out except a few plants. These made very poor growth during the season of 1903, and now only two weak plants remain.

In 1903 a similar plot was sown early in June. Wheat being used as a nurse-crop, was left uncut and allowed to remain as a protection to the plants during winter. The Alfalfa plants made a good start and nearly all came through the winter, but were in a sickly condition and made very poor growth this season. A few odd plants of Red clover that happened by chance to get into this plot lived through the winter and made exceptionally good growth. This plot was cut twice through the summer, at which times the Alfalfa was only from 4 to 6 inches high, while the few plants of Red clover in this plot were at least three times their height and weight. The soil of these two plots was a heavy clay, underdrained, in a fair state of fertility and well cultivated before sowing.

This season a plot of 1-10 acre of Alfalfa was sown. The soil was a heavy clay, underdrained, and in a good state of fertility. This land was plowed May 13 and well worked up. It was again worked May 29, June 20 and 29 with the springtooth and smoothing harrows. On July 7 this ground was again worked with the spade, springtooth and smoothing harrows and Alfalfa sown at the rate of 25 lbs. per acre with the grain seed drill. One-half of the plot was sown with wheat at the rate of 2 bushels per acre as a nurse-crop, and the other half with Alfalfa alone. The Alfalfa on the plot without a nurse-crop made a much more satisfactory growth than that with the nurse-crop, and was much better than that of any former year. On October 20 the growth of that sown alone averaged 10 to 12 inches, and that with the nurse-crop averaged only 5 to 7 inches. The nurse-crop, which made a growth of about 24 inches, was allowed to remain as a protection during winter.

## MILLET.

Six varieties of millet were grown on land that was in grain last year. The ground was manured last fall at the rate of 15 one-horse cart loads per acre and ploughed under this spring. This ground was again ploughed and worked up with the disc, springtooth and smoothing harrows. The seed was sown June 15 with the Planet Jr. hand drill in plots of one-fortieth acre each. The crop was cut August 29, while still in a green state for feed. The yield per acre is for green feed when cut.

| | Tons. | Lbs. |
|---|---|---|
| Moha Green California | 14 | 750 |
| Italian or Indian | 10 | 350 |
| Pearl or Cat Tail | 7 | |
| White Round French | 5 | 1,750 |
| Algerian | 5 | 1,050 |
| Moha Hungarian | 5 | 250 |

## CLOVER EXPERIMENTS.

Experiments were again conducted this season for the purpose of determining the gain, if any, from growing clover with grain crops for the purpose of turning under the growth made during the season for the benefit of future crops. The ground was the same as that on which similar clover experiments were conducted last season. The soil was a clay loam in a fair state of fertility. Three kinds of grain were sown and each of these series of plots were treated the same. Six plots were seeded down at the time the grain was sown, May 31, with Mammoth Red clover at the rate of 10 pounds per acre, and six with grain alone without clover. These plots were sown in a similar manner last season, and those seeded to clover this year had been seeded to clover last year, and those not seeded to clover this season had not been seeded to clover last year. The ground was ploughed in the fall and this spring was worked up with the disc, springtooth and smoothing harrows and the seed sown with the seed drill. The growth of clover on these plots was very light in 1903, consequently no very great difference in the yield per acre of grain from them this year could be expected. The clover on the plots seeded to clover was again unusually light and although starting well was killed out badly by the continued dry weather during June and July. Late sown grain rusted badly; especially was this the case with late sown wheat. The White Fife series of plots were so badly rusted that the crop was not worth threshing for the grain alone. The wheat was cut August 30; the oats, August 31; and the barley, August 27. The plots were one-fortieth acre each and gave the following yields per acre.

EXPERIMENTS WITH CLOVER SOWN WITH GRAIN.

| Name of Variety of grain and how seeded. | Yield per Acre. | |
|---|---|---|
| *White Fife Wheat.* | Bush. | Lbs. |
| No. 1—Without clover | 6 | 40 |
| " 2—With clover | 6 | 50 |
| " 3—Without clover | 6 | 20 |
| " 4—With clover | 5 | 10 |
| *Waverley Oats.* | | |
| No. 1—Without clover | 54 | 24 |
| " 2—With clover | 62 | 32 |
| " 3—Without clover | 57 | 2 |
| " 4—With clover | 60 | 20 |
| *Odessa Barley.* | | |
| No. 1—Without clover | 20 | 20 |
| " 2—With clover | 23 | 26 |
| " 3—Without clover | 27 | 4 |
| " 4—With clover | 27 | 24 |

## SPECIAL EXPERIMENTS WITH FERTILIZERS.

Special experiments with fertilizers of various kinds commonly used for field crops have been conducted for the past five years. It was decided that the further fertilizing of these plots should be abandoned and the land seeded to grain for some years, to determine the extent to which these fertilizers already applied would continue to supply the crop with the required plant food. Accordingly the field was seeded entirely to grain. Mammoth Red clover was sown on one-half of the field at the rate of 10 pounds per acre at the same time. The other half was not seeded to clover.

The plots were one-eighth acre each on which fertilizers of different kinds had been previously applied. These plots were divided into ten strips 14 feet wide, each running lengthwise across all the different fertilized plots. These strips were sown with five different kinds of grain: namely, oats, wheat, barley, pease and mixed grain. A margin of two feet was left between each plot, and one foot between each crop plot. The yield from these plots is given in the following table:

| Fertilizers used each Year during the past Five Years, per Acre. | Tartar King Oats with Clover. | | Tartar King Oats without Clover. | | Colorado Wheat with Clover. | | Colorado Wheat without Clover. | | Standwell Barley with Clover. | | Standwell Barley without Clover. | | Mixed Grain with Clover. | | Mixed Grain without Clover. | | Pease, Golden Vine, with Clover. | | Pease, Golden Vine, without Clover. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Bush. | Lbs. | Bush. | Lbs. | Bush. | Lbs. | Bush. | Lbs. | Bush. | Lbs. | Bush. | Lbs. | Bush. | Lbs. | Bush. | Lbs. | Bush. | Lbs. | Bush. | Lbs. |
| 1 Manure, 30 tons | 67 | 22 | 85 | 10 | 16 | 40 | 22 | 30 | 50 | .. | 56 | 12 | 57 | 20 | 60 | .. | 29 | 10 | 30 | .. |
| 2 Manure, 15 tons, fertilizer, 250 lbs | 72 | 2 | 73 | 18 | 20 | .. | 19 | 10 | 52 | 4 | 51 | 2 | 61 | 10 | 65 | .. | 30 | 50 | 35 | .. |
| 3 Complete fertilizer, 1,000 lbs. | 44 | 4 | 47 | 2 | 15 | .. | 15 | 50 | 35 | 20 | 27 | 4 | 41 | 10 | 40 | .. | 24 | 10 | 28 | 20 |
| 4 " 500 lbs | 45 | 20 | 41 | 6 | 12 | 30 | 14 | 10 | 33 | 16 | 24 | 18 | 37 | 20 | 45 | .. | 21 | 40 | 20 | .. |
| 5 Check. No fertilizer used | 36 | 26 | 38 | 8 | 10 | .. | 10 | 50 | 22 | 44 | 27 | 4 | 42 | 20 | 42 | 20 | 15 | .. | 13 | 20 |
| 6 Bone-meal, 1,000 lbs. | 52 | 32 | 48 | 18 | 11 | 40 | 11 | 40 | 33 | 16 | 29 | 8 | 43 | 30 | 41 | 10 | 25 | .. | 22 | 30 |
| 7 " 500 lbs | 41 | 6 | 52 | 32 | 10 | 50 | 11 | 40 | 31 | 12 | 37 | 24 | 37 | 20 | 45 | .. | 30 | .. | 26 | 40 |
| 8 Ashes, 2,500 lbs | 47 | 2 | 55 | 30 | 11 | 40 | 12 | 5 | 43 | 36 | 46 | 42 | 35 | .. | 47 | 20 | 28 | 20 | 27 | 30 |
| 9 Manure, rotted, 20 tons | 66 | 6 | 73 | 18 | 15 | 50 | 17 | 30 | 54 | 8 | 50 | .. | 56 | 10 | 65 | .. | 29 | 10 | 31 | 40 |
| 10 Check. No fertilizer used. | 33 | 28 | 29 | 14 | 6 | 40 | 7 | 30 | 20 | 40 | 22 | 44 | 30 | . | 27 | 20 | 16 | 40 | 11 | 40 |
| 11 Land plaster, 500 lbs | 38 | 8 | 32 | 12 | 8 | 20 | 10 | .. | 19 | 38 | 18 | 30 | 35 | .. | 32 | 20 | 15 | 50 | 14 | 10 |
| 12 Salt, 500 lbs | 42 | 22 | 39 | 24 | 10 | 50 | 13 | 20 | 25 | .. | 30 | 10 | 41 | 10 | 35 | .. | 25 | .. | 23 | 20 |
| 13 Marsh mud, 100 tons | 55 | 30 | 54 | 14 | 18 | 20 | 15 | 50 | 36 | 22 | 37 | 24 | 57 | 20 | 55 | .. | 31 | 40 | 26 | 40 |
| 14 Manure, green, 20 tons | 88 | 8 | 32 | 12 | 20 | 50 | 18 | 20 | 60 | 20 | 58 | 16 | 67 | 20 | 63 | 30 | 35 | 50 | 32 | 30 |

## EXPERIMENTS WITH FERTILIZERS ON WHEAT.

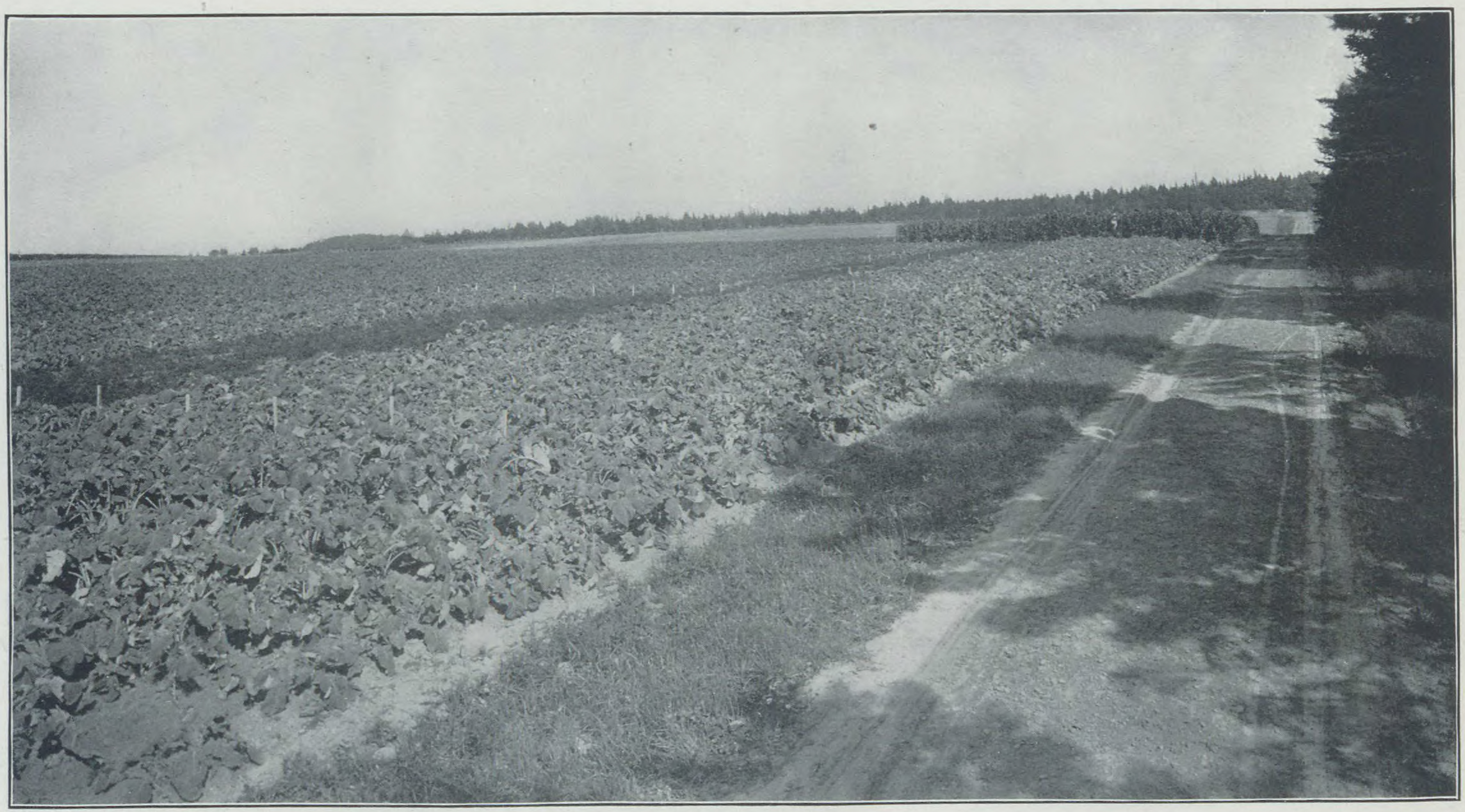
Experiments were conducted this year with wheat fertilized with different fertilizing materials. The variety Australian No. 19 was used. The seed was sown at the rate of 1¾ bushels per acre, June 1, and was harvested September 3. The ground on which this wheat was grown is a clay loam, and was previously in roots, having been manured with 30 one-horse cart loads of stable manure for that crop. The land was ploughed this spring and subsequently worked into good tilth. The growth of straw averaged 40 inches. This crop was practically ruined by rust.

## HAY.

The crop of clover and timothy hay was light, being fully one-third less than an average crop. Six acres of upland yielded 13 tons 1,165 lbs., and a 11-acre field yielded 24 tons 1,710 lbs. One acre of Awnless Brome yielded 1 ton 1,250 lbs. The 12 acres of underdrained marsh produced 15 tons 700 lbs., and the 35 acres not underdrained yielded 37 tons 1,270 lbs. This made a total of 93 tons 95 lbs.

## SUMMARY OF CROPS GROWN ON THE EXPERIMENTAL FARM THIS SEASON.

| Grain Field Crops. | Bush. | Lbs. |
|---|---|---|
| Oats | 181 | 18 |
| Barley | 27 | 26 |
| Mixed grain | 412 | 23 |
| Buckwheat | 64 | .. |
| | 685 | 27 |



Field of Turnips, Experimental Farm, Nappan.

| Grain from Trial Plots. | Bush. | Lbs. |
|---|---|---|
| Oats | 92 | 11 |
| Barley | 52 | 45 |
| Wheat | 25 | 2 |
| Pease | 27 | 44 |
| | 198 | 22 |

| Roots, &c., Field Crops. | Bush. | Lbs. |
|---|---|---|
| Turnips | 5,540 | 2 |
| Mangels | 1,767 | 55 |
| | 7,307 | 57 |

| From Trial Plots. | Bush. | Lbs. |
|---|---|---|
| Turnips | 277 | 34 |
| Mangels | 157 | 26 |
| Carrots | 74 | 12 |
| Sugar Beets | 66 | 16 |
| Potatoes—marketable | 116 | 15 |
| Potatoes—not marketable | 26 | 55 |
| | 718 | 38 |

| Corn for Ensilage. | Tons. | Lbs. |
|---|---|---|
| Field crop | 36 | 440 |
| From trial plots | 12 | 1,342 |
| | 48 | 1,782 |

## SUMMARY OF FEED USED.

Summary of feeds used in connection with stock on farm, July 1, 1903, to June 30, 1904:—

| — | Hay. | Grain or Meal. | Corn or Roots. |
|---|---|---|---|
| | Lbs. | Lbs. | Lbs. |
| Grown on farm | 205,272 | 52,686 | 640,560 |
| Purchased | 51,606 | 153,200 | |
| Received by exchange | 5,600 | 18,500 | |
| Total | 262,478 | 224,386 | |

The meal consumed consisted of oats, 37,094 lbs.; bran, 39,200 lbs.; middlings, 40,400 lbs.; mixed grain (oats, pease and barley), 34,104 lbs.; gluten meal, 30,000 lbs.; pea meal, 9,000 lbs.; oil cake, 8,500 lbs.; corn meal, 6,400 lbs.; moulie, 7,000 lbs.; wheat chop, 4,000 lbs.; buckwheat, 5,976 lbs.; barley, 2,712 lbs. Total, 224,386 lbs.

## DISPOSITION OF FEEDS.

Disposition of feed harvested, and purchased for use of live stock on farm, July 1, 1903, to June 30, 1904:—

| Class fed. | Grain or Meal. | Corn or Roots. | Hay. | Grain or Meal. | Corn or Roots. | Hay. |
|---|---|---|---|---|---|---|
| | Lbs. | Lbs. | Lbs. | | | |
| 8 horses | 41,200 | ........ | 58,400 | Weighed ... | Weighed ... | Weighed at intervals and amount calculated from said weighings. |
| 27 steers | 27,210 | 214,350 | 59,292 | " ... | " ... | |
| 10 young steers | 4,350 | 66,750 | 10,780 | " ... | " ... | |
| 21 cows (winter) | 39,690 | 159,500 | 56,700 | " ... | " ... | |
| 27 cows (summer) | 20,250 | ........ | 10,125 | Estimated .. | | |
| 22 young stock | 20,500 | 113,400 | 40,500 | " ... | " ... | |
| Calves under 1 year | 1,500 | ........ | ........ | Weighed ... | | |
| 3 bulls | 4,000 | ........ | 6,000 | " ... | | |
| Poultry | 2,000 | ........ | ........ | Estimated .. | | |
| 18 sheep | 3,240 | 2,000 | 6,480 | Weighed ... | " ... | |
| 70 swine | 38,000 | ........ | ........ | " ... | | |
| Seed | 5,000 | ........ | ........ | " ... | | |
| On hand July 1 | 7,000 | ........ | ........ | " ... | | |
| Total account | 213,940 | 556,000 | 248,277 | | | |
| Amount harvested | 224,386 | 640,560 | 262,478 | | | |
| Shrinkage | 10,446 | 84,560 | 14,201 | | | |
| % Shrinkage | 4·65% | 13·20% | 5·41% | | | |

## GRAIN AND POTATO DISTRIBUTION.

Some of the most promising varieties of grain and potatoes were again distributed this year free to farmers who made application. The following number of packages of 3 lbs. each were sent out:—

| | |
|---|---|
| Oats | 198 |
| Barley | 65 |
| Wheat | 72 |
| Pease | 51 |
| Buckwheat | 25 |
| Potatoes | 331 |
| Total | 742 |

## HORSES.

The stock of horses at present on the farm consists of three teams of heavy working horses, one express horse and one driver. There have been no changes during the year. All are in good condition.

## CATTLE.

The herd of dairy cattle on the farm at present, of all ages and breeds, numbers 49 head as follows:—

1 Guernsey bull, 6 years old.
1 Ayrshire bull, $1\frac{1}{2}$ years old.
1 Ayrshire bull calf.
2 Guernsey cows.
6 Ayrshire cows.
3 Holstein cows.
14 Grade cows.
1 Guernsey heifer, 1 year old.
5 Ayrshire heifers, 1 to 2 years old.
1 Holstein heifer, 1 year old.
7 Grade Ayrshire heifers, $1\frac{1}{2}$ years old.
1 Ayrshire heifer calf.
2 Holstein heifer calves.
4 Grade heifers, Ayr. and Guernseys.

The steers on hand and in experiments number 34 head, as follows:—

8 three-year-old steers, short-horn grades.
8 two-year-old steers, short-horn grades.
8 one-year-old steers, short-horn grades.
10 steer calves, short-horn grades.

## EXPERIMENT WITH DAIRY COWS.

This experiment was carried on as in former years, to further determine the profit or loss of a fairly good dairy herd, well fed and cared for, with the feeds consumed charged at current market prices, and receiving credit for milk produced, the value of which being established by the price received at the creamery during the season.

The different feeds were charged at the following prices: Wheat bran, $20 per ton; oats, $24 per ton; oil cake, $34 per ton; gluten-meal, $28.50 per ton; making an average price of mixed meal ration, as per proportion fed to cows, of 1⅓c. per pound. Roots at $2 per ton, ensilage at $2 per ton, and hay at $8 per ton.

The ration fed to cows in full milk was: Ensilage or roots, 50 lbs.; meal, 9 lbs.; hay, 10 lbs.; making a cost of 19¾ cents per cow per day.

In summer months, while milking, they were charged $2.50 per month, and when dry, $1 per month.

When dry in winter they were charged $3 per month. Different quantities were fed to different cows, according to their capacity to consume and produce, or period of lactation, and charged accordingly.

They were kept in the stable from November 1, 1903, to June 1, 1904, except on occasional fine days, when they were allowed out in the yard.

From June 1 to November 1, they were put out in the field the greater part of the time, night and day, but kept in during cold or wet weather.

They were fed, watered and milked each day at as nearly regular intervals as possible, and by the same persons.

The summer feed was practically all summer soiling crops, rye, clover, or oats, pease and vetches grown together and sown at different times after July 15. They were fed some hay, and after August 15, green corn.

The milk of each cow was weighed at milking twice each day, and a careful record kept of the number of pounds given.

The percentage of fat in the milk of each cow was determined by the Babcock milk tester, and the fat credited to the cow; on the basis that 85 pounds of fat produces 100 pounds of marketable butter.

The milk was sent to the Nappan dairy station, and the cows were credited with the butter produced at the prices paid to all patrons of that station, which averaged for the winter months 24 4-7 cents per pound, and for the summer months 20⅝ cents per pound, less 4 cents per pound for manufacturing and hauling milk, leaving 20 4-7 cents per pound for winter butter and 16⅝ cents per pound for summer butter.

The skim-milk was fed to calves and pigs, and credited to the cows at the rate of 15 cents per 100 pounds.

Of the 27 cows on hand December 1, 1903, only 21 are reported as in milk. Of the remainder, one died, some failed to breed ,and others were old and disposed of.

The following table will show the results obtained during the year:—

RECORD OF DAIRY COWS.

| Name. | Age. | Breed. | Date of dropping last Calf. | Days in Milk. | Quantity of Milk. | Fat. | Butter. | Value of Skim-milk. | Total Credit. | Cost of Feed. | Cost of Making Butter at 4c. per lb. | Total Cost | Profit. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Yrs. | | | | Lbs. | p. c. | Lbs. | $ cts. | $ cts. | $ cts. | $ cts. | $ cts. | $ cts. |
| Corie ............. | 7 | Ayrshire Grade... | Jan. 10, 1904 | 290 | 7,070 | 3·7 | 307·75 | 7 07 | 77 85 | 47 22 | 12 31 | 59 53 | 18 32 |
| Ilda Rooker..... | 5 | Holstein .......... | " 16, 1904. | 300 | 7,300 | 3·4 | 292·00 | 7 30 | 74 46 | 48 20 | 11 68 | 59 88 | 14 58 |
| Yellow Kate ... | 4 | Ayrshire.......... | Feb. 1........ | 280 | 6,700 | 3·6 | 283·76 | 6 70 | 71 96 | 46 24 | 11 35 | 57 59 | 14 37 |
| Rex's Maud. ...... | 9 | Guernsey.......... | Jan. 20, 1904. | 280 | 5,260 | 4·5 | 278·47 | 5 26 | 69 30 | 46 24 | 11 15 | 57 37 | 11 93 |
| Aitow .......... | 9 | Ayrshire Grade... | " 1, 1904. | 300 | 6,120 | 3·9 | 280·80 | 6 12 | 70 70 | 48 20 | 11 23 | 59 43 | 11 27 |
| Carrie............. | 11 | " .. | Mar. 1, 1904. | 270 | 6,050 | 3·7 | 263·35 | 6 05 | 66 62 | 45 26 | 10 53 | 55 79 | 10 83 |
| Curly. ............ | 5 | Ayrshire Gn. Grade | Feb. 1, 1904. | 300 | 6,010 | 3·9 | 275·75 | 6 01 | 69 43 | 48 20 | 11 03 | 59 23 | 10 20 |
| Sonsy.......... ... | 8 | Ayrshire... ...... | " 10, 1904. | 290 | 6,300 | 3·6 | 266·82 | 6 30 | 67 66 | 47 22 | 10 67 | 57 89 | 9 77 |
| Rae . ............ | 3½ | Ayrshire Gn. Grade | Jan. 1, 1904. | 300 | 5,640 | 4·0 | 265·41 | 5 64 | 66 68 | 46 40 | 10 61 | 57 01 | 9 67 |
| Lida Rooker. .... | 4 | Holstein .......... | " 1, 1904. | 300 | 6,590 | 3·3 | 255·84 | 6 59 | 65 43 | 48 20 | 10 23 | 58 43 | 7 00 |
| Daisy............. | 9 | Ayrshire Grade... | Mar. 1, 1904. | 270 | 5,430 | 3·6 | 229·88 | 5 43 | 58 30 | 43 93 | 9 19 | 53 12 | 5 18 |
| Lizzie . .......... | 3½ | Ayrshire G. Grade | Dec. 15, 1903. | 310 | 5,210 | 3·8 | 232·91 | 5 21 | 58 77 | 45 26 | 9 31 | 54 57 | 4 20 |
| Jessie P .......... | 10 | Ayrshire Grade... | May 15, 1904. | 285 | 5,300 | 3·8 | 236·94 | 5 30 | 59 79 | 46 73 | 9 47 | 56 20 | 3 59 |
| Bluebell.......... | 3½ | " .. | Dec. 30, 1903. | 210 | 4,700 | 3·7 | 204·58 | 4 70 | 51 75 | 41 90 | 8 18 | 50 08 | 1 67 |
| Sarah............. | 3½ | Ayrshire.......... | Feb. 15, 1904. | 255 | 4,740 | 3·7 | 206·35 | 4 74 | 52 20 | 42 53 | 8 25 | 50 78 | 1 42 |
| Norah.... ...... | 2½ | " ......... | Jan. 1, 1904. | 270 | 4,760 | 3·8 | 212·80 | 4 76 | 53 70 | 43 82 | 8 51 | 52 33 | 1 38 |
| Beatrice........... | 5 | " ......... | Sept. 1, 1903. | 210 | 4,880 | 3·7 | 212·42 | 4 88 | 53 73 | 44 48 | 8 49 | 52 97 | 0 76 |
| Molly I .......... | 11 | Sh. Ayrshire Grade | Feb. 6, 1904. | 295 | 4,950 | 3·8 | 221·29 | 4 95 | 55 84 | 47 21 | 8 85 | 56 06 | *0 22 |
| Maggie....... .... | 2½ | Ayrshire Grade... | Jan. 1, 1904. | 240 | 4,510 | 3·8 | 201·62 | 4 51 | 50 87 | 43 40 | 8 06 | 51 46 | 0 59 |
| Winnie............ | 3½ | Ayrshire Gn. Grade | " 1, 1904. | 300 | 4,540 | 3·9 | 208·30 | 4 54 | 52 44 | 45 40 | 8 32 | 53 72 | 1 28 |
| Betsy. ............ | 3½ | Ayrshire Grade... | " 10, 1904. | 260 | 4,680 | 3·6 | 198·21 | 4 68 | 50 26 | 44 04 | 7 92 | 51 96 | 1 70 |

*Loss.

## EXPERIMENTS WITH STEERS.

### TIED IN STALLS VS. FED IN LOOSE BOX.

This experiment was again carried on with the view of testing the advisability of feeding in loose boxes, as contrasted with similar steers fed tied in stalls.

Sixteen three-year-old steers were used for this test in two lots of eight each, of as nearly as possible equal form, fatness and weight (short-horn grades).

All weights were taken after a fast of fourteen hours, that is, at 9 a.m., without feed.

All were dehorned previous to beginning of test, and by careful weighing, both before and after dehorning, it was found that an average loss of 25 pounds per steer was sustained, requiring from 10 days to two weeks to regain.

All lots were fed alike, as nearly as possible, from start to finish of test, and kept in the stable all the time, except on occasional fine days, when they were let out for a time, averaging not more than once a week. The feeds were charged at the following prices : Hay, $8 per ton; roots, $2 per ton; ensilage, $2 per ton; mixed meals averaged $24 per ton; as per proportion fed.

The result of this experiment again shows slightly more gain for those fed in loose box stalls, than for those tied up, with a decided advantage as to the labour required, while the amount of straw required for loose steers is at least 50 per cent more than for those tied up.

Following are the results obtained :—

RECORD of steers, fed from November 16, 1903, to April 30, 1904.

LOT I.—DEHORNED, FED IN LOOSE BOX.

| Numbers. | Nov. 16. | Dec. 1. | Gain. | Dec. 31. | Gain. | Jan. 30. | Gain. | Mar. 1. | Gain. | Mar. 31. | Gain. | Apr. 30. | Gain. | Total Gain. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lbs. | Lbs. | Lbs | Lbs. | Lbs | Lbs. | Lbs | Lbs. | Lbs | Lbs. | Lbs | Lbs. | Lbs | Lbs. |
| 9... | 1,075 | 1,115 | 40 | 1,195 | 80 | 1,265 | 70 | 1,315 | 50 | 1,350 | 35 | 1,380 | 30 | 305 |
| 10... | 1,230 | 1,260 | 30 | 1,320 | 60 | 1,370 | 50 | 1,410 | 40 | 1,440 | 30 | 1,450 | 10 | 220 |
| 11... | 1,220 | 1,260 | 40 | 1,330 | 70 | 1,380 | 50 | 1,440 | 60 | 1,480 | 40 | 1,510 | 30 | 290 |
| 12... | 1,140 | 1,180 | 40 | 1,240 | 60 | 1,300 | 60 | 1,350 | 50 | 1,390 | 40 | 1,410 | 20 | 270 |
| 13... | 1,065 | 1,100 | 35 | 1,175 | 75 | 1,225 | 50 | 1,265 | 40 | 1,305 | 40 | 1,340 | 35 | 275 |
| 14... | 1,340 | 1,390 | 50 | 1,470 | 80 | 1,530 | 60 | 1,590 | 60 | 1,640 | 50 | 1,675 | 35 | 335 |
| 15... | 1,275 | 1,325 | 50 | 1,405 | 80 | 1,475 | 70 | 1,525 | 50 | 1,565 | 30 | 1,595 | 30 | 320 |
| 16... | 1,000 | 1,040 | 40 | 1,130 | 90 | 1,190 | 60 | 1,240 | 50 | 1,280 | 40 | 1,310 | 30 | 310 |
| | 9,345 | 9,670 | 325 | 10,265 | 595 | 10,735 | 490 | 11,135 | 400 | 11,450 | 315 | 11,670 | 220 | 2,325 |

LOT II.—DEHORNED, TIED IN STALLS.

| Numbers. | Nov. 16. | Dec. 1. | Gain. | Dec. 31. | Gain. | Jan. 30. | Gain. | Mar. 1. | Gain. | Mar. 31. | Gain. | Apr. 30. | Gain. | Total Gain. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1... | 1,415 | 1,465 | 50 | 1,545 | 80 | 1,605 | 60 | 1,645 | 40 | 1,695 | 50 | 1,725 | 30 | 310 |
| 2... | 1,300 | 1,340 | 40 | 1,400 | 60 | 1,450 | 50 | 1,495 | 45 | 1,525 | 30 | 1,560 | 35 | 260 |
| 3... | 1,225 | 1,275 | 50 | 1,345 | 70 | 1,385 | 40 | 1,425 | 40 | 1,460 | 35 | 1,485 | 25 | 260 |
| 4... | 1,130 | 1,180 | 50 | 1,260 | 80 | 1,300 | 40 | 1,350 | 50 | 1,390 | 40 | 1,415 | 25 | 285 |
| 5... | 1,065 | 1,100 | 35 | 1,160 | 60 | 1,195 | 35 | 1,245 | 50 | 1,285 | 40 | 1,310 | 25 | 245 |
| 6... | 1,175 | 1,220 | 45 | 1,300 | 80 | 1,360 | 60 | 1,400 | 40 | 1,440 | 40 | 1,475 | 35 | 300 |
| 7... | 1,080 | 1,120 | 40 | 1,170 | 50 | 1,220 | 50 | 1,260 | 40 | 1,290 | 30 | 1,310 | 10 | 230 |
| 8... | 1,070 | 1,100 | 30 | 1,160 | 60 | 1,200 | 40 | 1,250 | 50 | 1,275 | 25 | 1,305 | 30 | 235 |
| | 9,460 | 9,800 | 340 | 10,340 | 540 | 10,715 | 375 | 11,070 | 355 | 11,360 | 290 | 11,585 | 225 | 2,125 |

EXPERIMENT WITH STEERS—*Continued.*

Ex. 1.—Average cost of 1 steer per day for entire period.

| Period. | Daily Ration. | | Daily Cost. | Cost for period. | Total. |
|---|---|---|---|---|---|
| 1903. | | Lbs. | $ cts. | $ cts. | $ cts. |
| Nov. 16 to Dec. 1 | Roots | 90 | 0 09 | 1 35 | |
| | Hay | 10 | 0 04 | 0 60 | |
| | Meal | 2 | 0 02$\frac{2}{5}$ | 0 36 | 2 31 |
| Dec. 1 to Dec. 31 | Roots | 60 | 0 06 | 1 80 | |
| | Hay | 10 | 0 04 | 1 20 | |
| | Meal | 4 | 0 04$\frac{4}{5}$ | 1 44 | 4 44 |
| 1904. | | | | | |
| Dec. 31 to Jan 30 | Roots | 40 | 0 04 | 1 20 | |
| | Hay | 10 | 0 04 | 1 20 | |
| | Meal | 5 | 0 07$\frac{1}{5}$ | 2 16 | 4 56 |
| Jan. 30 to March 1 | Roots | 30 | 0 03 | 0 90 | |
| | Hay | 12 | 0 04$\frac{4}{5}$ | 1 44 | |
| | Meal | 7 | 0 08$\frac{2}{5}$ | 2 52 | 4 86 |
| March 1 to March 31 | Roots | 30 | 0 03 | 0 90 | |
| | Hay | 15 | 0 06 | 1 80 | |
| | Meal | 8 | 0 09$\frac{3}{5}$ | 2 88 | 5 58 |
| March 31 to April 30 | Roots | 20 | 0 02 | 0 60 | |
| | Hay | 15 | 0 06 | 1 80 | |
| | Meal | 8 | 0 09$\frac{3}{5}$ | 2 88 | 5 28 |
| Cost of feed, 1 steer | | | | | 27 03 |
| " 16 steers | | | | | 432 48 |

SUMMARY OF EXPERIMENT WITH STEERS.

*Financial Part.*

| | | |
|---|---|---|
| Original weight of 16 steers, 18,805 lbs., at 4$\frac{1}{8}$c. per lb. | $ | 775 70 |
| Weight at finish of 16 steers, 23,255 lbs., at 5 $\frac{40}{100}$c. per lb. | | 1,255 77 |
| Balance | | 480 07 |
| Cost of feed for lot, 165 days | | 432 48 |
| Net profit | | 47 59 |
| Daily rate of gain per steer | Lbs. | 1·68 |
| Cost of 1 lb. gain | Cts. | 9·71 |
| Cost of feed per day per steer | " | 16·38 |
| Profit per steer | | $2 97 |

It will be observed that an advance in price of 1·11 cents per lb. over buying price is required on a five months' feeding season, to cover feeding operations. The advance this season being 1·275 cents per lb, leaves a balance of $47.59 for lot. As in all other live stock experiments, no charge is made for labour, nor credit given for manure made.

## STEER CALF EXPERIMENT.

This experiment which was started in May, 1901, with ten calves, in two lots of five each, to determine the comparative economy of feeding calves a 'full fattening ration' from the start, as contrasted with a 'limited growing ration,' was continued with the five termed Ex. I., Lot II., L.G.R. calves of May, 1901, Lot I. of Ex. I., having been considered finished and sold April 30, 1903. Ex. II. calves of May, 1902, Ex. III. calves of May, 1903, were also continued, while Ex. IV. ten calves of May, 1904. was commenced.

EXPERIMENT I.—LIMITED GROWING RATION. CALVES OF MAY, 1901, CONTINUED FROM DECEMBER 1, 1903.

| Lot II. | Daily Ration. | Daily Cost. | Cost for Period. | Total. |
|---|---|---|---|---|
| *Period.* | | $ cts. | $ cts. | $ cts. |
| December 1 to December 31 | Roots, 90 lbs | 0 09 | 2 70 | |
| | Hay, 8 lbs | 0 03⅕ | 0 96 | |
| | Meal, 3 lbs | 0 03⅗ | 1 08 | 4 74 |
| December 31 to January 30 | Roots, 90 lbs | 0 09 | 2 70 | |
| | Hay, 8 lbs | 0 03⅕ | 0 96 | |
| | Meal, 4 lbs | 0 04⅘ | 1 44 | 5 10 |
| January 30 to March 1 | Roots, 60 lbs | 0 06 | 1 80 | |
| | Hay, 8 lbs | 0 03⅕ | 0 96 | |
| | Meal, 6 lbs | 0 07⅕ | 2 16 | 4 92 |
| March 1 to March 31 | Roots, 40 lbs | 0 04 | 1 20 | |
| | Hay, 10 lbs | 0 04 | 1 20 | |
| | Meal, 8 lbs | 0 09⅗ | 2 88 | 5 28 |
| March 31 to April 30 | Roots, 30 lbs | 0 03 | 0 90 | |
| | Hay, 10 lbs | 0 04 | 1 20 | |
| | Meal, 10 lbs | 0 12 | 3 60 | 5 70 |
| April 30 to May 30 | Roots, 20 lbs | 0 02 | 0 60 | |
| | Hay, 12 lbs | 0 04⅘ | 1 44 | |
| | Meal, 10 lbs | 0 12 | 3 60 | 5 64 |
| Cost of feed, 1 steer | | | | 31 38 |
| " 5 steers | | | | 156 90 |

| Lot II. | Weight at Start. | Weight at Finish. | Gain. |
|---|---|---|---|
| *Period.* | Lbs. | Lbs. | Lbs. |
| December 1 to May 30 | 5,160 | 6,530 | 1,370 |

| | | |
|---|---|---|
| | | Lbs. |
| Weight of five steers, December 1, 1903 | | 5,160 |
| Weight of five steers, May 30, 1904 | | 6,530 |
| Gain for period | | 1,370 |
| Daily rate of gain per steer | | 1·52 |
| Cost of feed per day per steer | $ | 0 17·43 |
| Cost of 1 lb. gain | | 0 11·45 |
| Cost of feed for lot, 180 days | | 156 90 |
| Cost of 1 lb. gain for entire experiment | | 0 06·15 |

## Experiment I.—Lot I.—F.F.R. Calves of May, 1901.

Lot I. finished April 30, 1903, sold and reported page 289 Report of 1903. Inserted for comparison.

### Summary of Lot I.—Experiment I.

| | | Lbs. |
|---|---|---|
| Weight of five steers, December 1, 1902 | | 4,620 |
| Weight of five steers, April 30, 1903 | | 6,355 |
| Gain for period | | 1,735 |
| Daily rate of gain per steer | | 2·32 |
| Cost of feed per day per steer | $ | 0 12·54 |
| Cost of 1 lb. gain | | 0 06· |
| Cost of feed for lot, 150 days | | 104 10 |
| Cost of 1 lb. gain for entire experiment | | 0 05·53 |

## Steer Calf Experiment—Experiment II.

Experiment II. (continued from December 1, 1903.)

The following tables show results to March 30, 1904, and December 1, 1904.

The full fattening ration 'Lot I.' of this experiment were finished and sold March 30, 1904. The limited growing ration Lot II. will be kept until spring of 1905.

Experiment II.—Calves of May, 1902. Continued from December 1, 1903.

| Lot I. | Daily Ration. | Daily Cost. | Cost for Period. | Total. |
|---|---|---|---|---|
| *Period.* | | $ cts. | $ cts. | $ cts. |
| Dec. 1 to Dec. 31 | Roots, 60 lbs | 0 06 | 1 80 | |
| | Hay, 8 lbs | 0 03⅕ | 0 96 | |
| | Meal, 3 lbs | 0 03⅗ | 1 08 | 3 84 |
| Dec. 31 to Jan. 30 | Roots, 60 lbs | 0 06 | 1 80 | |
| | Hay, 8 lbs | 0 03⅕ | 0 96 | |
| | Meal, 4 lbs | 0 04⅘ | 1 44 | 4 20 |
| Jan. 30 to Mar. 1 | Roots, 40 lbs | 0 04 | 1 20 | |
| | Hay, 10 lbs. | 0 04 | 1 20 | |
| | Meal, 5 lbs | 0 06 | 1 80 | 4 20 |
| Mar. 1 to Mar. 31 | Roots, 30 lbs | 0 03 | 0 90 | |
| | Hay, 10 lbs | 0 04 | 1 20 | |
| | Meal, 6 lbs | 0 07⅕ | 2 18 | 4 26 |
| Cost of feed, 1 steer | | | | 16 50 |
| " 5 steers | | | | 82 50 |

| | | Lbs. |
|---|---|---|
| Original weight, 5 steers, December 1, 1903 | | 5,220 |
| Weight at finish, 5 steers, March 30, 1904 | | 6,230 |
| Gain for period | | 1,010 |
| Daily rate of gain per steer | lbs. | 1·68 |
| Cost of feed per day per steer | cts. | 13·75 |
| Cost of 1 lb. gain | " | 8·16 |
| Cost of feed for lot, 120 days | $ | 82 50 |

EXPERIMENT II.—CALVES OF MAY, 1902, CONTINUED FROM DECEMBER, 1, 1903.

| Lot II. | Daily Ration. | Daily Cost. | Cost for Period. | Total Cost. |
|---|---|---|---|---|
| *Period.* | | $ cts. | $ cts. | $ cts. |
| Dec. 1 to Dec. 31 | Roots, 40 lbs | 0 04 | 1 20 | |
| | Hay, 4 lbs | 0 01⅗ | 0 48 | |
| | Straw, 5 lbs | 0 01½ | 0 45 | |
| | | | | 2 13 |
| Dec. 31 to Jan. 30 | Roots, 40 lbs | 0 04 | 1 20 | |
| | Hay, 4 lbs | 0 01⅗ | 0 48 | |
| | Straw, 5 lbs | 0 01½ | 0 45 | |
| | | | | 2 13 |
| Jan. 30 to March 1 | Roots, 40 lbs | 0 04 | 1 20 | |
| | Hay, 8 lbs | 0 03⅕ | 0 96 | |
| | | | | 2 16 |
| March 1 to March 31 | Roots, 40 lbs | 0 04 | 1 20 | |
| | Hay, 8 lbs | 0 03⅕ | 0 96 | |
| | | | | 2 16 |
| March 31 to April 30 | Roots, 30 lbs | 0 03 | 0 90 | |
| | Hay, 10 | 0 04 | 1 20 | |
| | | | | 2 10 |
| April 30 to May 30 | Roots, 20 lbs | 0 02 | 0 60 | |
| | Hay, 12 | 0 04⅘ | 1 44 | |
| | | | | 2 04 |
| May 30 to Nov. 1 | 5 months at pasture at | | | 6 00 |
| Nov. 1 to Dec. 1 | Roots, 80 lbs | 0 08 | 2 40 | |
| | Hay, 8 lbs | 0 03⅕ | 0 96 | |
| | Meal, 3 lbs | 0 03⅗ | 1 08 | |
| | | | | 4 44 |
| Cost of feed for 1 steer, 365 days | | | | 23 16 |

STEER CALF EXPERIMENT II.—CONTINUED.

| Lot II. | Weight at start. | Weight at finish. | Gain. |
|---|---|---|---|
| *Period.* | Lbs. | Lbs. | Lbs. |
| Dec. 1 to June 1 | 3,690 | 4,395 | 705 |
| June 1 to Dec. 1 | 4,395 | 5,475 | 1,080 |

| | | Lbs. |
|---|---|---|
| Original weight of 5 steers, Dec. 1, 1903 | | 3,690 |
| Weight at finish, of 5 steers, Dec. 1, 1904 | | 5,475 |
| Gain for period | | 1,785 |
| Daily rate of gain per steer | lbs. | ·97 |
| Cost of feed per day per steer (winter) | cts. | 8·17 |
| " " " (summer) | " | 4·00 |
| " " " for period | " | 6·34 |
| Cost of 1 lb. gain | " | 6·48 |
| **Cost of feed for lot, 1 year** | | **$115 80** |

EXPERIMENT III.—LOT I, FULL FATTENING RATION—CALVES OF MAY, 1903.

| Period. | Daily Ration. | Daily Cost. | Cost for Period. | Total. |
|---|---|---|---|---|
| | | $ cts. | $ cts. | $ cts. |
| Dec. 1 to Dec. 31 | Roots, 15 lbs | 0 01½ | 0 45 | |
| | Hay, 2½ lbs | 0 01 | 0 30 | |
| | Meal, 2 lbs | 0 02⅖ | 0 72 | 1 47 |
| Dec. 31 to Jan. 31 | Roots, 20 lbs | 0 02 | 0 60 | |
| | Hay, 2½ lbs | 0 01 | 0 30 | |
| | Meal, 2 lbs | 0 02⅖ | 0 72 | 1 62 |
| Jan. 31 to March 1 | Roots, 25 lbs | 0 02½ | 0 75 | |
| | Hay, 4 lbs | 0 01⅗ | 0 48 | |
| | Meal, 2 lbs | 0 02⅖ | 0 72 | 1 95 |
| Mar. 1 to Mar. 31 | Roots, 30 lbs | 0 03 | 0 90 | |
| | Hay, 4 lbs | 0 01⅗ | 0 48 | |
| | Meal, 2 lbs | 0 02⅖ | 0 72 | 2 10 |
| Mar. 31 to April 30 | Roots, 30 lbs | 0 03 | 0 90 | |
| | Hay, 4 lbs | 0 01⅗ | 0 48 | |
| | Meal, 2 lbs | 0 02⅖ | 0 72 | 2 10 |
| April 30 to May 30 | Roots, 30 lbs | 0 03 | 0 90 | |
| | Hay, 4 lbs | 0 01⅗ | 0 48 | |
| | Meal, 2 lbs | 0 02⅖ | 0 72 | 2 10 |
| May 30 to June 30 | Roots, 30 lbs | 0 03 | 0 90 | |
| | Hay, 5 lbs | 0 02 | 0 60 | |
| | Meal, 2 lbs | 0 02⅖ | 0 72 | 2 22 |
| June 30 to July 15 | Meal, 2 lbs | 0 02⅖ | 1 08 | |
| | Pasture at | | 1 50 | 2 58 |
| July 15 to Oct. 1 | Green feed, 40 lbs | 0 04 | 3 00 | |
| | Meal, 2 lbs | 0 02⅖ | 1 80 | 4 80 |
| Oct. 1 to Nov. 1 | Pasture at | | 1 00 | 1 00 |
| Nov. 1 to Dec. 1 | Roots, 40 lbs | 0 04 | 1 20 | |
| | Hay, 5 lbs | 0 02 | 0 60 | |
| | Meal, 2 lbs | 0 02⅖ | 0 72 | 2 52 |
| Cost of feed 1 steer, 365 days | | | | 24 46 |

STEER CALF EXPERIMENT III.—CONTINUED.

| Period. | Lot I. | | |
|---|---|---|---|
| | Weight at Start. | Weight at Finish. | Gains. |
| | Lbs. | Lbs. | Lbs. |
| December 1 to June 1 | 2,895 | 3,710 | 815 |
| June 1 to December 1 | 3,710 | 4,820 | 1,110 |

| | Lbs. |
|---|---|
| Weight at start, 5 steers, Dec. 1, 1903 | 2,895 |
| Weight at finish, 5 steers, Dec. 1, 1904 | 4,820 |
| Gain for period | 1,925 |

| | | |
|---|---|---|
| Daily rate of gain per steer | lbs. | 1·05 |
| Cost of feed per day per steer (winter) | cts. | 6·60 |
| Cost of feed per day per steer (summer) | " | 6·83 |
| Cost of 1 lb. gain | " | 6·35 |
| Cost of feed per day per steer for period | " | 6·70 |
| Cost of 1 lb. gain | " | 6·35 |
| Cost of feed for lot, 1 year | | $122 30 |

### Steer Calf Experiment IV.

In estimating the cost of feeding calves, the following values were put on the different feeds :—

New milk, $1 per 100 pounds.
Skim milk, 15 cents per 100 pounds.
Meal (oats, wheat, bran and oil cake), $1 per 100 lbs.
Roots or ensilage, 10 cents per 100 lbs.
Hay, $8 per ton.

Experiment IV.—Lot I. Full fattening ration—calves of May, 1904.

| Period. | Daily Ration. | Amount fed during Period. | Cost. | Total Cost. |
|---|---|---|---|---|
| | | Lbs. | $ cts. | $ cts. |
| June 1 to July 1 | 10 lbs. whole milk | 1,500 | 15 00 | |
| | 10 lbs. skim-milk | 1,500 | 2 25 | |
| | ½ lb. meal | 37½ | 0 37½ | |
| | | | | 17 62½ |
| July 1 to August 1 | 10 lbs. whole milk | 1,550 | 15 50 | |
| | 10 lbs. skim-milk | 1,550 | 2 32 | |
| | ½ lb. meal | 77½ | 0 77½ | |
| | | | | 18 59½ |
| August 1 to September 1 | 20 lbs. skim-milk | 3,100 | 4 65 | |
| | 2 lbs. hay | 310 | 1 24 | |
| | 1 lb. meal | 155 | 1 55 | |
| | | | | 7 44 |
| September 1 to October 1 | 10 lbs. skim-milk | 1,500 | 2 25 | |
| | 2 lbs. hay | 300 | 1 20 | |
| | 1 lb. meal | 150 | 1 50 | |
| | | | | 4 95 |
| October 1 to November 1 | 10 lbs. roots | 1,550 | 1 55 | |
| | 2 lbs. hay | 310 | 1 24 | |
| | 1½ lbs. meal | 232 | 2 32 | |
| | | | | 5 11 |
| November 1 to December 1 | 10 lbs. roots | 1,500 | 1 50 | |
| | 2 lbs. hay | 300 | 1 20 | |
| | 2 lbs. meal | 300 | 3 00 | |
| | | | | 5 70 |
| Cost of feed, 5 calves 180 days | | | | 59 42 |

| | Lbs. |
|---|---|
| Weight of 5 calves, June 1, 1904 | 905 |
| Weight of 5 calves, Dec. 1, 1904 | 2,650 |
| Gain for period | 1,745 |

| | | |
|---|---|---|
| Daily rate of gain per steer | lbs. | 1·90 |
| Cost of 1 lb. of gain | cts. | 3·40 |
| Cost of feed per day | " | 6·49 |
| Cost of feed for lot, 183 days | | $59 41 |

STEER CALF EXPERIMENT IV.—LOT II. LIMITED GROWING RATION CALVES OF MAY, 1904.

| Period. | Daily Rations. | Amount fed during Period. | Cost. | Total Cost. |
|---|---|---|---|---|
| | | Lbs. | $ cts. | $ cts. |
| June 1 to July 1 | 10 lbs. whole milk | 1,500 | 15 00 | |
| | 10 lbs. skim-milk | 1,500 | 2 25 | |
| | ¼ lb. meal | 37½ | 0 37½ | |
| | | | | 17 62½ |
| July 1 to August 1 | 5 lbs. whole milk | 775 | 7 75 | |
| | 15 lbs. skim-milk | 2,325 | 3 49 | |
| | ¼ lb. meal | 38¾ | 0 38¾ | |
| | | | | 11 63¾ |
| August 1 to September 1 | 20 lbs. skim-milk | 3,100 | 4 65 | |
| | 2 lbs. hay | 310 | 1 24 | |
| | ¼ lb. meal | 38¾ | 0 38¾ | |
| | | | | 6 27¾ |
| September 1 to October 1 | 10 lbs. skim-milk | 1,500 | 2 25 | |
| | 2 lbs. hay | 300 | 1 20 | |
| | ½ lb. meal | 75 | 0 75 | |
| | | | | 4 20 |
| October 1 to November 1 | 10 lbs. roots | 1,550 | 1 55 | |
| | 2 lbs. hay | 310 | 1 24 | |
| | ½ lb. meal | 77½ | 0 77½ | |
| | | | | 3 56½ |
| November 1 to December 1 | 20 lbs. roots | 3,000 | 3 00 | |
| | 2 lbs. hay | 300 | 1 20 | |
| | ½ lb. meal | 75 | 0 75 | |
| | | | | 4 95 |
| Cost of feed, 5 steers, 183 days | | | | 48 24 |

| | | |
|---|---|---|
| | | Lbs. |
| Weight of 5 calves, June 1, 1904 | | 650 |
| Weight of 5 calves, Dec. 1, 1904 | | 2,015 |
| Gain for period | | 1,365 |
| Daily rate of gain per calf | lbs. | 1·51 |
| Cost of 1 lb. gain | cts. | 3·53 |
| Cost of feed per day per calf | " | 5·27 |
| Cost of feed for period, 5 calves | | $48 24 |

## PIGS.

The herd of pigs on the farm consists of Yorkshires, Berkshires and their grades and crosses, in all 70 head, as follows :—

1 Yorkshire boar.
3 Yorkshire sows.
2 Berkshire sows.
4 Grade-York sows.
20 Grade pigs, 6 months old.
40 Grade pigs, 1 to 2 months old.

## EXPERIMENTS WITH SWINE.

Feeding in pasture as compared with feeding in pens.

This experiment, carried on in the summers of 1902-03, was repeated this year with 20 pigs of one month old, in two lots of 10 each, of various breeds and crosses, each lot consisting of an equal number from each litter and termed lot I. and lot II.—lot I. in pasture and lot II. in pens.

Lot I. were fed an average daily ration of 2 lbs. meal, largely shorts, and 5 lbs. skim-milk, from July 1 to November 1, and pasture, which consisted of clover, rape, hairy or sand vetch, and spring vetch and peas mixed sown on different parts of a field of one acre in extent.

Lot II. were fed the same daily ration in pens.

A portable house was used for shelter.

On November 1 the pigs were taken into pens, and fed a ration of 3 lbs. meal until December 1.

The results are as follows :—

### Experiments with Swine—Experiment I.

LOT I. FED ON PASTURE, JULY 1 TO NOVEMBER 1; FED IN PENS, NOVEMBER 1 TO DECEMBER 1.

| Period. | Weight at Start. | Weight at Finish. | Gain. |
|---|---|---|---|
| | Lbs. | Lbs. | Lbs. |
| July 1 to November 1 | 170 | 1,129 | 959 |
| November 1 to December 1 | 1,129 | 1,609 | 480 |
| Total gain, 10 pigs, 153 days | ........... | .......... | 1,439 |

| | Lbs. |
|---|---|
| Average daily gain on pasture, July 1 to November 1.. | ·78 |
| Average daily gain in pens, Nov. 1 to Dec. 1...... | 1·60 |
| Cost per pound gain, entire period..............cts. | 3·55 |

LOT II. FED IN PENS, JULY 1 TO DECEMBER 1, 1904.

| Period. | Weight at Start. | Weight at Finish. | Gain. |
|---|---|---|---|
| | Lbs. | Lbs. | Lbs. |
| July 1 to March 1 | 185 | 1,169 | 984 |
| November 1 to December 1 | 1,169 | 1,472 | 303 |
| Total gain, 10 pigs, 153 days | ........ | ............ | 1,287 |

| | Lbs. |
|---|---|
| Average daily gain in pens, July 1 to November 1.... | ·80 |
| Average daily gain in pens, Nov. 1 to Dec. 1........ | 1·01 |
| **Cost per pound gain, entire period............cts.** | **3·94** |

## SHEEP.

The flock of sheep at present consists of:—

1 pure bred Leicester ram.
3 " " ewes.
5 " Shropshire ewes.
4 grade ewes.
2 Shropshire ewe lambs.
3 Leicester ewe lambs.
1 Leicester ram lamb.
1 grade wether lamb.

## POULTRY.

During the year, six breeds of poultry were kept: B. P. Rocks, W. Leghorns, Black Minorcas, W. Wyandottes, Buff Wyandottes and Silver Grey Dorkings.

The breeding pens were made up as follows:—

| | Hens | Cocks. |
|---|---|---|
| B. Plymouth Rocks | 14 | 1 |
| Black Minorcas | 5 | 1 |
| White Leghorns | 4 | 1 |
| White Wyandottes | 5 | 1 |
| Buff Wyandottes | 3 | 1 |
| Silver Grey Dorkings | 2 | 1 |

The season's chicks were all hatched by incubators, the incubators being filled five times, with very unsatisfactory results. Partly owing to infertile eggs and weak germs, numerous fully developed chicks died in the shell at pipping stage, and those hatched were not as strong and vigorous as in former years.

The hens were apparently in good condition. So far, we have been unable to locate the trouble satisfactorily.

The eggs laid by the different breeds were as follows.

| | Eggs laid | Av. per hen |
|---|---|---|
| 14 B. P. Rocks | 686 | 49 |
| 5 Black Minorcas | 200 | 40 |
| 4 White Leghorns | 200 | 50 |
| 5 White Wyandottes | 245 | 49 |
| 3 Buff Wyandottes | 141 | 47 |
| 2 Silver Grey Dorkings | 90 | 45 |

## CORRESPONDENCE.

During the year, 2,030 letters were received, and 1,790 sent out, exclusive of circulars sent out with grain distribution, reports, &c.

## EXHIBITIONS, AGRICULTURAL MEETINGS AND EXCURSIONS TO THE FARM.

An exhibit was made of farm produce at the Nova Scotia provincial exhibition, Halifax, N.S., September 7 to 14; the New Brunswick provincial exhibition, St. John, N.B., September 16 to 24, and at the Prince Edward Island provincial exhibition, Charlottetown, P.E.I., September 27 to 30.

I addressed agricultural meetings during the year at West River, Pictou County, N.S.; Truro, N.S.; Fredericton, N.B.; Woodstock, N.B.; Chatham, N.B.; Pugwash, N.S.; Windsor, N.S.; Barronsfield, N.S.; River Hebert, N.S.; Greenville, N.S.; Wallace Bridge, N.S.; Upper Stewiacke, N.S.; Middle Stewiacke, N.S.; Brookfield, N.S., and Antigonish, N.S. I also delivered a series of lectures to the students of the Sussex, N.B. Dairy School in March. I also attended the Dominion Live Stock Convention at Ottawa, and the Maritime provincial exhibitions.

As usual many visitors have been on the farm this year and there have been several farmers' excursions, the largest of which was that of the Pictou County Farmers' Association on July 13, when over 1,000 were present. Small excursions from surrounding districts were frequently made to the farm.

I have the honour to be, sir,

Your obedient servant,

R. ROBERTSON,

*Superintendent.*

# REPORT OF THE HORTICULTURIST.

(W. S. Blair.)

Nappan, N.S., December 1, 1904.

To Dr. Wm. Saunders,
Director Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to submit herewith a report of some of the work done in the horticultural department of the Experimental Farm for the maritime provinces during the year 1904.

The winter of 1903-4 was a sèvere one, and the temperature was not so variable as usual. The fruit and ornamental trees and shrubs, however, came through the winter in excellent condition and did not suffer more from winter injury than usual.

The spring was later at the start than usual, but toward the last of May favourable warm weather forced along vegetation, and by the middle of June the season was as far advanced as it generally is at that date.

The mean average temperature for May was 4° warmer than the average for the past four years. June was warmer than the same month in 1903 by over 2°. July was also much warmer than usual, being about 5° in the mean average above the same month in 1903. The balance of the season averaged about the same as usual. The following table gives the mean average temperature for the months of May, June, July, August and September, as compared with the same months during the past four years :—

| Month. | Mean Temperature at Nappan. | | | | | Rainfall. | |
|---|---|---|---|---|---|---|---|
| | 1904. | 1903. | 1902. | 1901. | 1900. | 1904. | 1903. |
| | ° | ° | ° | ° | ° | In. | In. |
| May | 51·7 | 47·7 | 47·6 | 48·1 | 46·1 | 1·76 | 0·68 |
| June | 55·9 | 53·6 | 54·5 | 59·3 | 57· | 1·74 | 2·29 |
| July | 67·0 | 62·7 | 61·7 | 65·2 | 64·5 | 2·15 | 2·07 |
| August | 61·5 | 59·3 | 63·4 | 65·3 | 62·1 | 3·51 | 2·40 |
| September | 53 6 | 57·5 | 57·5 | 58·4 | 53·4 | 4·52 | 3·63 |

The season was exceptionally favourable for plants that require a fair amount of heat, such as tomatoes, squash and beans, all of which ripened up better than usual. This summer again was too dry for most farm crops, and many of the garden crops suffered greatly; especially was this the case with annual flowering plants. Never before has the lawn appeared so burnt and dried up as it was this summer. Where fruit trees were kept in a good state of cultivation they suffered little for want of moisture; but, generally speaking, the fruit was smaller than it would probably have been had the moisture conditions been more favourable. This was especially apparent in uncultivated orchards.

There were two frosts in June; one on the 9th of 1°, and one on the 10th of 2°, which did considerable damage to tomatoes, squash and tender annuals that were not covered. Fortunately the most of these were covered, as indications favoured a frost at this time. The only frosts recorded in May were on the 1st, 2nd, 6th and 7th of 1°, 5°, 6° and 5°, respectively. The first fall frost, September 1, of 1°, was earlier this season than usual, but light, doing slight damage. One on the 23rd of 9°, and one on the 28th of 2°, killed all tender plants.

The apple crop here this year was larger than usual. The capacity of the trees for producing is gradually increasing. Some of the varieties produce small unsaleable apples, and some are varieties of inferior quality which are hard to dispose of when such sorts as Gravenstein and Bishop Pippin are on the market in quantity at low prices, as was the case this season. Consequently the revenue from this source is not as high as anticipated. Heavy winds during the latter part of August and early September shook off a considerable quantity of fruit.

Two trees of Gravenstein were lost from the disease known as collar rot. This is a rotting of the bark at the surface of the ground. These trees were in a vigorous state until last season, when they appeared to lack vigour, and although the affected portions were removed, and the wounds well washed with a copper sulphate solution, they died during the winter, which was no doubt partly due to the severe season. One Banks or Red Gravenstein also winter root-killed. This tree had not previously been in a very vigorous state, although the bark appeared healthy. This tree was planted where there was heavy clay near the surface, which was probably the cause of its unthrifty condition. Four trees were injured by sunscalding above the veneering used for protection in the orchard, and had to be removed. In the orchard, protected by a shelter belt of natural spruce, two trees were injured by mice girdling below the veneering, which was not set down close enough to the ground. Mice were very numerous in the protected orchard, which was no doubt largely due to strips of land between the trees being previously in clover. No mice were noticed in the other orchard, where the whole ground was more or less in cultivated crops. Numerous complaints were received from different parts of the provinces of the damage done by mice. A good protection for trees against their attack is strips of veneering (thin hardwood) about 2 feet long wrapped around the trunk of the tree and tied with binder twine or some such strong twine. This veneering can be kept from year to year and made to serve for a number of years. This is also valuable for protecting trees from sunscald.

There was very little apple spot on the fruit this year, and very few apple worms. The apple and plum aphis were more numerous than usual, and were controlled by a spray of whale oil soap and water; 1 lb. soap to 6 gallons of water.

The plum crop was small, which was doubtless largely due to the severe winter. The pear crop was a failure, only the Flemish Beauty producing fruit. The crop of cherries was also small, and, as usual, the birds took the most of the fruit. From our experience it would appear that we cannot grow the sweet cherries here successfully. The common cherry of the country, of Richmond type, found growing in every section of the country, seems adapted to a larger range of conditions than any others. Seedlings of these start up under old trees and if set out and cultivated have given better satisfaction than any of the newer varieties. In some more suitable locations this may not hold good; but, generally speaking from a maritime standpoint, this is the case.

The strawberry plantation was on a piece of heavy soil on which ice formed during the winter, and the crowns of the plants were injured. When the mulch was removed it was found that the majority of the plots were killed out completely. Of the remaining plants the crop was light owing to the dry weather. The crop of gooseberries was fair. The English varieties were badly covered with mildew, rendering them largely unmarketable. They were sprayed several times with potassium sulphide, 1 oz. to 2 galls. water, which only partially controlled this fungus. The currants were a fair crop. Raspberries a light crop.

The fruit and ornamental trees and shrubs have made a fair growth of wood during the season which seems to have ripened up well. The perennial flowering plants did well, and some additional Japanese Irises were planted. In this report a list of some of the best perennials tested during the past four years, is given. There is also given in this report the results of some experiments conducted to find out the moisture contents of soil treated in different ways. Tests, as usual, have been carried on with different varieties of vegetables, some of which are given herewith. Some experiments were also tried, conducted with materials recommended for the destruction of root maggots and cutworms. The results also of some experiments with cover crops grown in the orchard here are included.

I beg to acknowledge the following donations:—From Prof. Sears, Director School of Horticulture, Wolfville, N.S., scions of 'Red Russet' apple. From Mr. Whitman Ruggles, Nictaux, N.S., scions of 'Red Russet' apple. From Mr. A. C. Starr, Starr's Point, N.S., scions of 'Bosc' pear and 'Winterstein' apple. From Mr. Wm. Bustin, Belleisle, Granville, Annapolis Co., N.S., scions of 'Ribston Pippin' apple. From Mr. James Bonneyman, New Annan, N.S., scions of 'Rhymer Pippin apple. From Mr. John Robertson, 'Inkerman Farm,' New Perth, P.E.I., seedling apple stocks for root grafting. From Mr. Henry Piers, North-west Arm, N.S., seeds of 'Asparagus' pole beans. From D. J. Stewart, Lower Montague, P.E.I., plants of 'Cyclone,' 'Hunn' and 'Excelsior' strawberries.

I also addressed several agricultural meetings in each of the three maritime provinces during the year.

## PERENNIALS.

Many different kinds of herbaceous perennials have been tested in the perennial border during the past four years. The following is a list of some of those which have done the best:—

*Anemone narcissiflora.*—Wind flower. Height 8 to 10 inches. Pretty white flowers. 1 to 1½ inches across. In bloom from the last of May to the last of July.

*Arabis alpina.*—White Alysssum. Height 6 inches. An abundance of small white flowers borne profusely over the whole plant. In bloom the 10th of May.

*Aster Novæ Angliæ roseus.*—Pink-flowered New England aster. Height 3 feet. In bloom the last of August. A showy perennial flowering profusely in clusters of bright pink.

*Aconitum napellus.*—Common monk's hood or helmet flower. Height 4½ feet. Comes into bloom soon after the middle of July. The flowers are blue, borne on large terminal spikes.

*Aconitum napellus album.*—Similar to the above, except that the flowers are nearly white. These two plants are very desirable for rear border planting.

*Achillea ptarmica flore pleno.*—Double sneezewort. Height 2 feet. Flowers small, white, round, compact, borne in loose clusters. In bloom from the middle of June to the last of August. One of the finest white flowering perennials for cutting.

*Aquilegia chrysantha.*—Golden spurred columbine. Height 2½ feet. Large, bright yellow flowers. In bloom the first of July.

*Aquilegia oxysepala.*—Russian colombine. Height 1 foot. In bloom the last of May. Flowers large purplish-blue. A very desirable early flowering perennial.

*Boltonia latisquama.*—Height 5 feet. White flowers, somewhat resembling the wild aster, borne profusely in large panicles. In bloom the middle of August. One of the best tall late flowering perennials.

*Boltonia asteroides.*—False chamomile. Height 4½ feet. Small pale pink flowers similar to the above. A profuse bloomer after the last of August. A showy late perennial that will stand wind without staking.

*Campanula persicifolia.*—Peach-leaved bellflower. Height 2 feet. Large blue flowers borne in a raceme with long flower stems. . In bloom during the month of July.

*Campanula persicifolia grandiflora alba.*—Double white bellflower. This is one of the best campanulas grown here. Large white double flowers. Height 2 feet. In bloom during July.

*Clematis recta.*—Erect Virgins Bower. Height 4 feet. In bloom during July. The flowers are white, small, borne profusely in dense clusters. Valuable for back of perennial border. Much admired.

*Convallaria majalis.*—Lily of the Valley. In bloom the first week in June. The plants do best in a shaded place. The bloom of this well known flower has in the past been injured greatly by our early June frosts.

*Coreopsis delphinifolia.*—Larkspur-leaved tick-seed. Height 2½ feet. Showy yellow flower with dark centre. In bloom July 20 to the last of August. One of the best perennials.

*Delphinium cashmerianum.*—Cashmerian larkspur. Height 18 inches. Flowers in different shades of blue; borne in large open heads. In bloom from the middle of July to the last of August.

*Dicentra spectabilis.*—Bleeding heart. Height 2½ feet. Red and white heart-shaped flowers, borne in pendulous racemes.

*Doronicum plantagineum excelsum.*—Tall plantain-like leopard's bane. Height 18 inches. In bloom the first of June. Large yellow flowers on long stems. Liked for cutting. One of the best.

*Doronicum caucasicum.*—Caucasian leopard's bane. Height 12 inches. Yellow flower similar to the above, but smaller. In bloom May 25 to June 18. These are two of the most desirable and showy spring flowering perennials.

*Erigeron macranthus.*—Fleabane. Height 18 inches. Flowers heliotrope, rays with yellow centres. In bloom during July. A much admired perennial.

*Funkia sieboldiana.*—Large-flowered plantain lily. Height 15 inches. Flowers pale blue, borne in racemes. In bloom July 18. This with its regular plantain-like leaves overlapping each other makes an interesting plant.

*Gypsophila paniculata.*—Infant's breath. Height 2½ feet. Small white flowers, borne profusely in large open panicles. In bloom from the last of July to September. Much liked for cutting.

*Gaillardia aristata grandiflora.*—Large flowered blanket flower. Height 18 inches. Flowers borne singly on long stems, yellow, with deep orange centres. In bloom during July and August. Very useful for cutting.

*Helenium grandicephalum striatum.*—Large striped Sneezewort. Height 3½ feet. Flowers yellow, with brown markings. A striking perennial in bloom from early August to October.

*Helenium autumnale.*—Autumn flowering Sneezewort. Height 4 feet. Large yellow flowers. Very showy. In bloom the last of July to the last of September.

*Helianthus maximiliana.*—Perennial sunflower. Height 4 feet. Flowers large yellow. Very showy. In bloom early in August.

*Hemerocallis flava.*—Yellow day lily. Height 2 feet. Flowers fragrant, orange yellow. In bloom after July 1. This is one of the best day lilies.

*Iris pumila.*—Dwarf Iris. Height 5 inches. In bloom the last of May. Flowers purple.

*Iris Sibirica.*—Siberian Iris. Height 3 feet. Flowers white and blue. Small, on long stems. In bloom the middle of June. Not so attractive as some other forms of Iris.

*Iris Germanica.*—German Iris. Height 2 feet. In bloom from the middle to the last of June. Flowers large, ranging in colours of lilac, blue and purple. Slightly fragrant. One of the most desirable groups of irises of which there are many good varieties. Purple King is an especially striking one.

*Iris florentina.*—Orris root. Height 2 feet. Flowers pale lilac blue, shading to white. Large flowers, sweet scented, on long stalks. A good one. In bloom from the middle to last of June.

*Iris flavescens.*—Height 2 feet. Flowers lemon yellow, with purplish brown markings. In bloom at the same time as the above.

*Iris variegata.*—Height 1½ to 2 feet. Flowers large, much veined with brown on a yellow ground. The variety Honorabile is a good one of this group.

*Iris Amœna.*—Height 18 inches. In bloom second and third week in June. Flowers almost white or lilac-tinted outer segments and purple or purple-tinted centre. This has a variety of markings. Mrs. H. Darwin, an almost pure white variety of this group, is also very fine.

*Iris plicata.*—Fringed Iris. Height 18 inches. Flowers white in centre of outer segments; veined with lilac toward the margin; inner segments white tinted with lilac or blue. Madame Chereau is a fine variety of this group.

*Iris kaempferi.*—Japanese Iris. Height 18 inches. In bloom soon after the middle of July. The flowers are very large, with various combinations of colours. A very desirable late flowering plant of which there are a great number of varieties.

*Lilium auratum.*—Golden-rayed lily of Japan. Height 3 feet. In bloom the second week in June. Flowers large, white petals, spotted with red and purple, and golden centre. Very desirable.

*Lilium tenuifolium.*—Narrow-leaved Siberian lily. In bloom the first of July. Height 2 feet. Flowers bright scarlet drooping. A very attractive little lily.

*Lilium tigrinum.*—Common tiger lily. Height 2½ feet. Flowers deep orange, large petals, spotted with many purplish black dots. In bloom the first of July.

*Lilium superbum.*—Superb lily. Height 4½ feet. Flowers orange red spotted with dark brown. Very showy.

*Lilium candidum.*—Madonna lily. Flowers large, pure white, fragrnt; one of the best for general cultivation. Height, 2 feet. In bloom early in July.

*Lilium speciosum.*—Showy Japanese lily. Height, 2½ feet. In bloom the middle of July. Flowers white, more or less tinged with pink and doted with red; a very fine lily, of which there are several varieties.

*Paeonia officinalis,* and *Paeonia sinensis.*—The common and Chinese pæonys are in bloom during the greater part of July. There are a great number of varieties, some of which should be included in every garden.

*Papaver orientale.*—Oriental poppy. Height 2 feet. In bloom the last of June. Flowers very large; a blaze of scarlet.

*Papaver nudicaule.*—Iceland poppy. Height 1 foot. In bloom the middle of May and continues through the summer. Flowers orange, white or yellow. Very desirable.

*Phlox subulata lilacina.*—Moss pink. A profuse bloomer from about May 24 to the middle of June. Low matted growth. Flowers light blue. Very desirable.

*Phlox amoena.*—Lovely Phlox. In bloom about the same time as the above. Flowers bright pink. Low matted growth of 4 to 6 inches. Very desirable.

*Phlox decussata.*—Hybrid perennial phlox. Height 1½ to 3 feet. In bloom during August and September. The many varieties of this beautiful plant show some superb markings in many shades and colours.

*Rudbeckia laciniata.*—Golden Glow. Height, 5 to 6 feet. Flowers large; bright yellow, double. This is a profuse bloomer during August, and is one of the most desirable tall-growing perennials.

*Rudbeckia maxima.*—Great cone flower. Height 5 to 6 feet. In bloom during August. Flowers yellow, with a long cone-shaped centre.

*Pyrethrum uliginosium.*—Great Ox-eye. Height 3½ feet. Flowers white with yellow centre. In bloom after the last of August.

*Spiræa filipendula.*—Dropwort. Height 2 feet. In bloom from the first to after the middle of July. A profuse bloomer; flowers white, borne in loose panicles.

*Spiræa ulmaria.*—Meadow sweet. Height 3½ feet. In bloom after the middle of July. Flower heads present a feathery appearance, having numerous cream-coloured flowers borne in large compound heads.

*Spiræa filipendula, flore pleno.*—Double-flowered Dropwort. Similar to the first-named spiræa, with double pure white flowers. Much admired.

*Spiræa palmata elegans.*—Japanese spiræa. Height 2 feet. In bloom during July. Flowers white, with crimson anthers, borne in panicles. A very desirable perennial.

*Spiræa venusta.*—Queen of the Prairie. Height 2½ feet. In bloom during the last of July and early August. Flowers pink, small, profusely borne in large panicles. A much desired pink spiræa.

*Thalictrum aquilegifolium.*—Columbine rue. Height 3½ to 4 feet. In bloom the middle of July. Flowers small, white, numerous, borne in loose panicles. A desirable sort.

## COVER CROPS.

Cover crops of different kinds have been grown in the orchard here for a number of years. The primary object in growing such a crop in the orchard is to form a cover of vegetation that will serve as a protection to the roots of the trees during winter. Such a crop, however, is also of value from the fact that plant food not required by the fruit tree during the fall, and which is liable to be leached away by late fall or early spring rains, is taken up and held in a convenient form to turn under the following spring; adding, also, humus to the soil by which it is so greatly improved.

In growing cover crops, the aim is to get a fairly thick mat of vegetation, and also a mat that can conveniently be turned under the following spring. It is also advisable to grow one of those crops known as legumes, which enrich the soil by the addition of nitrogen assimilated from the air by means of bacteria on their roots. Common and generally available among these for cover crop purposes are the pea, vetch and clover.

It is very important that an orchard should be worked as soon in the spring as the ground is fit and kept in a good loose condition by frequent cultivation until the middle of July. This practice not only stimulates early active vegetation, but also conserves moisture. Moisture is generally abundantly supplied by frequent rains after this date and the ground can safely be put into a cover crop any time between the middle of July and August. Cover crops should not be sown later than the first of August to get a good mat of growth for winter protection. In 1903 the cover crops were sown July 29, and this season they were sown July 26. The following table gives notes taken upon their growth in 1903, and concerning the ease with which they were turned under in the spring :—

| Cover Crop Sown. | Quantity of Seed sown per Acre. | Height of Growth, Oct. 31, 1903. | Character of Cover, Nov. 30, 1903. | Ease with which they were ploughed under, May 10, 1904. |
|---|---|---|---|---|
| | Bush. | | | |
| Peas | 3 | Growth of vine, 40 in. | Thick mat 3 to 5 in. deep, good cover. | Very difficult to get well turned under. |
| Oats | 4 | " straw, 30 in. | Thick mat 4 to 6 in. deep, good cover. | Very difficult to get well turned under. |
| Winter Rye | 3½ | 5 inches | Fairly thick mat 5 to 6 inches, ground almost covered. | Easily ploughed under and worked. |
| Buckwheat | 3 | 30 " | Thin covering 3 to 4 in. deep; leaves all gone, stalks only remaining. | Difficult to plough under; stalks gather ahead of the plough. |
| | Lbs. | | | |
| Sand Vetch | 40 | 6 to 8 inches | Thick covering 2 to 3 in. deep. | Quite easily turned under. |
| Mammoth Red Clover | 14 | 2 to 3 " | Thin mat, scarcely covered ground, 1 in. deep. | Easily ploughed under. |
| Crimson Clover | 20 | 5 to 8 " | Thick mat 4 to 6 in. deep, covers ground well. | Easily turned under. |

The experience gained here seems to indicate that Crimson clover is one of the best cover crops for use in orchards. It produces a good thick mat of nitrogenous material easily turned under and out of the way for future cultivation. Crimson clover is an annual, and only odd plants will stand the winter. The killing of the clover in the winter, however, is not considered a disadvantage because the ground is worked as soon as it is fit.

The cost of these different seeds per acre for sowing to cover crop, is as follows:—

| | |
|---|---|
| 3 bush. pease at 80 cents per bushel | $2 40 |
| 4 " oats at 40 cents per bushel | 1 60 |
| 3½ " winter rye at 60 cents per bushel | 2 10 |
| 3 " buckwheat at 50 cents per bushel | 1 50 |
| 40 pounds sand vetch at 9 cents per pound | 3 60 |
| 14 " mam. red clover at 14 cents per pound | 1 96 |
| 20 " crimson clover at 8 cents per pound | 1 60 |

## SOIL MOISTURE EXPERIMENTS.

The object of these experiments was to obtain information relative to the moisture contents of soil when growing grain or grass crops as compared with that given clean cultivation from early spring until time for sowing a cover crop. The reason for obtaining this information was to see whether fruit trees growing in soil cropped with grain or grasses had sufficient moisture to make proper growth of wood and fruit during this part of the season.

Fruit trees make their wood growth during the first half of the season; consequently any check to this growth during June and July, should, if at all possible, be prevented, especially for young trees. Grasses and grain crops make their growth principally during the first part of the summer and require large quantities of water for their full development. After this water has been taken up by the roots and performed its function in plant growth it is transpired from the leaves in the form of vapour. This taking up of the soil moisture would probably, if the rainfall during the season were light, provided these crops are grown within the root area of the tree, deprive the tree of the necessary moisture for proper growth.

The soil of these plots was of as uniform a character as could be had, a clay loam with a heavy clay subsoil, and underdrained. plots were 36 feet wide and 250 feet long. The samples, however, were taken from plots each 36 x 36 feet; the plots adjoining each other. The soil was taken up by means of galvanized iron cylinders, which were 14 inches long. These were driven into the ground and the column of soil to that depth obtained for each set of samples. Two canisters of soil were taken from a plot at each date, and each canister was taken at a different place in the plot. The places where samples were taken from were marked, and future samples, in case the moisture contents would be affected thereby, were taken sufficiently far from these to represent fairly accurately the percentage of moisture in each plot. The soil samples were sent to Ottawa in air-tight cans to prevent any loss of moisture.

I am indebted to the Chemist of the Experimental Farms, Mr. F. T. Shutt, for the data in the following table, giving the percentage of moisture in the samples of soil from these plots which were sent to him every two weeks during the season.

PERCENTAGE of Moisture in soil of plots sent from the Experimental Farm, Nappan, N.S.

| Date when Samples were taken. | Plot No. 1. | Plot No. 2. | Plot No. 3. | Plot No. 4. | Plot No. 4 *a*. | Plot No. 5. |
|---|---|---|---|---|---|---|
| | per cent. | per cent. | per cent. | per cent. | per cent. | per cent. |
| May 12 | 18·41 | 20·00 | 18·09 | 20·88 | ........... | 18·93 |
| " 26 | 17·21 | 18·02 | 18·43 | 21·21 | 22·42 | 18·97 |
| June 9 | 12·52 | 17·84 | 19·24 | 20·31 | 17·50 | 14·04 |
| " 23 | 10·46 | 17·40 | 17·71 | 20·46 | 19·78 | 11·65 |
| July 7 | 9·06 | 16·70 | 17·46 | 19·14 | 19·13 | 11·22 |
| " 21 | 7·46 | 13·43 | 16·35 | 20·54 | 17·50 | 12·06 |
| Aug. 4 | 8·23 | 9·49 | 15·10 | 18·11 | 17·74 | 10·36 |
| " 18 | 9·80 | 10·30 | 15·71 | 20·26 | 21·04 | 13·66 |
| Sept. 6 | 17·79 | 16·99 | 20 13 | 24·04 | 24·02 | 20·22 |
| " 20 | 14·91 | 16·31 | 17·99 | 18·09 | 18·57 | 19·87 |
| Oct. 31 | 21·33 | 19·77 | 21·42 | 26·02 | 26·53 | 19·71 |

HOW PLOTS WERE TREATED.

*Plot No. 1.*—Plot No. 1 was in potatoes in 1903, and was seeded to winter rye September 21, 1903. The rye was sown at the rate of two bushels per acre, together with Red clover at the rate of 10 pounds per acre. The rye made strong growth of about 50 inches and was harvested August 3. The clover sown with it made very poor growth.

*Plot No. 2.*—This ground was given clean cultivation during the spring and early summer of 1903, and was seeded to Crimson clover at the rate of 20 pounds per acre July 27, 1903. The clover made a strong growth of from five to seven inches, which in the following spring was practically all dead. The ground was ploughed May 26 to a depth of five inches, and on the 29th was worked up with the disc and springtooth harrows. It was again worked June 13 and 20, once each with the springtooth and smoothing harrows. On June 20 it was seeded to oats at the rate of three bushels of seed per acre.

*Plot No. 3.*—This plot was in Crimson clover the previous season and had been treated in a similar manner to plot 2. The ground was ploughed this spring as soon as fit, May 13, and harrowed once each with the disc and springtooth harrows on May 29. It was again worked in the same manner on June 20 and 29 and July 7. On July 7 this ground was worked up also with the spade harrow. Alfalfa clover was then sown at the rate of 25 lbs. per acre, drilled in with the grain seed drill. The Alfalfa started quickly and made strong growth, attaining an average height of 12 inches.

*Plot No. 4.*—This ground was treated similar to plots Nos. 2 and 3 during the season of 1903. The ground was ploughed as soon as fit on May 13 and worked up with disc and springtooth harrows. The land was again worked once each with the disc and springtooth harrows on May 29, June 20 and 29, and on July 7, 13 and 25. On July 25 Crimson clover at the rate of 20 lbs. per acre was sown broadcast and harrowed in lightly with the smoothing harrow. This clover started well and made strong growth, giving a thick mat from 5 to 7 inches deep..

*Plot No. 5.*—This plot was worked up in the spring of 1903 and seeded to oats June 24 at the rate of three bushels per acre, with 5 lbs. Mammoth Red clover, 3 lbs. Alsike and 12 lbs. Timothy per acre. The growth of grain was good and was used for green feed early in September. The catch of clover was good. The growth of clover this season was strong and was cut for green feed June 23, when about two feet high. A second growth of clover started up and quite a growth of Timothy also appeared. The second growth made quite a mat of from 4 to 7 inches, which still remains.

### WINTER RYE.

*Plot No. 1.*—Winter rye is not generally grown here, but was selected for one plot principally to show the drying effect of grain crops on soil. This plot, as compared with the clean cultivated plot, shows a marked difference in percentage of moisture, especially during June, July and August. The rye crop had ceased to grow by August 1, but not until the heavy rain on August 21 did this ground which had been so thoroughly dried out by the rye become sufficiently moist to admit of growth of the clover sown with the rye. It will be seen by referring to the following table that from July 23 to August 21, 2·28 inches of rain fell, yet the ground remained practically the same in moisture content. A thoroughly dried soil does not absorb water quickly, and drying weather generally prevailing at this time of the year quickly evaporates the water from the top soil before it penetrates to much depth. This shows that ground that has been dried out by such crops require very heavy rains to wet it to a sufficient depth for the moisture to be available for the fruit tree. One inch of rain will make the surface of such a piece of land quite wet, but, still not supply the tree with required moisture. When the soil samples were taken August 4, the surface of the plot was quite damp but the soil below was still thoroughly dried out and did not become moist until after the rainfall on September 3 and 4.

*Plot No. 2* was ploughed two weeks later than plot No. 3,, to determine the effect if any of inverting the top soil by ploughing to check the capillary flow of soil water. A reference to the results obtained will show that there was little difference in the percentage of moisture in these two plots up to July 9. It will also be seen that these plots both had a Crimson clover cover crop in 1903 which died during the winter and left a dead mat, which acted as a mulch preventing No. 2 plot from drying out as much as it actually would have done had this decaying mass not been there. The intention was to sow No. 2 and No. 3 plots to oats after working the land on the last of May, and by taking samples from each throughout the season determine what effect early working of the land had in checking the escape of moisture from the land and holding it for the use of the crop later on; but, owing to circumstances unavoidable grain was not sown until June 20. Plot No. 2 was seeded to oats June 20, and plot No. 3 was seeded to Alfalfa on July 7.

*Plot No. 4* was given clean cultivation to July 25. The data in the column marked 4*a* represent the moisture in the soil to a depth of only 5 inches. The object was to see how the top 5 inches of soil compared in moisture content with that to a depth of 14 inches.

*Plot No. 5,* it will be seen, was next to plot 4. Quite a striking difference in percentage of moisture between these two plots is shown.

The following table gives the rainfall and the date on which the rains occurred from March 31 to December 1, 1904:—

RAINFALL, 1904.

| April. | | May. | | June. | | July. | | August. | | September. | | October. | | November. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date. | Ins. | Date. | Ins. | Date. | Ins. | Date. | Ins. | Date. | Ins. | Date. | Ins. | Date. | Ins. | Date. | Ins. |
| 9 | ·28 | 10 | ·17 | 3 | ·07 | 1 | ·24 | 1 | ·13 | 1 | ·08 | 6 | ·23 | 4 | ·77 |
| 10 | ·39 | 17 | ·29 | 5 | ·74 | 3 | ·46 | 11 | ·63 | 3 & 4 | 1·24 | 10 | ·06 | 6 | ·07 |
| 12 | ·26 | 19 | ·93 | 7 | ·07 | 5 | ·07 | 15 | ·23 | 6 | ·66 | 11 | ·23 | 14 | 1·23 |
| 16 | ·11 | 21 | ·05 | 12 | ·10 | 8 | ·03 | 17 | ·29 | 8 | ·04 | 13 | ·97 | 18 | ·47 |
| 19 | ·94 | 24 | ·10 | 18 | ·04 | 13 | ·40 | 18 | ·08 | 12 | ·26 | 15 | ·08 | 24 | ·68 |
| 21 | ·26 | 25 | ·13 | 22 | ·46 | 20 | ·03 | 21 | 1·70 | 15 | ·30 | 22 | 2·98 | 29 | ·17 |
| 29 | ·16 | 27 | ·03 | 25 | ·12 | 23 | ·69 | 23 | ·48 | 21 | ·23 | 26 | ·18 | ........ | |
| 30 | ·52 | 30 | ·06 | 30 | ·14 | 29 | ·23 | 25 | ·02 | 25 & 26 | 1·20 | 3 | ·27 | ........ | |
| ........ | | ........ | | ........ | | ........ | | ........ | | 29 | ·15 | ........ | | ........ | |
| ........ | | ........ | | ........ | | ........ | | ........ | | 30 | ·36 | ........ | | ........ | |
| Total. | 2·92 | .. | 1·76 | .. | 1·74 | .. | 2·15 | .. | 3·51 | .. | 4·52 | .. | 5·00 | .. | 3·39 |
| The total Rainfall for the same period in 1903 was :— | | | | | | | | | | | | | | | |
| .. | 3·57 | .. | 0·68 | .. | 2·29 | .. | 2·07 | .. | 2·40 | .. | 3·63 | .. | 5·78 | .. | 7.98 |

## CABBAGE ROOT MAGGOT.

The Cabbage Root Maggot has given considerable trouble during the past few years, but this season they were much more numerous than usual, and proved very destructive to all the plots of cabbage and cauliflowers, except two plots where hellebore was used. An examination of the cabbage plots early in June showed that many eggs were being deposited near the surface of the ground at the base of the plant. Experiments were tried with various mixtures to determine their effect in controlling this pest. Accordingly nine plots were staked off containing 100 plants each. These plants were in a fairly vigorous state, having been set early in May. The plots were treated with the following mixtures:—

No. 1.—Hellebore 2 oz. to 1 gallon of water.

No. 2.—Hellebore 4 oz. to 1 gallon of water.

No. 3.—Kerosene emulsion, 1 part kerosene oil to 4 parts water.

No. 4.—Kerosene emulsion, 1 part kerosene oil to 6 parts water.

No. 5.—Kerosene emulsion, 1 part kerosene oil to 9 parts water.

No. 6.—Kerosene emulsion, 1 part kerosene oil to 12 parts water.

No. 7.—Paris green 2 oz. to 10 gallons water.

No. 8.—Tar paper disks.

No. 9.—No treatment.

These plots were treated June 18. An examination of a number of the cabbages at this date was made and no maggots could be seen. Some young maggots were found and eggs were being hatched around some of the cauliflowers at this date. The cauliflowers, however, were not included in this test. Notes were taken July 7, 14 and August 16. A summary of the data collected is given in the following table:—

| No. | How Treated. | Killed by kerosene emulsion. | Killed by root maggot. | Injured by root maggot and did not recover. | Injured by kerosene emulsion and did not recover. | Weak growth. | Fair growth. | Vigorous growth. |
|---|---|---|---|---|---|---|---|---|
| | | Plants. | Plants. | Plants. | Plants. | Plants. | Plants. | Plants. |
| 1 | Hellebore—2 oz. to 1 gall. water | ........ | ........ | ........ | ........ | ........ | 6 | 94 |
| 2 | Hellebore—4 oz. to 1 gall. water | ........ | ........ | ........ | ........ | ........ | 7 | 93 |
| 3 | Kerosene emulsion—1 part oil to 4 parts water | 36 | 17 | 23 | 14 | 9 | 1 | ........ |
| 4 | Kerosene emulsion—1 part oil to 6 parts water | 30 | 16 | 16 | 17 | 17 | 4 | ........ |
| 5 | Kerosene emulsion—1 part oil to 9 parts water | 11 | 27 | 41 | ........ | 11 | 6 | 4 |
| 6 | Kerosene emulsion—1 part oil to 12 parts water | ........ | 36 | 41 | ........ | 14 | 8 | 1 |
| 7 | Paris green—2 oz. to 10 gall. water | ........ | 29 | 39 | ........ | 27 | 3 | 2 |
| 8 | Tar paper disks put on June 1 | ........ | 27 | 36 | ........ | 22 | 11 | 4 |
| 9 | No treatment | ........ | 62 | 20 | ........ | 12 | 6 | ........ |

It will be seen that kerosene emulsion in this test has given unsatisfactory results. It appears that an emulsion stronger than one part of oil to nine of water will do serious injury, and that a weaker strength does not appear to have much effect on the eggs or maggot. The kerosene emulsion was applied with a force pump using a single jet of liquid, forcing about a cup full of the mixture into the soil around the base of each plant.

The tar paper disks put around the plants on June 1, did not give as good results as expected. This may possibly have been due to the disks not having been put around the plants early enough. The object of these disks is to prevent the insects from depositing their eggs, which it is claimed they will not do, if these disks are fitted closely around the plant at the surface of the ground.

The hellebore and water recommended by Dr. James Fletcher, Entomologist and Botanist of the Experimental Farms, exceeded expectation, and no root maggots could be found around any of the plants examined in these two plots. The cabbage in these two plots were the only good ones out of some 1,500 plants set. There was no noticeable difference between plot No. 1 and 2, and the heads averaged practically the same. The hellebore was mixed with water and applied with a force pump in the same manner as the emulsion. An equally good way, we should fancy, would be to move some of the earth back from the base of the plant and pour about a cup full of hellebore water into this hollow around the plant. About one cupful of liquid was used to a plant in these plots. Further experiments will be carried on with this material. As far as one can judge from a single season's experience, we are inclined to think that this will prove an excellent remedy for the root maggot. The cabbages were equally infested at the base of the root with eggs when the mixture was used.

## CUTWORM—POISONED BRAN REMEDY.

The Red-backed Cutworm *Paragrotis ochrogaster* was extremely troublesome around the flower beds and in the vegetable plots this season. It was found, however, that this pest could be easily controlled by using the poisoned bran bait recommended by Dr. James Fletcher. The poisoned bran is scattered on the ground around the plants, and if fowl are allowed to run where it has been used there is considerable danger. We found that chickens were killed by picking up pieces of the bran six weeks after it had been applied.

Dr. Fletcher advises one pound of Paris green to 80 pounds of bran, which is equal to 1 oz. of Paris green to 5 pounds of bran. The quantity used here was 3 ounces to 10 pounds of bran. The method adopted was to mix 3 ounces of Paris green in a quart bottle nearly full of water by shaking violently. This was added to a little over one-half gallon of water and poured slowly into the bran while it was being stirred with a stick. It is very important to mix the Paris green water thoroughly with the bran in order to get each flake of bran coated with some of the Paris green particles. The bran should be dampened just sufficiently to scatter nicely for if it is too wet this cannot be done to so good advantage.

Ten pounds of bran mixed in this way was found to do 500 feet of a row thoroughly. After it was used in this quantity, on beans where the cutworm was doing the most damage, few plants could be found cut off after the first night, and after the second night no plants were found destroyed. For plants, a greater distance apart, less bran would be required, for it is necessary to only scatter a ring of bran around each one.

The cutworm feeds during the night, cutting off the plant at the surface of the ground. They appear to have a fondness for bran and will feed upon it in preference to plants. A case particularly striking was noticed in the flower garden this year. Bran bags were used to protect some tender annuals from a June frost, and out of one of the bags a handful or two of bran happened to be deposited in one place. This ground was stirred in weeding about a week after and it was noticed that cutworms were collected in the soil under the bran while plants uninjured were close by. On a close examination, eight cutworms were found together, they evidently finding the bran a more suitable and convenient material to feed upon. Experience shows that this is a practical and efficient remedy for controlling this pest.

## GARDEN PEASE.

Experiments were conducted with six of the leading early sorts of garden pease to find out the number of pounds of marketable green pease in pod from each. The plots were two rows, each 66 feet long, equal to 1-165 of an acre. These were all fertilized at the rate of 500 lbs. complete fertilizer per acre. The seed was sown May 12, in rows 2 feet apart, and the seed was dropped 2 inches apart in the rows. The soil was a poor sandy loam. The following yields were obtained per acre. Owing to the very dry season these peas did not grow well, and the yield per acre was small:—

| Name of Variety. | Date of First Picking. | Pounds from First Picking. | Date of Second Picking. | Pounds from Second Pick'g. | Yield per Acre. |
|---|---|---|---|---|---|
| | | | | | Lbs. |
| Station | July 12 | 33 | July 18 | 10 | 7,095 |
| Thos. Laxton | " 14 | 25 | " 21 | 20¼ | 7,507 |
| Gradus | " 14 | 28¼ | " 21 | 12¾ | 6,765 |
| Prosperity | " 14 | 28¼ | " 21 | 9½ | 6,270 |
| Nott's Excelsior | " 14 | 29 | " 24 | 18¼ | 7,796 |
| American Wonder | " 14 | 6½ | " 24 | 42 | 8,001 |

## FERTILIZER EXPERIMENTS WITH GARDEN PEASE

Experiments were conducted with two kinds of early garden pease by dividing the land devoted to each into three plots. On one complete fertilizer, 'Imperial' brand, at the rate of 500 lbs. per acre was used, on another 250 lbs. per acre, and on the other third, no fertilizer was used. The seed was sown May 12 in rows 2 feet apart, and the seed dropped 2 inches apart in the row. The soil was a light clay loam in a poor state of fertility. Each plot was 2 rows, each 66 feet long. The growth of vine was short and the yield not as large as usual. The yield obtained from these plots is given in the following table.

If we consider the weight of green peas in pod at 40 lbs. to the bushel, we find that we have a gain in the first variety tested of 44 bushels per acre, where 500 lbs. of fertilizer was used per acre, than where not fertilized. If we allow pease in the pod to be worth 30 cents per bushel, we have a gain of $13.20 per acre. The fertilizer cost $7.50 per acre—a net gain of $5.70 per acre in favour of the heavily fertilized plot. With the variety Thomas Laxton there is a still larger gain from the use of the fertilizer.

GARDEN PEASE—FERTILIZER EXPERIMENTS.

| Name of Variety and how treated. | Date of First Picking. | No. of Pounds from First Picking. | Date of Second Picking. | No. of Pounds from Second Picking. | Total Yield per Acre in Pounds. |
|---|---|---|---|---|---|
| 'Station'—Complete fertilizer, 500 lbs. per acre.. | July 12... | 33 | July 18... | 10 | 7,095 |
| Complete fertilizer, 250 lbs. per acre......... | " 12... | 31½ | " 18... | 10 | 6,847 |
| No fertilizer............................ | " 12... | 27 | " 18... | 5¼ | 5,321 |
| 'Thomas Laxton'—Complete fertilizer, 500 lbs. per acre ......................... | " 14... | 25 | " 21... | 20¼ | 7,507 |
| Complete fertilizer, 250 lbs. per acre.......... | " 14... | 23 | " 21... | 13¾ | 5,987 |
| No fertilizer.............................. | " 14... | 23½ | " 21... | 8 | 5,156 |

## SNAP BEANS.

Experiments were conducted with fifty-four varieties of snap beans. The seed was planted May 30, being dropped 2 inches apart in the row and the rows 2 feet apart. The ground was previously in horse-beans and was manured in the fall of 1903 with 15 one-horse cart loads af stable manure per acre and ploughed. This spring the ground was worked up into good tilth with the spade, springtooth, and smoothing harrows. The plots were one row, 33 feet long. A duplicate plot of one row 33 feet long was also planted which was allowed to ripen if the season permitted. These were cultivated frequently to keep the ground loose and friable.

These beans made fair growth. The cutworm did some damage, but was quickly checked by using the poisoned bran mash, which was scattered along the row. The rust *Anthracnose* did not develop on the beans until after the middle of August, when some of the plots were attacked quite badly. Some of these varieties which have in the past appeared quite rust-proof, were this year the worst affected, and some sorts that were formerly badly attacked were this season quite free.

From experience gathered from time to time, it would appear that the varieties Bountiful and Improved Goddard are two of the best green podded sorts for general market. Refugee or 1,000 to 1 is an excellent late green podded sort, and Market Wax, Keeney's Rustless Wax and Valentine Wax, are three excellent golden-podded kinds. The following notes were taken from the plots tested :—

SNAP BEANS—TEST OF VARIETIES.

| Name of Variety. | When first fit to use. | | First Picking, Aug. 4. | Second Picking, Aug. 12. | Third Picking, Aug. 23. | Total Yield from plot. | Length of Pod. | Colour of Pod. | Form of Pod. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Lbs | Lbs | Lbs | Lbs | Inch's | | | |
| Extra Early Edible Podded | July | 28 | 5¾ | 4 | 2¼ | 12 | 4½—5 | Green.. | Round.. | Stringless, good, no rust. |
| Haricot or Golden Skinless | " | 28 | 6 | 5 | 2½ | 13½ | 4—4½ | Golden. | " .. | " " |
| Emperor of Russia........ | " | 28 | 4¾ | 6 | 4 | 14¾ | 5½—6 | Green.. | " .. | " " |
| Matchless................ | " | 28 | 5 | 4¾ | 3 | 12¾ | 5—5½ | " .. | " .. | Stringy, fair " |
| Dwarf German Black Wax | " | 28 | 5½ | 10½ | 4½ | 20½ | 4½—5¼ | Golden. | " .. | Few strings, good " |
| Green Pod Lightning..... | " | 28 | 7¾ | 4¾ | 2¾ | 15¼ | 4¾—5¼ | Green.. | Flat... | " " |
| Valentine Wax.......... | " | 28 | 6½ | 11 | 9¼ | 26¾ | 5—5¼ | Golden. | Round.. | Stringless, good " |
| Early Warwick .......... | " | 28 | 11¼ | 8 | 7¾ | 27 | 4½—5 | Green.. | Flat.... | Some strings, fair " |
| Dwarf Horticultural...... | " | 28 | 6¾ | 12¾ | 6¾ | 26¼ | 5—5½ | " .. | " .... | Stringless, good " |
| Davis Kidney Wax....... | " | 28 | 5¾ | 9 | 4¼ | 19 | 5¾—6½ | Golden. | " .... | " some rust. |
| Bountiful .............. | " | 28 | 9¾ | 15½ | 6¼ | 31½ | 6—7 | Green.. | " .... | " no rust. |
| Brittle Wax............. | " | 28 | ¼ | 4 | 3 | 7¼ | 4½—5½ | Golden. | Round.. | " slight rust. |
| Grencell's Rust Proof.... | " | 28 | 3½ | 7 | 2½ | 13 | 4—4½ | " .. | Flat.... | " " |
| Market Wax............. | " | 28 | 3¼ | 8½ | 5½ | 17¼ | 5—5¾ | " .. | " .... | " no rust. |
| Currie's Rust Proof....... | " | 28 | 5½ | 9¼ | 1¼ | 16 | 5¼—6 | " .. | " .... | Some strings, fair, some rust. |
| Davis' Dwarf White Wax. | " | 28 | 3¾ | 6 | 3½ | 13¼ | 6—6¾ | " .. | " .... | Stringless, good, some rust |
| Early Mohawk........... | " | 28 | 1¾ | 5 | 5¾ | 12½ | 5¼—5¾ | Green.. | " .... | Some strings, fair, no rust. |
| Wardwell's New Kidney.. | " | 28 | 5½ | 4 | 3¼ | 12¾ | 5¼—6 | Golden. | " .... | Stringless, good, some rust |
| Flageolet Wax ........... | " | 28 | 3¾ | 5½ | 2½ | 11¾ | 6—7 | " .. | " .... | " " |
| Early China............. | " | 28 | 3½ | 4¼ | 1¼ | 9 | 4¾—5¼ | " .. | " .... | Some strings, fair, no rust |
| Keeney's Rustless ........ | " | 30 | 5½ | 8 | 1¾ | 15¼ | 5¼—5¾ | " .. | " .... | Stringless, good, some rust |
| Improved Golden Wax.... | " | 30 | 2½ | 8¾ | 3 | 14¼ | 4—4½ | " .. | " .... | " fair, slight rust |
| Perfection Wax .......... | " | 30 | 1½ | 7 | 3¾ | 12¼ | 6¼—7¼ | " .. | " .... | " good " |
| Golden Crown........... | " | 30 | 2½ | 6½ | 4½ | 13½ | 4—4¼ | " .. | Round.. | " no rust. |
| Extra Early Refugee...... | " | 30 | 3½ | 7½ | 2¼ | 13¼ | 4¾—5¼ | Green.. | " .. | " " |
| Saddle Back Wax ........ | " | 30 | 2 | 5½ | 2 | 9½ | 4½—5 | Golden. | " .. | " slight rust |
| Round Yellow Six Weeks. | " | 30 | 1½ | 4¾ | 2½ | 8¾ | 4¼—4¾ | Green.. | " .. | " no rust. |
| Ne Plus Ultra........... | " | 30 | 4 | 5¾ | 1¾ | 11½ | 5¼—5¾ | " .. | Flat.... | Some strings, fair, no rust. |
| Blue Podded Butter...... | " | 30 | 1¼ | 5 | 1¾ | 8 | 5½—6 | Blue... | " .... | Stringless, good " |
| Don Carlos.............. | " | 30 | 3½ | 3¼ | 1¼ | 8 | 4—4¼ | Green.. | " .... | Some strings, fair, no rust. |
| Early Giant Wax ........ | " | 30 | 2 | 6¼ | 2¾ | 11 | 5¼—6 | Golden. | " .... | Stringless, good " |
| Best of All.............. | " | 30 | 2¼ | 4¾ | 2¾ | 9¾ | 5¾—6¾ | Green.. | " .... | " " |
| Challenge Black Wax .... | Aug. | 3 | ¾ | 3¾ | 3 | 7½ | 4½—5 | Golden. | Round.. | " some rust. |
| Early Golden Eye........ | " | 3 | 1¾ | 4½ | 1¾ | 8 | 4½—5 | " .. | Flat... | Some strings, fair, no rust. |
| Long Yellow Six Weeks .. | " | 3 | 2½ | 7½ | 2 | 12 | 5¾—6¼ | Green.. | " .... | Stringless, fair " |
| Longfellow............. | " | 3 | 1¼ | 9 | 3 | 13¼ | 5—6¾ | " .. | Round.. | " good, slight rust |
| Knickerbocker ........... | " | 3 | 1½ | 5¾ | 4½ | 11¾ | 5—5¾ | " .. | " .. | " some rust. |
| Stringless Wax.......... | " | 3 | 1½ | 11½ | 7¼ | 20¼ | 5¾—6½ | Golden. | Flat.... | " " |
| Golden Scimitar.......... | " | 4 | 1¼ | 2¼ | 2 | 5½ | 5—5½ | " .. | Round.. | " slight rust |
| Earliest Red Valentine... | " | 4 | ¼ | 4¾ | 2 | 7 | 4¼—5 | Green.. | " .. | " no rust. |
| Improved Goddard ...... | " | 4 | ½ | 8 | 14¾ | 24 | 6—6½ | " .. | Flat.... | " " |
| White Kidney............ | " | 4 | ½ | 4¾ | 9½ | 14¾ | 5—6 | " .. | " .... | Some strings, fair " |
| Fame of Vitry............ | " | 4 | 2¼ | 8 | 16¼ | 26½ | 6—7 | " .. | " .... | Stringless, good " |
| Refugee Wax............ | " | 4 | ½ | 9¾ | 1 | 11¼ | 4—4¼ | Golden. | Round.. | " " |
| Cylinder Ivory Podded ... | " | 4 | 1 | 3½ | 3 | 7½ | 4½—5¼ | " .. | " .. | " slight rust |
| Dwarf Chocolate.......... | " | 4 | ½ | 6 | 3 | 9½ | 5—5¾ | Green.. | " .. | Some strings, fair, no rust. |
| Pencil Pod Wax .......... | " | 4 | ¾ | 3¼ | 1¼ | 5¼ | 4¾—5¼ | Golden. | " .. | Stringless, good, some rust |
| Giant Stringless ......... | " | 4 | ½ | 4¾ | 2 | 7¼ | 4¾—5¼ | Green.. | " .. | " " |
| Burpee's Stringless ...... | " | 4 | 1½ | 3¾ | 1¾ | 7 | 4½—4¾ | " .. | " .. | " no rust. |
| Royal Dwarf Kidney ..... | " | 4 | ½ | 2¾ | 6 | 9¼ | 4½—5½ | " .. | Flat.... | Stringless, fair " |
| Cream Valentine......... | " | 4 | 1¼ | 4¾ | 4 | 10 | 4¼—4¾ | " .. | Round.. | " good " |
| Refugee or 1,000 to 1..... | " | 12 | .... | 4¾ | 8½ | 12¼ | 4½—5¼ | " .. | " .. | " " |
| Black Speckled.......... | " | 12 | .... | 10 | 5½ | 15½ | 6½—8 | Green.. | Flat.... | Some strings, fair, no rust. |
| Eclair.................. | " | 12 | .... | 3¼ | 6 | 9¼ | 6½—8½ | " .. | Round.. | " " |

## ONIONS.

The ground on which the onions were grown was in a fairly good state of fertility. The soil was a light clay loam well drained but lacking somewhat in humus; so essential to make it an ideal soil for this crop. The best soil for onions is a light clay loam abounding in decomposed vegetable matter, and well drained either naturally or artificially. Almost any good garden soil can be put into shape to grow a good crop of onions by using a liberal supply of manure for one or two years in succession to get a large supply of readily available plant food. The ground should be manured in the fall and ploughed under. In the spring this can be ploughed again and the manure thoroughly incorporated by using the disc and springtooth harrows. Poor soil will not produce good onions, and it requires several years of enriching to bring such soil into condition for the successful culture of the crop. The same ground can be used year after year unless disease or root maggots attack the crop, in which case a change is necessary.

The ground on which these onions were grown was previously in roots and was manured in the fall of 1903 with fifteen one-horse cart loads of stable manure per acre, which was ploughed under. It was again manured this spring with fifteen one-horse cart loads of stable manure per acre. The ground was worked into good tilth and the manure thoroughly mixed with the soil, and was run into rows two feet apart.

Complete fertilizer at the rate of 500 lbs. per acre was sown broadcast and lightly harrowed in with the smoothing harrow before the rows were run up. This crop requires a liberal amount of plant food in a readily available form, consequently, the liberal use of commercial fertilizer is necessary. A complete fertilizer is the best; that is one containing nitrogen, potash and phosphoric acid. Wood ashes can be used to good advantage to supply potash.

This ground was intended for roots and was run into rows 24 inches apart. These rows were raked down somewhat and the plots set in rows 2 feet apart. Onions are usually set in rows one foot apart on the level ground. The yield per acre on these plots is calculated from the number of pounds obtained from one row 66 feet long, allowing two feet of space for each row or equal to 1-330 of an acre for each plot; consequently, had these been grown in rows one foot apart the crop yield per acre would have been larger than what is given in this report.

Owing to the shortness of the season here satisfactory results cannot be had from growing onions from seed sown in the ground, although the variety Extra Early Red, will do fairly well in this way. The practice now followed is to start the plants in the hot-bed and transplant to the open ground. The transplanting does not entail much more labour than thinning the plants of seed started in the open.

The seed for these plots was sown in boxes, 15 by 30 inches, holding six inches deep of soil, on March 24. The seed was planted in drills ¾ of an inch deep in rows 3 inches apart, using 10 to 12 seeds per inch. It requires 6 or 7 weeks from the date of sowing to get good plants for transplanting. The soil used in these boxes was a rich loose sandy loam. The boxes were set into a hot-bed made March 9, which had a good even bottom heat. They were given ventilation on warm days, and sufficient moisture was supplied to produce good thrifty growth. Onions should not be forced in the hot-bed, as a spindling growth is not wanted, and makes very unsatisfactory plants for transplanting. After May 1 the glass is left off the hot-beds entirely. This hardens up the plants for setting in the open.

Transplanting to the open should be done as early in May as possible, and the nearer the plants can be got to about the size of a lead pencil at this time the better. The boxes were taken to the field when ready for transplanting, May 21. The plants were set 3 inches apart, using a garden line to set by. They were set as deep as the plants were in the starting box. The crop was frequently cultivated to kill weeds, keep the ground loose and friable, conserve moisture, admit air and allow the bulbs to readily develop.

Harvesting should be done when the most of the necks have turned yellow and are considerably withered. It is not advisable to defer this operation much after the middle of September. Even at this time some green tops will be found in the earliest maturing varieties, but they will soon dry up after harvesting. They should be pulled and left in rows for a week or ten days. If there is danger from frost they should be stored in a shed or barn floor and left dry, after which they can be topped and sorted for market.

The best onion for the average grower is the Australian Brown. For the experienced market gardener the Prize taker will prove the most profitable. The following table gives the date on which these plots were pulled and the yield per acre.

ONIONS—TEST OF VARIETIES.

| Name of Variety. | When Harvested. | Yield per Acre. Bush. | Yield per Acre. Lbs. | Size of Onion. | Colour of Skin. | Remarks. |
|---|---|---|---|---|---|---|
| Prizetaker | Sept. 23 | 342 | 40 | Large | Yellow | Fairly well matured. Large cropper. |
| Trebon's Large Yellow | " 23 | 300 | 00 | " | " | Not well matured. |
| Australian Brown | " 13 & 23 | 228 | 15 | Medium | Brown | Well matured. One of the best. |
| Golden Globe | " 13 & 23 | 228 | 00 | " | Yellow | " " " |
| Australian Yellow Globe | " 13 & 23 | 214 | 30 | " | " | " " " |
| Yellow Globe Danvers | " 23 | 156 | 45 | Large | " | Not well matured. |
| Large Red Wethersfield | " 23 | 154 | 00 | " | Red | " " |
| Red Wonder | " 13 & 23 | 148 | 30 | Medium | Brown | Well matured. Apparently a strain of Australian Brown. |
| Market Favourite | " 23 | 137 | 30 | Large | Yellow | Not well matured. |
| Extra Early Red | " 13 | 137 | 30 | Medium | Red | Well matured. A good flat early kind. |
| Vanguard | Aug. 16 | 111 | 22 | " | White | Well matured. Good for early market. |
| Mammoth Silver King | " 24 | 83 | 52 | Large | " | Well matured. Did not do as well as usual. |
| Paris Silver Skin | " 24 | 60 | 30 | Small | " | Well matured. Good for pickling. |

## SQUASH, PUMPKINS AND CITRON MELON.

Eight of the leading varieties of squash, two of pumpkins and one of citron melon were started May 9 in strawberry boxes filled with earth, set in the hot-bed. These were kept quite cool and were not forced, but made a good strong growth. They were set into hills in the open ground June 1 by cutting the boxes and setting the plants without disturbing the soil around the roots. Five seeds were put into each box, and after they started all but three plants to a box were thinned out. Three of these boxes were set to a hill and later on the plants were thinned out to six plants to a hill.

The hills into which these were set were made May 28 by digging out some of the top soil to a depth of six inches, two feet long and one foot wide, and putting into and tramping manure to a depth of four inches and covering with three or four inches of soil. The plants from the boxes were set practically on the manure.

A duplicate set of the plots started in the hot-bed were started by planting the seed in these hills May 28. About one dozen seeds were planted to a hill, and they were later thinned to six plants to a hill. These hills after planting were covered with a 12 x 20 glass set on a frame of wood, three inches high. Under this enclosure the seed quickly germinated and by the middle of July the plots were apparently as far advanced as those started in the hot-bed. After the plants have appeared under this glass, the glass should be removed during part of bright days, and after the middle of June should be removed altogether. The hills were 12 feet apart each way.

The first cutting was made from these plots September 2, when the then matured squash were gathered and weighed. The balance of the crop was harvested September 21. There appears to be little difference between the two sets of plots. The Boston Marrow is probably the best autumn squash, and the Hubbard the best winter squash.

The Warted Hubbard is similar to the Hubbard, except that it has a rougher shell. It has proven to be a heavier cropper also than the Hubbard tested here. The Golden Hubbard is an excellent sort, but small. The following crop was taken from these plots:—

SQUASH, CITRON MELONS AND PUMPKINS—EXPERIMENTS WITH.

| Name of Variety. | How Started. | Sept. 2. Number Harvested. | Sept. 2. Weight. | Sept. 21. Number Harvested. | Sept. 21. Weight. | Total Number Harvested | Total Number of pounds from Hill. | Average Weight of Squash Harvested. | Colour. |
|---|---|---|---|---|---|---|---|---|---|
| | | | Lbs. | | Lbs. | | Lbs. | Lbs. | |
| SQUASH. | | | | | | | | | |
| Hubbard | Outside... | 1 | 8 | 4 | 40½ | 5 | 48½ | 9·7 | Green. |
| | Hotbed... | 1 | 15½ | 4 | 29½ | 5 | 45 | 9· | |
| Warted Hubbard | Outside... | 2 | 31 | 4 | 54 | 6 | 85 | 14·1 | " |
| | Hotbed... | 2 | 39½ | 5 | 46 | 7 | 85½ | 12·2 | |
| Golden Bronze | Outside... | 1 | 16½ | 6 | 39½ | 7 | 56 | 8· | Dark grayish green. |
| | Hotbed... | 1 | 10 | 7 | 47½ | 8 | 57½ | 7·2 | |
| Bay State | Outside... | 2 | 19¾ | 4 | 29½ | 6 | 49¼ | 8·2 | Blue. |
| | Hotbed... | 2 | 20½ | 4 | 36 | 6 | 56½ | 9·4 | |
| Boston Marrow | Outside... | 5 | 40 | 3 | 33½ | 8 | 73½ | 9·2 | Bright orange. |
| | Hotbed... | 3 | 32½ | 3 | 32 | 6 | 64½ | 10·7 | |
| Dunlop's Early Marrow | Outside... | 4 | 46 | 6 | 42¼ | 10 | 88¼ | 8·8 | Orange yellow. |
| | Hotbed... | 4 | 37½ | 3 | 31 | 7 | 68½ | 9·8 | |
| Golden Hubbard | Outside... | 4 | 33 | 5 | 29 | 9 | 62 | 6·9 | Deep orange yellow. |
| | Hotbed... | 4 | 28¼ | 3 | 18½ | 7 | 46¾ | 6·6 | |
| Essex Hybrid | Hotbed... | 3 | 34 | 2 | 14 | 5 | 48 | 9·6 | Orange yellow. |
| CITRON MELON. | | | | | | | | | |
| Colorado Mammoth, Preserving. | Outside... | 2 | 21 | 8 | 48 | 10 | 69 | 6·9 | |
| | Hotbed... | 7 | 68¾ | 5 | 33 | 12 | 101¾ | 8·5 | |
| PUMPKINS. | | | | | | | | | |
| Sugar | Outside... | 2 | 10¾ | 8 | 49 | 10 | 59¾ | 5·9 | Deep orange, good keeper, |
| | Hotbed... | 2 | 13½ | 9 | 41¼ | 11 | 54¾ | 4·9 | excellent quality. |
| Jumbo | Hotbed... | 1 | 28½ | 2 | 57 | 3 | 85·5 | 28·4 | Large yellow. |

## LIST OF THE BEST VEGETABLES TO GROW.

The following list of vegetables are considered the best for general culture. We find from our tests that a number are practically of equal merit; yet, we feel safe in recommending the following as equal to any of the different sorts of vegetables tested here:—

*Pease.*—Extra early: Surprise. Early: Thomas Laxton, American Wonder, Nott's Excelsior. Medium: McLean's Advancer, American Champion. Late: Juno, Heroine and Stratagem. The height of these as recorded this year are: 22, 30, 19, 16, 30, 32. 16, 24 and 14 inches respectively.

*Tomatoes.*—Sparks' Earliana.

*Beans.*—Green Pod. Early: Bountiful and Improved Goddard. Late: Refugee or 1,000 to 1. Golden Pod: Market Wax, Valentine Wax and Keeney's Rustless Wax.

*Corn.*—Extra early: Extra Early Beverly. Early: Extra Early Cory and Premo. Medium: Crosby's Early.

*Cucumbers.*—White Spine. The Cumberland is excellent for pickling.

*Squash.*—Autumn: Boston Marrow and Golden Hubbard. Late: Hubbard.

*Parsnips.*—Hollow Crown and Improved Half Long.

*Carrots.*—Chantenay.

*Onions.*—Prizetaker and Australian Brown.

*Lettuce.*—Curled: Black Seeded Simpson. Cabbage: Improved Salamander, Cos. Trianon.

*Cabbage.*—Extra early: Paris Market. Early: Jersey Wakefield. Medium: Early Spring and Succession. Late: Late Flat Dutch, Late Red, Red Dutch.

*Celery.*—Paris Golden Yellow Self-Blanching, Improved White Plume and Winter Queen.

*Cauliflowers.*—Early Snowball and Early Dwarf Erfurt.

*Beets.*—Eclipse.

*Spinach.*—Victoria.

*Salsify.*—Sandwich Island.

*Radishes.*—French Breakfast and Icicle. Winter: Long Black Spanish.

*Parsley.*—Double Curled.

*Citron Melon.*—Colorado Mammoth.

*Peppers.*—Cayenne.

*Water Melon.*—Cole's Early and Phinneys' Early.

*Egg Plants.*—New York Improved Purple.

*Brussels Sprouts.*—Improved Dwarf.

*Kale.*—Scotch Dwarf Green Curled.

*Asparagus.*—Conover's Colossal.

*Rhubarb.*—Victoria and Linnæus.

*Turnips.*—Early: Extra Early Milan and Golden Ball. Swede: Selected Purple Top.

I have the honour to be, sir,
Your obedient servant,

W. S. BLAIR,
*Horticulturist.*

# EXPERIMENTAL FARM FOR MANITOBA

## REPORT OF S. A. BEDFORD, SUPERINTENDENT.

BRANDON, MAN., November 30, 1904.

To DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa, Ont.

SIR,—I have the honour to submit, herewith, my sixteenth annual report, with details of experiments undertaken and work accomplished on the Brandon Experimental Farm, during the year.

The past winter was a very cold and stormy one, the last half of January and all of February being particularly so, heavy drifts formed during March and April, filling bluffs of timber and ravines to their full capacity, in some instances native poplar trees were completely stripped of their branches by the weight of snow.

When the immense drifts of snow commenced to thaw, all the rivers rose to unusual heights and overflowed their banks. The flood prevented the sowing of grain on a portion of this farm, so the land was summer-fallowed and is now ready for next year's seeding.

Spring opened late, the first sowing was done here on April 28, fully three weeks later than the average.

The month of May was seasonable. June set in wet, and vegetation grew very rank and soft during the first two weeks of that month.

During the latter part of July and the beginning of August rains were very abundant throughout the province, and growth rapid.

The autumn was unusually favourable for harvesting and crops of all kinds were saved without injury from rain or snow.

A large amount of fall ploughing has also been done, which will allow of rapid seeding next spring.

Although there has been some loss from rust and frost, the injury has been quite local in its character, prices for produce have been higher than usual and the year was a profitable one for the farmer.

On the experimental farm the yield of wheat, owing to the ravages of rust, was only an average crop, but nearly all other products gave the largest returns in the history of the farm.

I beg to call your attention to the following experimental work undertaken here this year for the first time :—

The effect of early harvesting in lessening the injury to wheat by rust.

The results of sowing flax on newly broken virgin soil.

The suitability of flax stubble for different grain crops.

Growing clover in large fields with green fodder as a nurse-crop.

The improvement of pasture fields.

The fattening of swine on pease growing in the field. Barley compared with mixed grain for fattening swine. A comparison of one-year-old, with two-year-old steers for fattening purposes.

The use of incubators in raising poultry.

## WHEAT.

The past season will be long remembered among the farming community, owing to the alarming reports prevalent regarding injury to our staple crop from rust.

As a rule this province is not subject to serious injury from rust in wheat, but the abundant rains of June and July, accompanied by several close sultry days, was unusually favourable to the spread of rust, and by August 15 many fields were badly discoloured from this cause. Where the injury was only slight, the colour of the straw was dull red, and the grain only slightly shrunken, but in the fields seriously injured, both heads and straw were of a dark brown colour readily distinguishable at a distance, and the kernel badly shrunken.

The badly injured fields were sometimes scattered among others comparatively free of rust, and often there was no apparent reason for the difference, but excessive growth of straw from any cause appears to encourage the disease. This was particularly noticeable on rank summer-fallow and land heavily manured for root crops.

Many fields lying under the shelter of belts or bluffs of timber were noticed to be badly affected, possibly for want of a free circulation of air; sheltered hollows also suffered badly, especially if the soil was rich in humus.

On this farm most of the uniform test plots were on sheltered land which had been ploughed early and well summer-fallowed, for this reason the growth of straw was very rank and the injury from rust much greater than on the larger fields more exposed and not so carefully summer-fallowed.

In the accompanying tables it will be noticed that some varieties are more subject to injury from this cause than others, all velvet headed kinds such as Hayne's Blue Stem were severely injured, while the Macaroni Wheats are comparatively uninjured, the yield large and kernel plump and heavy.

It will be noticed that a number of the cross-bred varieties are several days earlier than Red Fife, and in districts where there is danger of Red Fife being injured by fall frosts, I would strongly recommend a trial of one of these early ripening kinds, Early Riga is the earliest of all the varieties tested here, but it has not proved as productive as some of the others.

Preston Wheat although not as early as Riga, is more productive, and is usually several days earlier than Red Fife, the area sown to this wheat is increasing each year, especially in districts subject to autumn frosts. At present the millers here are paying the same price for Preston Wheat as they are for Red Fife.

Thirty-six varieties of spring wheat were tested this year, irrespective of Macaroni Wheat and Spelt. All were sown on May 4 on clay loam soil, summer-fallowed, in plots of one-twentieth acre. All the seed was treated with bluestone and the varieties were all free of smut.

SPRING WHEAT—TEST OF VARIETIES.

| Name of Variety. | Date of Ripening. | | No. of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Kind of Head. | Weight of Straw. | Yield per Acre. | | Weight per Bushel. | Rusted. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | In. | | In. | | Lbs. | Bush. | Lbs. | Lbs | |
| Australian No. 9 | Sept. | 6 | 125 | 53 | Fair | 4 | Beardless. | 6,550 | 36 | 40 | 59¼ | Slightly. |
| Red Fife | " | 7 | 126 | 53 | Stiff | 3½ | " | 6,700 | 36 | 40 | 58½ | Considerably. |
| Crawford | " | 1 | 120 | 44 | " | 3 | " | 5,840 | 36 | | 60¼ | Slightly. |
| Australian No. 19 | " | 8 | 127 | 50 | " | 3½ | " | 6,840 | 36 | | 59¼ | Considerably. |
| Power's Fife (Minn. 149) | " | 8 | 127 | 51 | Weak | 4 | " | 6,800 | 35 | | 59 | Slightly. |
| Chester | Aug. | 6 | 125 | 52 | Stiff | 4 | " | 6,260 | 34 | | 59¼ | Badly. |
| Monarch | Sept. | 8 | 127 | 51 | Fair | 3½ | " | 6,880 | 33 | 40 | 58¾ | Considerably. |
| Preston | " | 4 | 123 | 53 | Stiff | 3½ | Bearded | 6,420 | 33 | | 56 | " |
| Benton | " | 1 | 119 | 47 | " | 4 | Beardless. | 5,520 | 31 | 20 | 58 | Badly. |
| Huron | Aug. | 29 | 117 | 52 | Fair | 3½ | Bearded | 6,520 | 31 | 20 | 56¼ | Considerably. |
| Pringle's Champlain | Sept. | 2 | 121 | 50 | " | 3½ | " | 6,120 | 31 | 20 | 58 | " |
| White Fife | " | 7 | 126 | 53 | Stiff | 3 | Beardless. | 5,600 | 31 | 20 | 57¼ | " |
| Fraser | Aug. | 27 | 115 | 41 | " | 3 | Bearded | 6.140 | 31 | | 58¾ | " |
| Advance | Sept. | 1 | 120 | 51 | " | 3 | " | 5,840 | 31 | | 57¼ | Badly. |
| Admiral | " | 6 | 125 | 53 | " | 3½ | Beardless. | 6,420 | 29 | 40 | 56½ | Considerably. |
| Hungarian | " | 1 | 120 | 47 | " | 3 | Bearded | 5,940 | 29 | 20 | 57¼ | Badly. |
| Dawn | " | 4 | 123 | 51 | " | 3 | Beardless. | 6,160 | 29 | | 56½ | Considerably. |
| Early Riga | Aug. | 24 | 112 | 43 | Stiff | 3 | " | 5,420 | 28 | | 58½ | " |
| Byron | " | 29 | 117 | 50 | " | 3½ | Bearded | 5,380 | 27 | 40 | 57 | " |
| Hastings | Sept. | 4 | 123 | 49 | " | 3 | Beardless. | 4,880 | 27 | | 58¾ | Badly. |
| Hayne's Blue Stem (Minn. 169) | " | 5 | 124 | 50 | Weak | 4 | " | 7,380 | 27 | | 55½ | " |
| White Russian | " | 2 | 121 | 47 | " | 4 | " | 7,200 | 26 | 40 | 58½ | " |
| Weldon | " | 4 | 123 | 53 | Stiff | 3½ | " | 7,120 | 26 | 20 | 57 | " |
| Wellman's Fife | " | 5 | 124 | 53 | " | 4 | " | 7,520 | 26 | 20 | 55½ | Considerably. |
| Stanley | " | 1 | 120 | 51 | Fair | 4 | " | 7,160 | 26 | 20 | 56 | " |
| Percy | Aug. | 31 | 119 | 50 | Stiff | 4 | " | 6,420 | 26 | 20 | 55½ | " |
| Clyde | " | 31 | 120 | 50 | " | 5 | " | 6,140 | 26 | | 54¼ | " |
| Minnesota No. 163 | Sept. | 4 | 123 | 52 | Weak | 4 | " | 6,560 | 25 | 40 | 56¼ | Badly. |
| Laurel | " | 4 | 123 | 53 | Stiff | 4 | " | 6,180 | 25 | 20 | 56 | Considerably. |
| Countess | " | 1 | 120 | 50 | Fair | 3 | " | 5,580 | 25 | 20 | 56 | Badly. |
| Red Fern | " | 1 | 120 | 51 | Stiff | 3½ | Bearded | 6,700 | 23 | 20 | 54½ | Considerably. |
| Plumper | " | 3 | 122 | 49 | " | 3 | " | 6,800 | 23 | 20 | 56½ | " |
| Herisson Bearded | Aug. | 29 | 117 | 46 | Weak | 2 | " | 5,860 | 22 | 20 | 55½ | Badly. |
| Colorado | Sept. | 2 | 121 | 51 | Fair | 3½ | " | 6,080 | 22 | | 54 | Considerably. |
| Rio Grande | " | 6 | 125 | 50 | " | 3½ | " | 6,920 | 19 | 40 | 52½ | " |
| McKendry's Fife | " | 2 | 121 | 52 | " | 4½ | Beardless. | 6,520 | 16 | 20 | 57 | Badly. |

## MACARONI WHEAT.

This class of wheat has proved almost free of rust, and for that reason it has during the past few years been much more productive than other varieties.

As this kind of wheat is unsaleable for milling purposes in this country, we do not recommend it for general cultivation.

The size of the plots used for this test was one-twentieth acre. The soil a clay loam, summer-fallowed. All were sown on May 4.

MACARONI WHEAT—TEST OF VARIETIES.

| Name of Variety. | Date of Ripening. | | No. of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Kind of Head. | Weight of Straw. | Yield per Acre. | | Weight per Bushel. | Proportion Rusted. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | In. | | In. | | Lbs. | Bush. | Lbs. | Lbs | |
| Goose | Sept. | 10 | 129 | 52 | Fair | 2½ | Bearded | 6,700 | 53 | 20 | 60 | Slightly. |
| Roumanian | " | 12 | 131 | 53 | " | 2½ | " | 6,180 | 45 | 20 | 61 | Considerably. |
| Yellow Gharnovka | " | 9 | 128 | 53 | Weak | 3 | " | 6,600 | 45 | .. | 62¼ | Slightly. |
| Mahmoudi | " | 9 | 128 | 45 | Fair | 3½ | " | 5,320 | 44 | 40 | 61 | " |

EMMER AND SPELT.

In addition to the Common Emmer, incorrectly called Speltz in this country, a test has been made with one other Emmer and two kinds of Spelt.

The Common Emmer is not only the most productive but the weight per bushel is decidedly greater.

The Common Emmer has suffered during the past two seasons from the heads breaking from the straw just before harvest. For this reason, it may be better to harvest it before it is fully ripe.

The size of the plots used for this test was one-twentieth acre. The soil a clay loam, summer-fallowed. All were sown on May 4.

EMMER AND SPELT—TEST OF VARIETIES.

| Name of Variety. | Date of Ripening. | No. of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Kind of Head. | Weight of Straw. | Yield per Acre. | Proportion Rusted. |
|---|---|---|---|---|---|---|---|---|---|
| | | | In. | | In. | | Lbs. | Lbs. | |
| Common Emmer | Sept. 9 | 128 | 44 | Weak | $2\frac{1}{2}$ | Bearded | 6,260 | 4,140 | Slightly. |
| Red Emmer | " 9 | 133 | 50 | Stiff | $2\frac{1}{2}$ | " | 6,720 | 2,780 | " |
| Red Spelt | " 9 | 131 | 48 | " | $4\frac{1}{2}$ | Beardless | 5,800 | 2,000 | " |
| White Spelt | " 9 | 129 | 46 | " | $4\frac{1}{2}$ | " | 5,060 | 1,240 | " |

FIELD PLOTS OF WHEAT.

Owing to the Assiniboine river overflowing its banks, we were unable to sow as many large grain fields as usual and in some cases where fields had been sown the water partly destroyed the crop, making accurate returns impossible

| Variety. | Rust. | Character of Soil. | Size of Field. | Date of Sowing. | Date of Ripening. | Weight per Bushel. | Yield per Acre. | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Lbs. | Bush. | Lbs. |
| Preston | Little | Clay loam | 6 acres | May 2 | Aug. 23 | 60 | 30 | .. |
| Laurel | None | Sandy " | 5 " | April 28 | " 17 | $59\frac{1}{2}$ | 24 | 36 |
| White Fife | " | " " | 2 " | " 29 | " 22 | 60 | 22 | .. |
| Red " | " | " " | 4 " | May 2 | " 22 | $59\frac{1}{2}$ | 29 | 43 |
| Huron | " | " " | 1 " | April 29 | " 17 | 60 | 31 | .. |
| Pringle's Champlain | " | " " | 1 " | " 29 | " 17 | 60 | 25 | .. |

## VARIETIES OF WHEAT GROWN FROM SELECTED AND UNSELECTED SEED.

As in former years, the largest heads were selected from standing grain of last year, and the seed was sown this year for comparison with unselected seed from the same plots.

The accompanying table gives the result of each individual variety. A summary is also given which shows the average yield from the selected wheat to be fifty-four pounds more than the unselected. All were sown on summer-fallow land. The soil was a clay loam.

WHEAT.

| Variety. | Size of Plot. | Date of Sowing. | Date of Ripening. | Yield per Acre. | | Weight per Bushel. |
|---|---|---|---|---|---|---|
| | | | | Bush. | Lbs. | Lbs. |
| Countess, unselected | 1/20 acre | May 4 | Sept. 1 | 25 | 20 | 54½ |
| " selected | 1/20 " | " 4 | " 1 | 24 | 20 | 54½ |
| Stanley, unselected | 1/20 " | " 4 | " 1 | 26 | 20 | 54 |
| " selected | 1/20 " | " 4 | " 1 | 29 | .. | 54 |
| Byron, unselected | 1/20 " | " 4 | Aug. 29 | 27 | 40 | 55 |
| " selected | 1/20 " | " 4 | " 29 | 28 | 40 | 55 |

Average yield of 3 varieties (selected) 27 bush. 20 lbs.
" (unselected) 26 bush. 26 lbs.

CUTTING RUSTY WHEAT AT DIFFERENT STAGES.

Farmers found it somewhat difficult to decide on the most suitable time to cut fields of rusty grain. It was thought by many, that early cutting would arrest the rust, and allow the kernel to fill out in the stook. Others allowed the grain to fully mature before harvesting. For the purpose of gaining some information on this point, four plots of wheat were cut at intervals of one week and a record kept of the returns from each.

From the accompanying table it will be seen that the plot cut in the dough or late milk stage, gave the best results. This experiment should, however, be repeated before definite opinions are reached.

| No. | Variety. | When Sown. | When Harvested. | Stage of Straw when Harvested. | Stage of Grain when Harvested | Yield per Acre. | | Weight per Bushel. |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Bush. | Lbs. | Lbs. |
| 1 | Red Fife | May 18 | Aug. 30 | Quite green | In the milk | 25 | 40 | 54 |
| 2 | " | " 18 | Sept. 6 | Greenish | In the dough | 26 | .. | 54 |
| 3 | " | " 18 | " 13 | Nearly ripe | Nearly hard | 24 | 40 | 54 |
| 4 | " | " 18 | " 22 | Quite ripe | Quite hard | 24 | 20 | 54 |

## EXPERIMENTS WITH THE USE OF BARN-YARD MANURE ON WHEAT.

The plots used for this test in 1903 were again sown with wheat this year. Five adjoining plots in fallow last year were also sown at the same time.

The series of plots selected for this purpose were laid out on the upper portion of the farm where the soil is quite light and somewhat exhausted.

The size of the plots was one-twentieth acre, and the soil a very light sandy loam. The previous crop was wheat. The variety sown was Red Fife, sown on May 13 and harvested from August 26 to September 1.

| No. Plot. | Treatment in 1903. | Yield in 1903. | | Yield in 1904. | |
|---|---|---|---|---|---|
| | | Bush. | Lbs. | Bush. | Lbs. |
| 1 | 10 loads per acre, rotted manure | 13 | 30 | 18 | 40 |
| 2 | No manure | 16 | 10 | 19 | .. |
| 3 | 10 loads fresh manure | 18 | .. | 24 | .. |
| 4 | Summer-fallowed in 1903 | None. | | 23 | 20 |
| 5 | Clover ploughed in | " | | 20 | .. |
| 6 | Peas ploughed in | " | | 21 | 20 |
| 7 | 10 loads rotted manure | " | | 24 | 40 |
| 8 | 10 " fresh " | " | | 25 | 40 |

SUMMARY.

1. The plots left without a crop in 1903 gave the largest average yields of grain this year.

2. The two plots treated with fresh manure gave larger returns than the two treated with rotted manure.

3. Peas used as a green manure gave better results than did clover for that purpose.

A TEST OF FERTILIZERS ON WHEAT.

With one exception the fertilized plots have this year given the largest returns. The same result was obtained with this experiment in 1902.

The size of the plots was one-fortieth acre. The soil a sandy loam, summer-fallowed. All were sown on May 18 and all harvested September 9. There was no smut, but considerable rust on all the plots. The variety of wheat sown on all the plots was Red Fife.

| Plot. | — | Length of Straw. | Length of Head. | Weight of Straw. | Yield per Acre. | | Weight per Bushel. |
|---|---|---|---|---|---|---|---|
| | | Inches. | Inches. | Lbs. | Bush. | Lbs. | Lbs. |
| 1 | 100 lbs. per acre of nitrate of soda, half sprinkled when the grain was 2 in. high, balance when 6 in. high | 45 | 3 | 4,720 | 31 | 20 | 56 |
| 2 | 200 lbs. per acre of nitrate of soda, half sprinkled when the grain was 2 in. high, balance when 6 in. high | " | " | 4,400 | 30 | 00 | 55 |
| 3 | No fertilizer used | " | " | 4,960 | 30 | 40 | 55 |
| 4 | Superphosphate, 400 lbs. per acre, spread just before sowing | " | " | 5,800 | 33 | 20 | 56½ |
| 5 | Muriate of potash, 200 lbs. per acre, spread just before sowing | " | " | 4,720 | 34 | 40 | 57 |
| 6 | A mixture, 200 lbs. superphosphate, 100 lbs. nitrate of soda, 100 lbs. muriate potash, per acre, half spread before sowing, half when grain was 2 or 3 inches high | " | " | 4,080 | 35 | 20 | 58 |

PREVENTIVES OF SMUT IN WHEAT.

Bluestone and formalin were both used in the tests this year.

The plots were one-twentieth acre each, and the soil a very light sandy loam. The wheat was harvested from August 26 to September 1.

| Variety. | How Treated. | Good heads on 9 sq. ft. | Smut heads. |
|---|---|---|---|
| Red Fife. | Sprinkled with 9 oz. of formalin to 10 galls. water | 379 | |
| " | " " 1 lb. of bluestone to 1 pail " | 389 | |
| " | Not treated | 430 | 25 |

DEEP AND SHALLOW SOWING.

Two one-twentieth acre plots of Red Fife were sown on May 18, with a shoe drill. In one case the seed was sown 2 inches deep and the other 3½ inches. As each produced at the rate of 31⅔ bushels per acre the depth of sowing made no appreciable difference in the yield.

## OATS.

Early sown oats in this part of Manitoba were generally a good crop, and on the experimental farm the uniform plots gave the best returns ever obtained here.

The land used for this purpose was sown with pease in May, 1903. These were ploughed down when in blossom, and the land cultivated on the surface for the balance of the season. This spring the land was harrowed and the oats sown at once. The growth was very rapid, but the straw remained stiff all summer, and there was no lodged grain at any time.

Many complaints are received each year of serious losses from rust in oats and requests for a remedy are numerous; while none of the varieties of oats tested on this farm are entirely free from rust, Banner is as little affected as any of them. As a preventive for rust, early sowing should be practiced. In every instance where late sowing has been done on this farm, rust has considerably injured a large proportion of the crop, while early sown oats on adjoining fields seldom, if ever, suffer much from this cause.

Four plots of oats were seriously injured by blackbirds. The plots were near water, and in spite of the free use of a gun, the birds destroyed a large proportion of the crop.

The test was made with forty-two varieties, on plots of one-twentieth acre each. The soil was a clay loam, the previous crop, pease, ploughed down, two bushels of seed per acre was used. All were sown on May 5.

OATS—TEST OF VARIETIES.

| Name of Variety. | Date of Ripening. | | No. of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Kind of Head. | Weight of Straw. | Yield per Acre. | | Weight per Bushel. | Rusted. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | In. | | In. | | Lbs. | Bush. | Lbs. | Lbs | |
| Improved American | Aug. | 26 | 113 | 49 | Stiff | 11 | Branching | 5280 | 134 | 4 | 36½ | Slightly. |
| Golden Beauty | " | 26 | 113 | 48 | " | 8 | " | 4920 | 132 | 32 | 36 | Considerably. |
| Danish Island | " | 26 | 113 | 41 | " | 9 | " | 5040 | 132 | 12 | 36½ | " |
| Banner | " | 27 | 114 | 47 | " | 9 | " | 5080 | 131 | 6 | 37½ | Slightly. |
| Abundance | " | 26 | 113 | 46 | " | 9 | " | 4500 | 130 | 20 | 35 | " |
| Lincoln | " | 26 | 113 | 47 | " | 8 | " | 5200 | 127 | 22 | 36½ | Considerably. |
| Siberian | " | 26 | 113 | 43 | " | 8 | " | 5520 | 127 | 22 | 35 | " |
| Early Golden Prolific | " | 23 | 110 | 50 | " | 9 | " | 4820 | 127 | 2 | 36 | Slightly. |
| Wide Awake | " | 27 | 114 | 48 | " | 8 | " | 5360 | 125 | 30 | 37½ | " |
| American Triumph | " | 26 | 113 | 48 | " | 9 | " | 4880 | 125 | 10 | 36½ | None. |
| Waverley | " | 26 | 113 | 43 | " | 9 | " | 5260 | 122 | 32 | 36½ | Slightly. |
| Buckbee's Illinois | " | 27 | 114 | 45 | " | 9 | " | 4900 | 121 | 26 | 36½ | " |
| White Giant | " | 24 | 111 | 49 | " | 9 | " | 5800 | 121 | 26 | 35½ | Considerably. |
| Golden Fleece | " | 26 | 113 | 47 | " | 11 | " | 5060 | 120 | .. | 34 | " |
| Scotch Potato | " | 27 | 114 | 49 | " | 10 | " | 5880 | 119 | 14 | 36 | Slightly. |
| Columbus | " | 23 | 110 | 45 | " | 8 | " | 4640 | 117 | 22 | 35½ | " |
| Thousand Dollar | " | 22 | 109 | 46 | " | 9 | " | 5140 | 117 | 22 | 37½ | None. |
| American Beauty | " | 23 | 110 | 48 | " | 9 | " | 5140 | 117 | 22 | 34 | Slightly. |
| Golden Giant | " | 31 | 118 | 41 | " | 11 | Sided | 5780 | 116 | 16 | 35 | Considerably. |
| Olive White | " | 29 | 116 | 48 | " | 9 | " | 5580 | 116 | 16 | 36¼ | Slightly. |
| Bavarian | " | 23 | 110 | 44 | " | 9 | Branching | 4900 | 115 | 30 | 37½ | Considerably. |
| Golden Tartarian | " | 30 | 117 | 43 | " | 12 | Sided | 5780 | 113 | 18 | 34½ | Slightly. |
| Irish Victor | " | 23 | 110 | 43 | " | 9 | Branching | 5400 | 112 | 32 | 33½ | Considerably. |
| Goldfinder | " | 30 | 117 | 42 | " | 10 | ½ Sided | 4840 | 111 | 26 | 34 | " |
| Kendal White | " | 25 | 112 | 46 | " | 10 | Sided | 5460 | 108 | 8 | 38¾ | Slightly. |
| Black Beauty | " | 24 | 111 | 43 | Weak | 9 | Branching | 5260 | 108 | 8 | 37 | Considerably. |
| Joanette | " | 30 | 117 | 44 | " | 8 | " | 5580 | 107 | 22 | 37 | " |
| Twentieth Century | " | 20 | 107 | 48 | Stiff | 9 | " | 4380 | 107 | 22 | 37½ | None. |
| Pioneer | " | 26 | 113 | 49 | " | 8 | " | 4900 | 107 | 2 | 38½ | Considerably. |
| Tartar King | " | 20 | 107 | 46 | " | 8 | Sided | 4440 | 105 | 30 | 40 | " |
| Pense Black | " | 30 | 117 | 51 | " | 9 | " | 5960 | 105 | 30 | 38 | " |
| Milford White | " | 28 | 115 | 47 | " | 10 | " | 5260 | 105 | 10 | 38½ | " |
| Kendal Black | " | 30 | 117 | 50 | " | 10 | " | 5980 | 104 | 24 | 38 | Slightly. |
| Milford Black | " | 29 | 116 | 42 | " | 9 | " | 5420 | 103 | 18 | 37½ | " |
| Olive Black | " | 29 | 116 | 49 | " | 10 | Branching | 5920 | 103 | 18 | 37¼ | " |
| Pense White | " | 28 | 115 | 49 | " | 9 | Sided | 5900 | 101 | 6 | 38¾ | " |
| *Holstein Prolific | " | 17 | 105 | 44 | " | 9 | Branching | 5120 | 100 | 20 | 34 | Considerably. |
| Storm King | " | 26 | 113 | 47 | " | 9 | Sided | 4680 | 90 | .. | 37 | Slightly. |
| *Mennonite | " | 17 | 105 | 44 | " | 9 | Branching | 5080 | 90 | .. | 26 | Considerably. |
| *Sensation | " | 23 | 110 | 46 | " | 9 | " | 5140 | 79 | 14 | 33 | " |
| *Improved Ligowo | " | 17 | 105 | 48 | " | 9 | " | 6360 | 58 | 8 | 31 | Badly. |
| *Swedish Select | " | 17 | 105 | 47 | " | 8 | " | 6460 | 54 | 4 | 29½ | " |

*Injured by Blackbirds.

FIELD PLOTS OF OATS.

The remarks given under the head of field plots of wheat apply to oats also, only two fields of this grain were left uninjured by the flood.

One field of Banner oats, 11 acres in extent, soil a clay loam, summer-fallowed, was sown on May 13 and cut on August 23. It gave a return of 73 bushels and 27 lbs. per acre, weighing 37 lbs. per bushel. There was very little rust and no smut in this field.

A field of American Beauty oats, 5 acres in extent, soil a clay loam, summer-fallowed, was sown on May 13 and cut on September 1. It gave a return of 81 bushels and 2 lbs. per acre, weighing 38 lbs. per bushel. There was very little rust and no smut in this field.

## BARLEY.

This grain has given excellent returns and a heavy kernel. Among the six-rowed varieties I wish to call attention to Yale barley, a hybrid between Duckbill and Rennie's Improved, this variety stands second on the list of the most productive kinds tested here during the past five years, and it has also given excellent returns on nearly all the experimental farms.

We find that barley can be used to a good advantage as a cleaning crop, weedy land cultivated near the surface in early spring, then ploughed deep about May 20 and sown at once with six-rowed barley will generally give large returns, and also leave the land much cleaner of weeds.

Many inquiries are made regarding beardless varieties of barley. Champion and other varieties of this class have been under trial on this farm for many years, but the yield from them has generally been much below that of the bearded kinds, and the weight per bushel is invariably under the standard.

While all varieties of barley stood up well this year, we usually find the six-rowed varieties have the best straw. The two-rowed Thorpe kinds come next, while the Chevalier varieties are usually too weak for summer-fallow land in this climate.

Twenty varieties of six-rowed barley were tested. Size of plots one-twentieth acre. The soil was sandy loam, which had been summer-fallowed. All were sown on May 17 in the proportion of two bushels of seed per acre. There was no rust on any of the varieties.

BARLEY—SIX-ROWED—TEST OF VARIETIES.

| Name of Variety. | Date of Ripening | No. of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Weight of Straw. | Yield per Acre. | | Weight per Bushel. |
|---|---|---|---|---|---|---|---|---|---|
| | | | In. | | In. | Lbs. | Bush. | Lbs. | Lbs |
| Brome | Aug. 18 | 93 | 34 | Fair | 3 | 3,900 | 66 | 32 | 52½ |
| Yale | " 18 | 93 | 38 | Stiff | 3 | 3,600 | 62 | 24 | 51½ |
| Empire | " 18 | 93 | 38 | " | 3½ | 3,480 | 58 | 36 | 52½ |
| Odessa | " 18 | 93 | 36 | " | 3¾ | 2,440 | 57 | 24 | 52 |
| Claude | " 18 | 93 | 35 | " | 2¾ | 3,120 | 55 | 40 | 49½ |
| Argyle | " 16 | 91 | 37 | " | 3 | 2,380 | 54 | 28 | 51 |
| Trooper | " 18 | 93 | 34 | " | 3 | 3,780 | 54 | 28 | 52¼ |
| Stella | " 16 | 91 | 33 | " | 3 | 3,600 | 53 | 16 | 52 |
| Baxter | " 14 | 89 | 38 | " | 2½ | 2,740 | 53 | 16 | 53 |
| Summit | " 18 | 93 | 34 | " | 3 | 2,980 | 52 | 44 | 52¼ |
| Mansfield | " 18 | 93 | 37 | " | 3½ | 3,140 | 52 | 24 | 52 |
| Garfield | " 17 | 87 | 34 | " | 3 | 2,980 | 52 | 24 | 52 |
| Nugent | " 18 | 93 | 32 | " | 3 | 2,700 | 47 | 24 | 52 |
| Mensury | " 14 | 89 | 37 | " | 3½ | 3,040 | 47 | 04 | 50½ |
| Albert | " 13 | 88 | 37 | " | 3 | 3,560 | 46 | 32 | 53 |
| Royal | " 14 | 89 | 34 | " | 3 | 2,780 | 46 | 12 | 50½ |
| Rennie's Improved | " 14 | 89 | 36 | " | 3½ | 2,720 | 43 | 16 | 52½ |
| Common | " 13 | 88 | 33 | " | 3 | 2,340 | 42 | 44 | 52 |
| Oderbruch | " 14 | 89 | 27 | " | 3 | 1,900 | 41 | 32 | 53½ |
| Champion | " 10 | 85 | 33 | " | 3 | 2,120 | 21 | 32 | 46¾ |

Fifteen sorts of two-rowed barley were tested this season. The soil was a sandy loam, which had been summer-fallowed. All were sown on one-twentieth acre plots, on June 6, in the proportion of two bushels of seed per acre.

BARLEY—TWO-ROWED—TEST OF VARIETIES.

| Name of Variety. | Date of Ripening. | | No. of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Weight of Straw. | Yield per Acre. | | Weight per Bushel. | Rusted. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | In. | | In. | Lbs. | Bush. | Lbs. | Lbs | |
| Invincible | Sept. | 7 | 85 | 45 | Stiff.... | 5 | 4,380 | 63 | 36 | 50¾ | Considerably. |
| Gordon | " | 8 | 83 | 44 | " .... | 3 | 5,380 | 63 | 36 | 51½ | Slightly. |
| Standwell | " | 10 | 85 | 39 | " .... | 4 | 5,580 | 63 | 36 | 51¼ | " |
| Fulton | " | 7 | 82 | 40 | " .... | 3 | 5,140 | 59 | 28 | 51 | " |
| Clifford | " | 8 | 83 | 43 | " .... | 3½ | 5,180 | 58 | 36 | 52 | " |
| Dunham | " | 9 | 84 | 38 | " .... | 3 | 5,180 | 56 | 32 | 51 | " |
| Sidney | " | 7 | 82 | 38 | " .... | 4 | 3,720 | 55 | 40 | 50½ | None. |
| Jarvis | " | 7 | 82 | 44 | " .... | 4½ | 4,920 | 55 | 40 | 51½ | Slightly. |
| Harvey | " | 11 | 86 | 40 | " .... | 3½ | 3,620 | 55 | 40 | 51½ | " |
| Canadian Thorpe | " | 12 | 87 | 38 | " .... | 3 | 6,540 | 55 | 20 | 51¾ | " |
| Danish Chevalier | " | 12 | 87 | 34 | " .... | 4 | 4,720 | 53 | 36 | 50 | " |
| Logan | " | 12 | 87 | 40 | " .... | 4 | 5,080 | 52 | 24 | 51¼ | " |
| Beaver | " | 12 | 87 | 35 | " .... | 3½ | 5,580 | 52 | 24 | 52 | Considerably. |
| French Chevalier | " | 12 | 87 | 36 | " .... | 4 | 5,240 | 42 | 44 | 51 | " |
| Newton | " | 10 | 85 | 34 | " .... | 4 | 5,740 | 30 | 20 | 49½ | Slightly. |

## EXPERIMENTS WITH FLAX.

Ten varieties of flax were under trial on the experimental farm. The crop was uniformly good and attracted much attention, particularly from the United States visitors, who are much interested in flax growing.

The St. Petersburg, Russian, Improved Russian, and Common are very similar in appearance. The La Plata has a decidedly spreading habit and branches much nearer the ground than the others. It is also about a week later.

The La Plata and Novarossick again head the list for productiveness, evidently they are very desirable kinds for this country.

These plots were all one-fortieth acre each.

FLAX—TEST OF VARIETIES.

| Varieties. | Date of Sowing. | | Date of Ripening. | | Length of Straw. | Weight of Straw. | Yield per Acre. | | Weight per Bushel. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Inches. | Lbs. | Bush. | Lbs. | Lbs. |
| La Plata | May | 19.. | Aug. | 26.. | 20 | 1,480 | 23 | 32 | 55½ |
| Novarossick | " | 19.. | " | 20.. | 23 | 1,760 | 22 | 8 | 55 |
| Russian | " | 19.. | " | 21.. | 25 | 1,640 | 20 | 40 | 55½ |
| Riga | " | 19.. | " | 23.. | 33 | 1,560 | 18 | 32 | 56 |
| Yellow Seeded | " | 20.. | " | 19.. | 27 | 1,560 | 18 | 32 | 55 |
| White Flowering | " | 19.. | " | 20.. | 27 | 1,600 | 17 | 48 | 56 |
| Bombay | " | 19.. | " | 26.. | 18 | 1,200 | 17 | 48 | 56 |
| Improved Russian | " | 20.. | " | 23.. | 34 | 1,720 | 15 | 40 | 56 |
| St. Petersburg | " | 19.. | " | 23.. | 28 | 1,760 | 11 | 24 | 56 |
| Common | " | 20.. | " | 23.. | 33 | 1,040 | 10 | .. | 56 |

SOWING FLAX ON NEW BREAKING.

Many inquiries are received from new settlers regarding the advisability of sowing flax on new breaking. I have always recommended that new breaking be left unsown the first year, for the following reasons:—

1st. The yield of grain of any kind is comparatively small from breaking and the time can be more profitably used in breaking additional land.

2nd. It is almost impossible to procure flax seed free from foul weed seeds. We have found seven distinct varieties of wild mustard in one lot of flax procured for this farm.

3rd. For some unexplained reason, land sown with flax the first year fails to give full returns for several years afterwards.

Last year two plots of new prairie land were broken in May, one of the plots was sown with Common Flax as soon as broken and harrowed, the other was left unsown, but was ploughed a second time (backsett) in July. The plot sown with flax gave a yield of 8 bushels and 12 pounds per acre.

This year both were again ploughed and sown with Red Fife Wheat, with the following result:—

| — | Date of Sowing. | Date of Ripening. | Weight of Straw. | Yield per Acre. | |
|---|---|---|---|---|---|
| | | | Lbs. | Bush. | Lbs. |
| Red Fife on backsetting | May 12 | Sept. 5 | 4,200 | 33 | 20 |
| " after flax crop | " 12 | " 5 | 3,320 | 24 | 40 |

From the accompanying table it will be noticed that the plot left without a crop gave 8⅔ bushels per acre more wheat than the land sown with flax.

### FLAX STUBBLE FOR GRAIN CROP.

On old land a grain crop following flax has usually given fair returns here. This is probably owing to the small amount of stubble left by a flax crop, permitting of a compact seed bed so necessary for the wheat plant.

### DIFFERENT PREPARATIONS FOR A WHEAT CROP.

All on plots of 1-20 acre each.

| Preparation. | Rusted. | Date of Sowing. | Date of Ripening. | Weight of Straw. | Yield per Acre. | |
|---|---|---|---|---|---|---|
| | | | | lbs. per ac. | Bush. | Lbs. |
| Wheat after flax | Considerably | May 11 | Sept. 3 | 5680 | 43 | 40 |
| " wheat | " | " 11 | " 3 | 4880 | 37 | .. |
| " oats | " | " 11 | " 3 | 4900 | 36 | 40 |
| " barley | " | " 11 | " 3 | 4080 | 33 | 40 |
| " millet | " | " 11 | " 3 | 3280 | 35 | 20 |
| Wheat on summer-fallow | Badly | " 11 | " 4 | 4540 | 32 | 46 |

### DIFFERENT GRAIN CROPS FOLLOWING FLAX.

| — | Date of Sowing. | Date of Ripening. | Weight of Straw. | Yield per Acre. | |
|---|---|---|---|---|---|
| | | | Lbs. | Bush. | Lbs. |
| Wheat (Red Fife) after flax | May 11 | Sept. 3 | 5680 | 43 | 40 |
| Oats (Banner) after flax | " 11 | Aug. 26 | 4620 | 68 | 8 |
| Barley (Mensury) after flax | " 11 | " 22 | 3060 | 52 | 44 |
| Pease (Mummy) " | " 11 | Sept. 2 | ........ | 53 | 20 |

## EXPERIMENTS WITH PEASE.

Thirty-one varieties of pease were on trial this year. The yield has been very much above the average and the sample excellent.

This grain is nearly always very productive here, the only obstacle to its more general cultivation is the difficulty in harvesting and threshing it.

The pea weevil is unknown, the sample is usually good and the weight per bushel high.

The soil selected this year was a sandy loam summer-fallowed, the size of the plots one-twentieth acre. All were sown on May 11, in the proportion of two bushels of seed per acre for the small kinds and three bushels for the larger ones.

PEASE—TEST OF VARIETIES.

| Number. | Name of Variety. | Date of Ripening. | No. of Days Maturing. | Character of Growth. | Length of Straw. | Length of Pod. | Size of Pea. | Yield per Acre. | | Weight per Bushel. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | In. | In. | | Bus. | Lbs. | Lbs. |
| 1 | Mackay | Sept. 11 | 123 | Rank | 42 | 2½ | Medium | 85 | .. | 63½ |
| 2 | Macoun | " 12 | 124 | " | 37 | 2½ | Small | 79 | 40 | 64½ |
| 3 | Picton | " 12 | 124 | " | 36 | 2½ | Large | 77 | 10 | 63½ |
| 4 | Arthur | " 2 | 114 | Medium | 34 | 2½ | Medium | 77 | .. | 65 |
| 5 | King | " 8 | 120 | Rank | 42 | 2 | " | 75 | .. | 65 |
| 6 | Carleton | " 10 | 122 | Medium | 37 | 2¼ | Small | 73 | 50 | 64¼ |
| 7 | Paragon | " 10 | 122 | Rank | 38 | 2½ | Medium | 73 | 20 | 62½ |
| 8 | Pearl | " 20 | 133 | " | 46 | 3 | " | 73 | 20 | 62 |
| 9 | Mummy | " 19 | 132 | " | 53 | 2 | " | 73 | .. | 64 |
| 10 | Victoria | " 20 | 133 | " | 44 | 3½ | Large | 71 | 40 | 64 |
| 11 | Early Britain | " 5 | 117 | " | 43 | 2½ | " | 71 | .. | 61¾ |
| 12 | Gregory | " 9 | 121 | Medium | 54 | 2½ | Medium | 70 | .. | 65½ |
| 13 | White Marrowfat | " 20 | 133 | Rank | 63 | 3 | Large | 68 | 20 | 64 |
| 14 | Daniel O'Rourke | " 16 | 129 | " | 46 | 2½ | Small | 67 | .. | 65½ |
| 15 | Golden Vine | " 5 | 117 | Fair | 48 | 2 | " | 66 | 20 | 63¼ |
| 16 | Pride | " 20 | 133 | Rank | 54 | 2 | Medium | 64 | 20 | 64¼ |
| 17 | Archer | " 18 | 131 | " | 43 | 2 | " | 64 | .. | 64¼ |
| 18 | Prince | " 18 | 131 | " | 44 | 2½ | " | 63 | 20 | 64 |
| 19 | Kent | " 18 | 131 | " | 44 | 3 | Large | 61 | 20 | 64½ |
| 20 | Prince Albert | " 15 | 128 | Fair | 63 | 2½ | Small | 60 | 40 | 63½ |
| 21 | English Grey | " 18 | 131 | " | 42 | 3 | Medium | 60 | .. | 61¾ |
| 22 | Duke | " 20 | 133 | Rank | 42 | 2 | " | 58 | .. | 63 |
| 23 | Prussian Blue | " 1 | 113 | Fair | 43 | 2½ | " | 58 | .. | 65¼ |
| 24 | Nelson | " 10 | 122 | " | 33 | 2½ | " | 57 | 40 | 64¾ |
| 25 | Crown | Aug. 25 | 106 | Weak | 37 | 2 | Small | 57 | 20 | 65½ |
| 26 | Wisconsin Blue | Sept. 10 | 122 | " | 38 | 2 | " | 57 | 20 | 66 |
| 27 | Agnes | " 6 | 118 | Fair | 42 | 2¼ | Medium | 56 | .. | 63½ |
| 28 | White Wonder | Aug. 30 | 111 | Weak | 34 | 2 | Small | 55 | 40 | 66 |
| 29 | Black-eyed Marrowfat | Sept. 1 | 113 | Rank | 41 | 3½ | Large | 52 | .. | 63½ |
| 30 | Chancellor | Aug. 25 | 106 | Weak | 32 | 2 | Small | 51 | 20 | 65½ |
| 31 | German White | Sept. 5 | 117 | Medium | 36 | 2½ | Large | 50 | 20 | 65 |

## EXPERIMENTS WITH INDIAN CORN.

The crop of Indian Corn was slightly above the average this year, but it was scarcely as far advanced as usual when harvested.

In addition to the uniform test of plots of corn, about eight acres were sown for feeding purposes, 38 tons of this was used for ensilage, and the balance cured in stooks, and will be fed during the winter months. We find that all classes of stock relish dry corn fodder, even horses are benefited by one meal of it a day during the slack months of winter.

The seed was sown on May 26, in rows 30 inches apart, using about half a bushel of seed per acre. The crop was cut on September 23. Twenty varieties were under trial. The soil was a rather light sandy loam and the previous crop was corn. The yields were calculated from two rows, each 66 feet long.

INDIAN CORN—TEST OF VARIETIES.

| Number. | Name of Variety. | Height. | Leafiness. | When Tasselled. | In Silk. | Early Milk. | Late Milk. | Condition when Cut. | Weight per Acre grown in rows. | | Weight per Acre grown in hills. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | In. | | | | | | | Tons. | Lbs. | Tons. | Lbs. |
| 1 | Giant Prolific Ensilage | 87 | Very leafy.. | Aug. 29 | | | | In tassel | 25 | 160 | 26 | 272 |
| 2 | White Cap Yell'w Dent | 87 | Fairly leafy. | " 29 | | | | " | 24 | 840 | 24 | 48 |
| 3 | Thoroughbred White Flint | 76 | Very leafy.. | " 29 | | | | " | 24 | 840 | 22 | 1,672 |
| 4 | Red Cob Ensilage | 90 | Fairly leafy. | Sept. 1 | | | | " | 23 | 200 | 21 | 1,560 |
| 5 | Superior Fodder | 74 | Very leafy.. | " 5 | | | | " | 22 | 1,408 | 22 | 352 |
| 6 | Champion White Pearl | 97 | Few leaves. | Aug. 27 | | | | " | 21 | 768 | 19 | 808 |
| 7 | Salzer's All Gold | 87 | Very leafy.. | " 30 | | | | " | 21 | 240 | 23 | 1,520 |
| 8 | King Philip | 85 | " | " 18 | Aug. 23 | Aug. 31 | Sept. 6 | L. milk. | 20 | 920 | 18 | 960 |
| 9 | Mammoth Cuban | 75 | Few leaves. | " 26 | Sept. 1 | | | In silk.. | 19 | 1,600 | 19 | 808 |
| 10 | Cloud's Early Yellow. | 86 | " | " 29 | | | | In tassel | 18 | 960 | 17 | 848 |
| 11 | Longfellow | 84 | Fairly leafy. | " 17 | Aug. 27 | Sept. 16 | | E. milk. | 18 | 432 | 18 | 1,488 |
| 12 | Pride of the North | 74 | Very leafy.. | Sept. 1 | | | | In tassel | 17 | 1,640 | 16 | 1,000 |
| 13 | North Dakota White. | 76 | " | Aug. 18 | Aug. 23 | Sept. 1 | Sept. 6 | L. milk. | 17 | 1,640 | 19 | 1,600 |
| 14 | Angel of Midnight | 93 | Leafy | " 19 | " 30 | " 5 | | E. milk. | 17 | 1,112 | 17 | 1,376 |
| 15 | Compton's Early | 79 | Fairly leafy. | " 18 | " 26 | " 1 | | " | 16 | 1,792 | 18 | 960 |
| 16 | Early Mastodon | 84 | Leafy | " 29 | Sept. 5 | | | In silk.. | 16 | 1,000 | 17 | 1,640 |
| 17 | Early Butler | 104 | Quite leafy. | Sept. 1 | | | | In tassel | 16 | 1,000 | 19 | 280 |
| 18 | Eureka | 76 | Few leaves. | Aug. 30 | | | | " | 15 | 360 | 18 | 960 |
| 19 | Selected Leaming | 81 | " | Sept. 1 | | | | " | 13 | 664 | 10 | 64 |
| 20 | Evergreen Sugar | 73 | Leafy | Aug. 28 | | | | " | 11 | 440 | 11 | 1,760 |

INDIAN CORN—SOWN AT DIFFERENT DISTANCES APART.

| Name of Variety. | Distance apart. | Height. | Condition when Cut. | Weight per Acre, cut green for ensilage. | |
|---|---|---|---|---|---|
| | Inches. | Inches. | | Tons. | Lbs. |
| Longfellow, 4 rows | 24 | 85 | Early milk | 26 | 800 |
| " 4 " | 30 | 85 | " | 22 | 880 |
| " 4 " | 36 | 85 | " | 19 | 1,600 |
| " 4 " | 42 | 85 | " | 17 | 1,252 |
| Selected Leaming | 24 | 81 | In tassel | 16 | 1,000 |
| " | 30 | 81 | " | 15 | 1,680 |
| " | 36 | 81 | " | 14 | 600 |
| " | 42 | 81 | " | 17 | 1,438 |
| Champion White Pearl | 24 | 97 | " | 20 | 1,250 |
| " " | 30 | 97 | " | 19 | 1,072 |
| " " | 36 | 97 | " | 16 | 1,880 |
| " " | 42 | 97 | " | 15 | 160 |

INDIAN CORN.

| Average Yield at Different Distances Apart. | Tons. | Lbs. |
|---|---|---|
| Average yield of green corn 24 inches apart | 21 | 350 |
| " " 30 " | 19 | 544 |
| " " 36 " | 17 | 26 |
| " " 42 " | 16 | 1,616 |

## FIELD ROOTS.

The yield of all kinds of field roots has been unusually good on the experimental farm this year, and a few notes on our manner of growing them may prove useful to new settlers in this country.

For the best results soil intended for field roots should be rich, moist, and fairly free of weed seeds. These conditions can be obtained by sowing on manured summer-fallow land, or by using the same land continuously for a root crop, but alternating the kind of root from year to year; for instance, land in potatoes this year could be sown to turnips next season. The latter plan has been adopted here, and about ten loads of manure per acre is applied every second or third year. If all root tops and other rubbish is ploughed under deeply, just as soon as the crop is off, and the land rolled, there will be no trouble from cutworms.

All manure should be applied in the autumn. Only well rotted manure should be used, and it must be broken up fine for the best results.

All field roots should be sown much earlier than is generally practiced. Carrots can be sown May 1, turnips May 10, and mangels and sugar beets May 15.

Ridged drills dry out quickly, for that reason only level drills should be used.

## TURNIPS.

Twenty varieties of turnips have been on trial at the experimental farm this year. The yield was the largest for years, and the quality good.

The soil was a sandy loam, manured in 1902, and the previous crop was potatoes.

As usual two sowings were made of each variety; in every instance the early sown plots gave the largest returns.

The first plots were sown on May 10, the second on May 23, and the roots from both were pulled on October 6. The estimate of yield has been made from the produce of two rows, each 66 feet long.

TURNIPS—TEST OF VARIETIES.

| Number. | Name of Variety. | Yield per Acre. — 1st Plot. | | Yield per Acre. — 1st Plot. | | Yield per Acre. — 2nd Plot. | | Yield per Acre. — 2nd Plot | |
|---|---|---|---|---|---|---|---|---|---|
| | | Tons. | Lbs. | Bush. | Lbs. | Tons. | Lbs. | Bush. | Lbs. |
| 1 | Good Luck | 43 | 1,120 | 1,452 | .. | 23 | 1,520 | 792 | . |
| 2 | Jumbo | 37 | 1,240 | 1,254 | .. | 25 | 1,480 | 858 | .. |
| 3 | Magnum Bonum | 34 | 640 | 1,144 | .. | 25 | 1,480 | 858 | .. |
| 4 | Hall's Westbury | 31 | 304 | 1,038 | 24 | 23 | 200 | 770 | .. |
| 5 | Bangholm, selected | 30 | 720 | 1,012 | .. | 22 | 880 | 748 | .. |
| 6 | East Lothian | 29 | 1,400 | 990 | .. | 21 | 768 | 712 | 48 |
| 7 | Perfection Swede | 29 | 1,136 | 985 | 36 | 21 | 1,560 | 726 | .. |
| 8 | Kangaroo | 29 | 80 | 968 | .. | 19 | 1,600 | 660 | .. |
| 9 | Hartley's Bronze | 29 | 80 | 968 | .. | 21 | 240 | 704 | .. |
| 10 | New Century | 28 | 1,552 | 959 | 32 | 23 | 1,520 | 792 | .. |
| 11 | Selected Purple Top | 28 | 760 | 946 | .. | 22 | 616 | 743 | 36 |
| 12 | Imperial Swede | 28 | 760 | 946 | .. | 23 | 200 | 770 | .. |
| 13 | Drummond Purple Top | 28 | 760 | 946 | .. | 21 | 1,560 | 726 | .. |
| 14 | Carter's Elephant | 28 | 760 | 946 | .. | 21 | 768 | 712 | 48 |
| 15 | Emperor Swede | 27 | 1,176 | 919 | 36 | 19 | 1,600 | 660 | .. |
| 16 | Sutton's Champion | 26 | 1,592 | 893 | 12 | 21 | 768 | 712 | 48 |
| 17 | Mammoth Clyde | 26 | 1,328 | 888 | 48 | 23 | 1,520 | 792 | .. |
| 18 | Halewood's Bronze Top | 26 | 1.328 | 888 | 48 | 19 | 280 | 638 | .. |
| 19 | Elephant's Master | 26 | 800 | 880 | .. | 19 | 1,600 | 660 | .. |
| 20 | Skirvings | 26 | 800 | 880 | .. | 22 | 880 | 748 | .. |

## EXPERIMENTS WITH MANGELS.

Sixteen varieties of mangels have been on trial at the experimental farm this year. The yield was excellent and the roots were saved free of injury from frost.

The soil used for this crop was a black loam fertilized in 1902, with ten loads of well-rotted stable manure, applied in the autumn. The previous crop was potatoes. The first sowing was made on May 7, and the second on May 21. All were harvested on September 24.

The estimate of yield has been made from the product of two rows each 66 feet long.

MANGELS—TEST OF VARIETIES.

| Number. | Name of Variety. | Yield per Acre. — 1st Plot. | | Yield per Acre. — 1st Plot. | | Yield per Acre. — 2nd Plot. | | Yield per Acre. — 2nd Plot. | |
|---|---|---|---|---|---|---|---|---|---|
| | | Tons. | Lbs. | Bush. | Lbs. | Tons. | Lbs. | Bush. | Lbs. |
| 1 | Mam. Yellow Intermediate | 39 | 1,992 | 1,333 | 12 | 31 | 568 | 1,042 | 48 |
| 2 | Gate Post | 37 | 712 | 1,245 | 12 | 29 | 872 | 981 | 12 |
| 3 | Half Long Sugar White | 35 | 1,544 | 1,192 | 24 | 31 | 40 | 1,034 | .. |
| 4 | Yellow Intermediate | 31 | 1,624 | 1,060 | 24 | 38 | 32 | 1,267 | 12 |
| 5 | Prize Winner Yellow Globe | 31 | 1,360 | 1,056 | .. | 30 | 1,512 | 1,025 | 12 |
| 6 | Mammoth Long Red | 31 | 1,096 | 1,051 | 36 | 27 | 120 | 902 | .. |
| 7 | Triumph Yellow Globe | 31 | 568 | 1,042 | 48 | 28 | 760 | 946 | .. |
| 8 | Selected Mammoth Long Red | 31 | 304 | 1,038 | 24 | 29 | 1,928 | 998 | 48 |
| 9 | Leviathan Long Red | 31 | 40 | 1,034 | .. | 28 | 496 | 941 | 36 |
| 10 | Giant Yellow Intermediate | 31 | 40 | 1,034 | .. | 31 | 304 | 1,038 | 24 |
| 11 | Giant Sugar Mangel | 29 | 80 | 968 | .. | 27 | 648 | 910 | 48 |
| 12 | Prize Mammoth Long Red | 28 | 496 | 941 | 36 | 30 | 192 | 1,003 | 12 |
| 13 | Lion Yellow Intermediate | 27 | 648 | 910 | 48 | 24 | 1,104 | 818 | 24 |
| 14 | Half Long Sugar Rosy | 26 | 800 | 880 | .. | 28 | 760 | 946 | .. |
| 15 | Giant Yellow Globe | 25 | 160 | 836 | .. | 35 | 1,280 | 1,188 | .. |
| 16 | Selected Yellow Globe | 24 | 1,896 | 831 | 36 | 36 | 600 | 1,210 | .. |

## CARROTS.

Profiting by last year's experience, a deep friable soil was selected for this test. The land was ploughed deeply in the fall so as to give the root an opportunity to penetrate the soil. The previous crop was mangels.

Ten varieties were tried. The first sowing was made on May 7, the second on May 21. This year, with one exception, the first sown plots gave the largest yield.

The yield per acre has been calculated from the products of two rows, each 66 feet long.

CARROTS—TEST OF VARIETIES.

| Number. | Name of Variety. | Yield per Acre. — 1st Plot. | | Yield per Acre. — 1st Plot. | | Yield per Acre. — 2nd Plot. | | Yield per Acre. — 2nd Plot. | |
|---|---|---|---|---|---|---|---|---|---|
| | | Tons. | Lbs. | Bush | Lbs. | Tons. | Lbs. | Bush. | Lbs. |
| 1 | New White Intermediate | 38 | 1,440 | 1,290 | 40 | 24 | 840 | 814 | .. |
| 2 | Long Yellow Stump Rooted | 36 | 600 | 1,210 | .. | 29 | 520 | 975 | 20 |
| 3 | Ontario Champion | 35 | 1,720 | 1,195 | 20 | 18 | 840 | 630 | 40 |
| 4 | Improved Short White | 33 | 440 | 1,107 | 20 | 26 | 1,680 | 894 | 40 |
| 5 | White Belgian | 33 | .... | 1,100 | .. | 18 | 840 | 630 | 40 |
| 6 | Carter's Orange Giant | 31 | 1,360 | 1,056 | .. | 25 | 1,040 | 850 | 40 |
| 7 | Mammoth White Intermediate | 30 | 280 | 1,004 | 40 | 24 | 1,720 | 828 | 40 |
| 8 | Half Long Chantenay | 28 | 760 | 946 | .. | 24 | 1,720 | 828 | 40 |
| 9 | Giant White Vosges | 26 | 800 | 880 | .. | 15 | 800 | 513 | 20 |
| 10 | Early Gem | 22 | 880 | 748 | .. | 23 | 1,080 | 784 | 40 |

## SUGAR BEETS.

Eight varieties of these roots were on trial this year. The season was a favourable one and a large crop of well-shaped roots was harvested.

Three of the varieties were tested by Mr. F. T. Shutt, Chemist of the Dominion Experimental Farms, Ottawa, and the juice of all was found fairly rich and pure. Full particulars of this test will be found in Mr. Shutt's annual report.

The soil was a black sandy loam. The previous crop was potatoes.

The first plots were sown on May 7, the second on May 21. All were harvested on September 24.

The estimate of yield has been made from the product of two rows, each 66 feet long.

SUGAR BEETS—TEST OF VARIETIES.

| Number. | Name of Variety. | Yield per Acre. — 1st Plot. | | Yield per Acre. — 1st Plot. | | Yield per Acre. — 2nd Plot. | | Yield per Acre. — 2nd Plot. | |
|---|---|---|---|---|---|---|---|---|---|
| | | Tons. | Lbs. | Bush. | Lbs. | Tons | Lbs. | Bush. | Lbs. |
| 1 | Royal Giant | 25 | 688 | 844 | 48 | 25 | 1,744 | 862 | 24 |
| 2 | Red Top Sugar | 24 | 48 | 800 | 48 | 25 | 1,480 | 858 | .. |
| 3 | Danish Red Top | 23 | 992 | 783 | 12 | 23 | 464 | 774 | 24 |
| 4 | Danish Improved | 23 | 200 | 770 | .. | 20 | 656 | 677 | 36 |
| 5 | Wanzleben | 22 | 880 | 748 | .. | 18 | 1,488 | 624 | 48 |
| 6 | Improved Imperial | 21 | 504 | 708 | 24 | 24 | 840 | 814 | .. |
| 7 | French 'Very Rich' | 21 | 240 | 704 | .. | 14 | 1,040 | 484 | .. |
| 8 | Vilmorin's Improved | 17 | 1,904 | 598 | 24 | 16 | 208 | 536 | 48 |

## POTATOES.

Forty-one varieties of potatoes were on trial on this farm. The yield was larger than usual and the quality excellent. There was no injury from rot or other disease and they were free from the attacks of the Colorado beetle.

The soil selected this year was a sandy loam and the previous crop was turnips. The soil was fertilized with ten tons of well-rotted manure in the autumn of 1902.

The potatoes were planted on May 14 in rows three feet apart and dug on September 26. The yield has been estimated in each case from the product of one row 66 feet long.

It is quite evident from the experience gained on this farm during the past 15 years, that Early Rose potatoes, the kind usually grown here, are no longer as prolific as some other varieties, and I do not hesitate to advise the abandonment of that variety for others mentioned in the accompanying list. As potatoes increase rapidly, the 3-pound packages supplied free by the experimental farms will in a short time produce sufficient to supply a family. It is found that a somewhat long, pink-coloured potato, of the Early Rose type, gives the best satisfaction in this province. This class of potatoes are usually early, dry and mealy.

The following are some of the most productive varieties of this class: Maule's Thoroughbred, Canadian Beauty, General Gordon, Rose No. 9, Seedling No. 7.

POTATOES—TEST OF VARIETIES.

| Number. | Name of Variety. | Character of Growth. | When Matured. | Average Size. | Total Yield per Acre. Bush. | Lbs. | Yield per Acre of Marketable. Bush. | Lbs. | Yield per Acre of Unmarketable. Bush. | Lbs. | Form and Colour. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Late Puritan | Rank | Sept. 5 | Large | 847 | .. | 799 | 20 | 47 | 40 | Long, round, white. |
| 2 | Prolific Rose | " | Aug. 25 | " | 656 | 20 | 616 | .. | 40 | 20 | Round, deep pink. |
| 3 | Dreer's Standard | " | Sept. 1 | " | 649 | .. | 616 | .. | 33 | .. | Flattish oval, white. |
| 4 | Money Maker | Med. | " 16 | " | 634 | 20 | 590 | 20 | 44 | .. | Round " " |
| 5 | Sabean's Elephant | Rank | " 6 | Med. | 605 | .. | 561 | .. | 44 | .. | Long round " |
| 6 | Maule's Thoroughbred | " | " 5 | Large | 568 | 20 | 553 | 40 | 14 | 40 | " deep pink. |
| 7 | Rose No. 9 | " | " 6 | " | 561 | .. | 539 | .. | 22 | .. | " flat, deep pink. |
| 8 | Canadian Beauty | " | " 1 | " | 557 | 20 | 531 | 40 | 25 | 40 | " round, lt. pink. |
| 9 | American Giant | " | " 6 | " | 553 | 40 | 520 | 40 | 33 | .. | Round oval, white. |
| 10 | Uncle Sam | Med. | " 1 | " | 550 | .. | 524 | 20 | 25 | 40 | Flattish " " |
| 11 | Country Gentleman | Rank | Aug. 26 | Med. | 550 | .. | 509 | 40 | 40 | 20 | Long, deep pink. |
| 12 | Empire State | " | " 29 | Large | 546 | 20 | 506 | .. | 40 | 20 | " white. |
| 13 | American Wonder | " | Sept. 6 | " | 546 | 20 | 509 | 40 | 36 | 40 | Long round, white. |
| 14 | State of Maine | " | " 6 | " | 542 | 40 | 506 | .. | 36 | 40 | Flat oval, white. |
| 15 | Irish Cobbler | Med. | " 1 | " | 539 | .. | 487 | 40 | 51 | 20 | Flat, white. |
| 16 | Carman No. 3 | Rank | " 6 | " | 531 | 40 | 517 | .. | 14 | 40 | Long round, white. |
| 17 | Seedling No. 7 | " | " 7 | " | 528 | .. | 506 | .. | 22 | .. | " deep red. |
| 18 | General Gordon | Med. | " 1 | Med. | 528 | .. | 506 | .. | 22 | .. | Long round, d'p pink. |
| 19 | Holborn Abundance | V. rank. | " 6 | Large | 524 | 20 | 491 | 20 | 33 | .. | Round, white. |
| 20 | Carman No. 1 | " | " 6 | " | 517 | .. | 484 | .. | 33 | .. | Flat " |
| 21 | Pearce | Rank | " 1 | Med. | 509 | 40 | 502 | 20 | 7 | 20 | Round, pink. |
| 22 | Cambridge Russet | " | " 1 | Large | 509 | 40 | 484 | .. | 25 | 40 | L'g round, d'p russet. |
| 23 | Enormous | " | " .. | " | 495 | .. | 451 | .. | 44 | .. | Roundish, white. |
| 24 | I. X. L. | " | " 6 | " | 495 | .. | 454 | 40 | 40 | 20 | Long round, pink. |
| 25 | Delaware | " | " 5 | Fair | 487 | 40 | 465 | 40 | 22 | .. | Long oval, white. |
| 26 | Rochester Rose | Med. | Aug. 28 | Med. | 465 | 40 | 451 | .. | 14 | 40 | Long round, l't pink. |
| 27 | Swiss Snowflake | V. rank. | Sept. 6 | " | 462 | .. | 429 | .. | 33 | .. | Irregular, white. |
| 28 | Clay Rose | Rank | " 6 | Large | 458 | 20 | 429 | .. | 29 | 20 | Flat oval, deep pink. |
| 29 | Penn Manor | Med. | " 1 | " | 429 | .. | 410 | 40 | 18 | 20 | Long " " |
| 30 | Reeve's Rose | Rank | " 6 | " | 407 | .. | 388 | 40 | 18 | 20 | Flat " light pink. |
| 31 | Everett | Med. | Aug. 25 | " | 366 | 40 | 333 | 40 | 33 | .. | Long " pink. |
| 32 | Burnaby Seedling | Rank | Sept. 5 | " | 355 | 40 | 333 | 40 | 22 | .. | Flat " " |
| 33 | Bovee | Weak | Aug. 20 | Med. | 352 | .. | 315 | 20 | 36 | 40 | Long " light pink. |
| 34 | Early St. George | Med. | Sept. 1 | Large | 348 | 20 | 333 | 40 | 14 | 40 | " " deep pink. |
| 35 | Pingree | Weak | Aug. 25 | Med. | 341 | .. | 311 | 40 | 29 | 20 | Flat " white. |
| 36 | Early Andes | " | " 24 | " | 330 | .. | 300 | 40 | 29 | 20 | Round oval, white. |
| 37 | Vick's Extra Early | V. rank. | ....... | Large | 326 | 20 | 304 | 20 | 22 | .. | Flat, pink. |
| 38 | Rawdon Rose | Weak | Aug. 25 | " | 315 | 20 | 293 | 20 | 22 | .. | Round oval, l't pink. |
| 39 | Early Envoy | Med. | " 31 | Med. | 315 | 20 | 389 | 40 | 25 | 40 | " pink. |
| 40 | Early Rose | Weak | " 25 | Large | 282 | 20 | 271 | 20 | 11 | .. | " " |
| 41 | Early White Prize | ........ | ........ | ........ | 264 | .. | 231 | .. | 33 | .. | " oval, l't pink. |

## GRASSES.

The past season has been a fairly satisfactory one for grasses and the yield was above the average. Bald Wheat grass (*E. Virginicus*) is a native of the province. We have found it quite vigorous on light dry locations where many other grasses give poor returns. It should be cut quite green, otherwise it cures a dark brown colour and is decidedly woody in texture.

Western Rye grass (*A. tenerum*) is also a native of this province. Although a more tender grass than the Wheat grass, it also should be cut directly the head is formed, otherwise the hay is tough and hard.

On this farm we have had good results from sowing a mixture of Western Rye grass and Austrian Brome, using 7 lbs. of each variety of seed. By this plan the Brome cures better and in the mixture the slippery character of pure Rye grass is not so noticeable.

| Varieties. | When sown. | Seed per acre. | Yield of Hay per acre. | |
|---|---|---|---|---|
| | | Lbs. | Tons. | Lbs. |
| Austrian Brome *(Bromus inermis)* | 1902 | 12 | 2 | 700 |
| " " | 1903 | 12 | 1 | 1200 |
| Western Rye Grass *(A tenerum)* | 1902 | 12 | 2 | 500 |
| " " | 1903 | 12 | 2 | 1100 |
| Bald Wheat Grass *(Elymus virginicus)* | 1902 | 12 | 1 | 1300 |
| Timothy | 1902 | 8 | 1 | 700 |
| Red Top *(Agrostis vulgaris)* | 1903 | 8 | .. | 1900 |
| Hard Fescue | 1900 | 20 | 1 | 1800 |

IMPROVING PASTURE FIELDS.

Every year large areas of new land in this country are brought under cultivation, and catle pasture becomes less plentiful, this has led many farmers to dispose of their herds, and engage exclusively in grain-growing. This is to be regretted, as mixed farming is the most desirable system of husbandry for any country.

On this farm it has been found possible to greatly increase the productiveness of a native prass pasture field, by ploughing up a portion of it each year, and seeding it down with Awnless Brome grass. If the sod is thin it can be ploughed deeply in April or May, then well disk-harrowed and sown at once with about 15 lbs. of Brome grass seed per acre, then harrowed a second time. If the land is fairly dry when seeding is done, we have not found it necessary to keep the cattle out of the field.

Where the sod is thick and tough, it is sometimes desirable to break the native sod a year in advance, and then backset it before sowing the seed. Should the Brome sod in time become too thick it may be ploughed during the summer and not harrowed or backset. This will kill a portion of the grass plants, and the remainder will become more vigorous.

The productiveness of native pasture fields can be greatly increased, if treated as above.

## CLOVER.

The plots of clover have all passed another winter safely. The yield has been above the average, and the favourable weather enabled us to save the hay in good condition.

In addition to the one-twentieth acre plots of clover sown during 1902 and 1903, three one-acre fields were sown on June 1, 1904. The varieties were Alfalfa, Common Red and Alsike. The soil was a sandy loam summer-fallowed, half a bushel of barley per acre was first sown, with a drill, then 15 bs. per acre of clover seed was sown broadcast and harrowed in. Owing to the barley being thin, the clover made a good stand of stocky plants. Just as soon as the barley had headed out it was cut for hay and removed from the land. By winter the clover had become firmly established and it promises to winter well.

Volunteer clover plants are now appearing in several parts of the farm where clover had been ploughed down many years ago. Alsike appears to be the most persistent variety. This year for the first time the Common Red clover gave a good yield of hay at the second cutting.

We find that pasturing clover during the fall months has a very injurious effect on the plants; for that reason a fenced field is the most suitable place for clover of all kinds.

The accompanying table gives this year's yield of the different varieties of clover. The soil was a sandy loam and the previous crop was barley. They were all sown on spring ploughed stubble, without a nurse crop. The weeds and volunteer crop was cut the first year when one foot high, and the cuttings left on the ground to act as a mulch.

| Varieties. | When sown. | Seed per acre. | Thickness of Aftermath. | Yield of Hay per acre. | |
|---|---|---|---|---|---|
| | | Lbs. | | Tons. | Lbs. |
| Alsike and Timothy mixed | 1902 | 15 | Thin | 2 | 1400 |
| Mammoth Red Clover | 1902 | 20 | Fair | 2 | 300 |
| Alsike | 1902 | 20 | Thin | 1 | 1200 |
| Common Red Clover, 1st cutting | 1902 | 20 | Thick | 1 | 600 |
| " " 2nd " | 1902 | 20 | " | 1 | 800 |
| Alfalfa clover, 1st cutting | 1902 | 25 | " | 1 | 1200 |
| " 2nd " | 1902 | 25 | " | 1 | 1200 |
| " 1st " | 1903 | 25 | " | 1 | 800 |
| " 2nd " | 1903 | 25 | " | 1 | 400 |
| Common Red Clover, 1st cutting | 1903 | 20 | " | 1 | 1600 |
| " 2nd " | 1903 | 20 | " | 1 | 1000 |
| White Dutch | 1902 | 20 | Thin | .. | 1600 |

## MILLETS.

As the land set apart for Millets was flooded, a trial was made of sowing them on wheat stubble land, ploughed in spring, and the result was very unsatisfactory. This plant requires a clean and compact soil, with a liberal supply of moisture; all of these requirements were lacking in the land used. The yield of hay was generally much below the average. Moha Hungarian was the only variety that gave a good return.

The size of the plots for this test were one-fortieth acre and the soil a sandy loam. All were sown on May 20 and cut on September 1.

| Variety. | Height. | Stage when cut. | Yield of Hay per acre. | |
|---|---|---|---|---|
| | In. | | Tons. | Lbs. |
| Moha Hungarian | 45 | Fully headed | 6 | .... |
| Japan | 40 | Not headed | 3 | 1600 |
| Italian or Indian | 35 | " | 2 | 1200 |
| Common Millet | 30 | Fully headed | 2 | 800 |
| Algerian | 65 | Not headed | 2 | .... |
| California | 50 | " | 2 | .... |
| White Round French | 55 | Nearly ripe | .. | 1600 |
| Pearl or Cat-tail | 25 | Not headed | .. | 600 |

## CATTLE.

The herd of cattle on the experimental farm now consists of the following animals:—

| Name of Animal. | Breed. | Age. | Weight. |
|---|---|---|---|
| | | | Lbs. |
| Alice May | Shorthorn | 4 years | 1,365 |
| Nancy | " | 4 " | 1,210 |
| Brandon Myrtle | " | 5 " | 1,435 |
| Red Knight of Brandon | " | 2 " | 1,710 |
| Rose of Brandon | " | 18 months | 890 |
| Lily of Brandon | Ayrshire | 2 years | 1,145 |
| Dentry | " | 2 " | 1,020 |
| Haron | " | 1 " | 1,020 |
| Brandon Maid | Guernsey | 2 " | 945 |
| Ottawa Prince | " | 2 " | 1,480 |
| Marie | " | 8 months | 470 |
| Ruben | Shorthorn Grade | 3 " | 230 |
| Christie | " | 4 years | 1,275 |
| Gretchen | " | 6 " | 1,310 |
| Carrie | " | 7 " | 1,465 |
| Jennette | " | 6 " | 1,590 |
| Jenney | " | 15 months | 530 |
| Margaret | " | 11 " | 630 |
| Daisy | " | 6 " | 330 |
| Pet | Ayrshire Grade | 5 years | 920 |
| Sis | " | 17 months | 655 |

### MILKING COWS.

The accompanying table gives the length of the milking period and the weight of milk given by a number of the experimental farm cows for the past year:—

| Name. | Age. | Breed. | Milking Period. | Pounds of Milk. |
|---|---|---|---|---|
| Nancy | 4 | Shorthorn | 335 days ending Nov. 30, 1904 | 6,751 |
| Brandon Myrtle | 5 | " | 292 " " | 5,219 |
| Brandon Maid | 2 | Guernsey | 268 " " | 4,869 |
| Christie | 6 | Shorthorn Grade | 303 " " | 9,241 |
| Carrie | 8 | " | 279 " " | 6,934 |
| Gretchen | 5 | " | 267 " " | 5,782 |
| Pet | 6 | Ayrshire | 138 " " | 3,334 |

## EXPERIMENTS IN FEEDING STEERS.

### ONE-YEAR-OLD STEERS COMPARED WITH TWO-YEAR-OLDS.

The twelve steers selected for this test were apparently all shorthorn grades. Six of them were about 18 months old, the others 30 months. All were raised in the neighbourhood of Hamiota, Manitoba.

When purchased in November, 1903, the steers cost $3.25 per hundred pounds live weight and sold in May, 1904, for $4.25 per hundred pounds. The older steers were the most suitable for export purposes, but all were killed in Winnipeg, and the buyer gave the same price for each lot.

After two weeks of preparatory feeding they were divided into two groups, according to age.

All were tied in double stalls and fed all they would eat of the following ration:—

Ration per day for each one-year-old steer—

| | | |
|---|---|---|
| Corn fodder | 15 | lbs. |
| Oat straw | 8 | " |
| Corn ensilage | 17 | " |
| Swede turnips | 10 | " |
| Wheat bran | 5 | " |
| Ground grain | 3 to 6 | " |

Ration per day for each two-year-old steer—

| | | |
|---|---|---|
| Corn fodder | 15 | lbs. |
| Oat straw | 8 | " |
| Corn ensilage | 17 | " |
| Swede turnips | 10 | " |
| Wheat bran | 5 | " |
| Ground grain | 4 to 8 | " |

DESCRIPTION OF FODDER.

The fodder corn was Pearce's Prolific, cut when in the early milk stage, well cured in the stooks outside and drawn in as wanted. This was cut into one-inch lengths. The straw was mixed wheat and oat. The grain was composed of one-third each of barley, oats and wheat screenings, ground somewhat coarsely. The amount of grain fed was increased slightly each month until the test was completed.

COMPARATIVE GAINS.

| One year old steers. | Date. | Weight. | Gain. | Total Gain. |
|---|---|---|---|---|
| Original weight of steers | Dec. 11, 1903 | 4,940 lbs. | | |
| Weight at end of 1st term | Jan. 8, 1904 | 5,235 " | 295 lbs. | |
| " 2nd " | Feb. 5, 1904 | 5,520 " | 285 " | |
| " 3rd " | March 4, 1904 | 5,865 " | 345 " | |
| " 4th " | April 1, 1904 | 6,092 " | 227 " | 1,152 lbs. |

| Two year old steers. | Date. | Weight. | Gain. | Total Gain. |
|---|---|---|---|---|
| Original weight of steers | Dec. 11, 1903 | 6,725 lbs. | | |
| Weight at end of 1st term | Jan. 8, 1904 | 7,095 " | 370 lbs. | |
| " 2nd " | Feb. 5, 1904 | 7,390 " | 295 " | |
| " 3rd " | March 4, 1904 | 7,765 " | 375 " | |
| " 4th " | April 1, 1904 | 7,895 " | 130 " | 1,170 lbs. |

COST OF FEEDING.

*One-year-old steers—*

| | |
|---|---|
| 9,000 lbs. of fodder corn, at $4 per ton | $18 00 |
| 4,788 lbs. of straw, at $1 per ton | 2 39 |
| 5,940 lbs. of turnips, at 5 cents per bushel | 4 95 |
| 11,058 lbs. of ensilage, at $2 per ton | 11 05 |
| 2,970 lbs. of bran, at $12 per ton | 17 82 |
| 2,766 lbs. of chop, at 75c. per 100 lbs | 20 74 |
| | $74 95 |

*Two-year-old steers—*

| | |
|---|---|
| 9,360 lbs. of fodder corn, at $4 per ton | $18 72 |
| 4,980 lbs. mixed straw, at $1 per ton | 2 49 |
| 6,180 lbs. of turnips, at 5c. per bushel | 5 05 |
| 11,466 lbs. of ensilage, at $2 per ton | 11 46 |
| 3,090 lbs. bran, at $12 per ton | 18 54 |
| 4,008 lbs, of chop, at 75c. per 100 lbs | 30 60 |
| | $86 86 |

SUMMARY OF RESULTS.

| — | First Cost of Steers. | Value of Feed Consumed. | Price per Steer sold for. | Gain per Day. | Profit per Steer. |
|---|---|---|---|---|---|
| | $ cts. | $ cts. | $ cts. | Lbs. Oz. | $ cts. |
| One year old steers | 28 81 | 12 49 | 43 15 | 1 11 | 1 85 |
| Two year old steers | 39 22 | 14 47 | 55 92 | 1 11 | 2 23 |

CONCLUSIONS.

The results of this experiment would lead us to the following conclusions :—

First, the amount of gain in weight per day is the same with each lot of steers.

Second, the two-year-olds were slightly more profitable than the one-year-olds.

Third, the feeding of steers provides a ready market on the farm for rough fodder and inferior grain, but unless there is a greater difference than $1 per 100 lbs. between the buying price in the fall and the selling price in the spring, there is very little profit.

## EXPERIMENTS WITH SWINE.

BARLEY COMPARED WITH MIXED GRAIN.

Barley is very productive in this country, and the six-rowed varieties can be sown late in the season, after all other seeding is finished, and still escape injury from frost. But few farmers, however, appear to use it extensively for pig feed.

Eight pigs were used for this test, all were cross-bred Berkshire and Tamworths.

The mixed grain used was one-third each of wheat, oats and barley; all the grain was ground coarsely.

Both kinds of feed were valued at 75c. per 100 lbs.

The pigs were purchased at $4 per 100 lbs. live weight, and sold at the close of the test at $5 per 100 lbs.

RATION FED.

Amount and value of food consumed during the fattening term of 70 days, from June 23 to September 1, 1904 :—

| — | Grain fed. | Value of feed. |
|---|---|---|
| | Lbs. | $ cts. |
| Pen No. 1, fed barley alone | 1,130 | 8 47 |
| Pen No. 2, fed mixed grain | 1,090 | 8 17 |

SUMMARY.

| — | Weight when bought. | Value when bought. | Weight when sold. | Value when sold. | Value of food. | Profit on each pen. |
|---|---|---|---|---|---|---|
| | Lbs. | $ cts. | Lbs. | $ cts. | $ cts. | $ cts. |
| Pen 1, fed on barley.................. | 362 | 14 48 | 616 | 30 80 | 8 47 | 7 85 |
| Pen 2, fed on mixed grain. ........... | 342 | 13 68 | 547 | 27 35 | 8 15 | 5 52 |

CONCLUSIONS.

First, the pen fed on barley consumed 40 lbs more grain during the fattening period than those fed on mixed grain.

Second, the same pen also made a gain of 49 lbs. more than those fed on mixed grain.

Third, the pen fed on barley made $2.33 more profit than the animals fed on mixed grain.

FEEDING PIGS ON PEASE IN THE FIELD.

Field pease give large returns in this province, but the one great obstacle to their general cultivation is the difficulty in harvesting and threshing the crop. With the object of overcoming this difficulty a trial was made of turning a number of pigs into one acre of nearly ripe pease and allowing them to do the harvesting and threshing.

Ten pigs were used for this test. They were all of mixed breeding and cost on September 3, $4.75 per hundred pounds, live weight, and sold on October 20 for $5 per hundred pounds. It was found necessary to ring them, otherwise they covered many of the pease in rooting up the soil.

The variety of pease used was Canadian Beauty, sown on one acre of summer-fallow land, on May 7. Pigs were turned into the field on September 3, and by October 20, they had all the grain eaten clean.

SUMMARY.

| — | Weight when bought. | Value when bought. | Weight when sold. | Value when sold. | Profit on 1 acre peas fed to pigs |
|---|---|---|---|---|---|
| | Lbs. | $ cts. | Lbs. | $ cts. | $ cts. |
| Group of 10 pigs................................ | 1,393 | 66 16 | 1,670 | 83 50 | 17 34 |

## POULTRY.

Three breeds of poultry and their crosses have been kept during the year, namely:—White Wyandottes, Light Brahmas and Barred Plymouth Rocks.

All have kept quite healthy and seventy chicks were raised during the summer. A number of cockerels have been sold to farmers for breeding purposes. Plymouth Rocks are preferred for this purpose.

COMPARISON OF WHITE WYANDOTTES WITH BARRED PLYMOUTH ROCKS AS FATTENING FOWL.

This is a repetition of last year's test, but the comparison is not quite so favourable to the Plymouth Rocks as the previous test.

Four pure bred Barred Plymouth Rock cockerels and an equal number of White Wyandottes were shut up in slatted pens, each 2 x 3 feet, and fed all they would eat of finely ground grain, consisting of one-third each of wheat, oats and barley. This was given in troughs mixed with skim-milk to the consistency of thin porridge.

In the following tables the meal has been estimated at 75 cents per hundred pounds. The fattening period covered 21 days.

*Wyandottes (White).*

| Weight Oct. 31. | | Weight Nov. 21. | | Gain. | | Cost of Food. | | Cost per lb. live weight. |
|---|---|---|---|---|---|---|---|---|
| Lbs. | Oz. | Lbs. | Oz. | Lbs. | Oz. | $ | cts. | Cts. |
| 20 | 6 | 25 | 8 | 5 | 2 | 0 | 18 | 3½ |

*Barred Plymouth Rocks.*

| Weight Oct. 31. | | Weight Nov. 21. | | Gain. | | Cost of Food. | | Cost per lb. live weight. |
|---|---|---|---|---|---|---|---|---|
| Lbs. | Oz. | Lbs. | Oz. | Lbs. | Oz. | $ | cts. | Cts. |
| 20 | 1 | 26 | 1 | 6 | 0 | 0 | 19 | 3¼ |

INCUBATORS FOR HATCHING.

Owing to the late spring here it is difficult to obtain sitting hens early in the season. On this account chickens are often too late for early autumn killing, when prices are the highest. An effort has ben made to overcome this difficulty by using an incubator.

The incubator was filled for the first time last spring, on April 19, with 120 Plymouth Rock and Wyandotte eggs. Only 60 proved fertile, and 30 of these hatched. It was found impossible to obtain broody hens for a comparison in April.

On May 20 another lot of 120 eggs from the same fowls were started in the incubator, at the same time two broody hens were set on eggs from the same fowls. In each case two-thirds of the fertile eggs hatched.

All the chickens were raised in outside brooders and were equally strong, the loss after hatching being only four per cent.

CONCLUSION.

1st. The percentage of chickens from fertile eggs was the same, whether setting hens or incubator was used.

2nd. It is possible to secure earlier chickens by using an incubator.

3rd. A large proportion of the eggs laid in early spring before the fowls have an opportunity to take exercise are not fertile.

## BEES.

Of the thirteen colonies of bees placed in the cellar in the fall of 1903, three late and weak colonies died during the winter.

All were removed from the cellar to their summer stands on April 5, as they appeared quite restless. The first pollen was gathered on April 28 from Anemone patens, commonly known as Wild Crocus; this was closely followed by Early Willow pollen.

The months of May and June were not favourable for gathering nectar, but as soon as July set in the bees worked very freely on wild flowers. Perhaps the largest supply was obtained from the Mint family of plants, which were unusually abundant this year, the honey from these plants was very thick, quite aromatic and agreeable to the taste.

Forty pounds of extracted honey was produced per colony, spring count, and eight new swarms obtained.

Bees have now been successfully kept on the farm for a number of years, and I see no reason why the average farmer should not succeed equally well, providing he is located near thickets of wood, where the bees can obtain ready access to abundance of native flowers, most of which secrete nectar, but out in the open prairie at a distance from timber, it may be more difficult to make a success of bee-keeping.

Parties supplied with colonies from this farm last year report having had good success with them.

## HORTICULTURE, 1904.

The past season was in nearly every respect an ideal one for the horticulturist. April opened with bright sunny weather, which conditions were very favourable to the successful growing of plants in the hot-bed, and remarkably strong seedlings were ready at planting out time Perhaps the most gratifying feature in the climatic conditions is the continued absence of spring frosts. Formerly this was the most discouraging factor we had to contend with in horticultural work, resulting, as it frequently did, in the total destruction of the fruit blossoms, and seriously damaging such vegetables as cucumbers, squash, pumpkins, corn and tomatoes. For the past four years these frosts have not been in evidence, and it seems reasonable to hope that in this connection climatic conditions are permanently ameliorated. In the vegetable garden a bountiful crop was harvested. Continuing the practice established some years ago, a complete test was made of one or two kinds of vegetables, this year squash, pumpkins and onions being the vegetables selected.

Such extensive records as these must necessarily be of considerable value to the farmer and market gardener. The fruit crop was also a very satisfactory one. Cross bred apples and Siberian crab apples set heavily, and many varieties of considerable merit fruited for the first time. Plums also produced an abundant crop, among which were some of the best ever fruited on this farm. In the small fruits raspberries gave a very fair crop and showed much improvement over the product of previous years, due principally (in our opinion) to the mulch of green manure given them the preceding fall. Currants also set well, and a moderate crop of excellent quality was gathered, fuller particulars of which will be found under the heading of currants. In the Arboretum the trees have become so thick as render a generous thinning necessary, and a considerable amount of this work has been accomplished.

### APPLES, 1904.

Last season again proved favourable for testing these fruits in Manitoba. The absence of spring frosts was followed by a heavy setting, and the somewhat open fall assisted in the ripening of some of the late varieties. The winter of 1903-4 was one of the most severe experienced here for some time past and some damage was occasioned by sun-scald. No permanent injury, however, was sustained, and by cutting off a few of the branches all traces of the trouble was removed. A large number of the varieties under test at the farm are rapidly coming into bearing condition, and each year shows a decided progress in this important branch of work.

#### STANDARD APPLES.

The following varieties of standard apples, root grafted on *Pyrus baccata,* together with some Russian seedlings, were received from the Central Experimental Farm at Ottawa, in the spring of 1903. The following table shows their condition after having passed through one winter:—

| Variety. | Trees No. | Condition 1904. |
|---|---|---|
| Hibernal | 3 | 1. Killed back one quarter 1903-4; strong growth 1904. |
| | | 2. Wintered well 1903-4; strong growth 1904. |
| | | 3. " " " |
| Wealthy | 3 | 1. Killed to near ground 1903-4; strong growth 1904. |
| | | 2. Killed to ground 1903:4; strong growth 1904. |
| | | 3. Killed back one-quarter 1903-4; fair growth 1904. |
| North-western Greening | 2 | 1. Killed to ground 1903-04; strong growth. |
| | | 2. Died 1903-4. |
| McMahon White | 3 | 1. Killed back slightly 1903-04; fair growth 1904. |
| | | 2. " " " " |
| | | 3. Killed back one-quarter 1903-4; strong growth 1904. |
| Longfield | 2 | 1. " " fair growth 1904. |
| | | 2. " " strong growth 1904. |
| Yellow Transparent | 3 | 1. Killed to ground 1903-4; strong growth 1904. |
| | | 2. " " fair growth 1904. |
| | | 3. " " strong growth 1904. |
| Pointed Pipka | 3 | 1. Killed back slightly 1903-04; strong growth 1904. |
| | | 2. Killed to near ground 1903-04, strong growth 1904. |
| | | 3. Killed to ground 1903-4; fair growth 1904. |
| Duchess of Oldenburgh | 3 | 1. Killed back one-quarter 1903-4; fair growth 1904. |
| | | 2. Killed to ground 1903-4; strong growth 1904. |
| | | 3. Wintered fairly well 1903-4; very weak growth 1904. |
| Scott's Winter | 3 | 1. Died 1903-4. |
| | | 2. Killed to ground 1903-4; fair growth 1904. |
| | | 3. " " weak growth 1904. |
| McIntosh Red | 2 | 1. Killed back one-quarter 1903-4; strong growth 1904. |
| | | 2. Killed to near ground 1903-4; fair growth 1904. |
| Russian Seedling No. 3 | 2 | 1. Killed back slightly 1903-4; fair growth 1904. |
| | | 2. Wintered well 1903-04; strong growth 1904. |
| Russian Seedling No. 7 | 2 | 1. " " " |
| | | 2. " " " |
| Russian Seedling No. 18 | 3 | 1. Killed back slightly 1903-04; fair growth 1904. |
| | | 2. " " strong growth 1904. |
| | | 3. Wintered well 1903-4; strong growth 1904. |
| Russian Seedling No. 22 | 3 | 1. Killed back slightly 1903-4; strong growth 1904. |
| | | 2. Killed to ground 1903-4; fair growth 1904. |
| | | 3. Killed to near ground 1903-4; strong growth 1904. |
| Russian Seedling No. 26 | 1 | 1. Killed to ground 1904; strong growth 1904. |

Scions of the following standard apples were received from the Central Experimental Farm in 1903, and were top grafted on *Pyrus baccata* in the orchard south of the barn: Patten's Greening, Duchess, Yellow Transparent, McMahon White, Wealthy, Longfield, Charlamoff, Malinda, North-western Greening, Hibernal. These were all dead in the spring of 1904.

A number of scions of named cross-bred apples were received from the Central Farm for the same purpose. The following table shows their condition:—

| Variety. | Condition 1904. | |
|---|---|---|
| Aurora | Killed back slightly, 1903-04. | Strong growth, 1904. |
| Carleton | " " " | " " " |
| Ruby | Received, 1904. | Fair. " " |
| No. 218 | " " | " " " |
| Pioneer | Wintered well, 1903-04. | Strong " " |
| Derby | " " | " " " |
| Northern Queen | " " | " " " |
| Rideau | Received, 1904. | Fair " " |
| Alberta | " failed to unite. | |
| Jewel | " | Weak " " |
| Elsa | " did not take. | |
| Novelty | Wintered well, 1903-04. | Strong " " |
| Columbus | Received, 1904. | " " " |
| Tony | " " | " " " |

### THE WEALTHY APPLE.

In previous reports mention has been made of the hardiness of an apple received from Mr. A. P. Stevenson, of Nelson, as the Wealthy. Although this tree has fruited for one or two years past, the fruit has been stolen before it approached maturity, consequently we could not verify the correctness of the name.

From specimens grown this season it is evident that it has been mis-named, as the fruit is much too small for Wealthy, and lacks all other characteristics of that variety. It is probably one of the larger crab apples.

### DUCHESS OF OLDENBURGH.

Some scions of this variety were received from H. L. Patmore, a local nurseryman, in 1902, and were top grafted on Pyrus baccata. A portion of these were used in the Pyrus orchard south of the barn, and the balance were put on to a single specimen of *Pyrus baccata* growing on the hillside. The spring following, all in the south orchard were entirely killed, while those on the hillside were perfectly sound. The latter has continued hardy, and a few flowers were produced last spring, though not in sufficient quantity to ensure a set. Should this hardiness prove permanent a valuable addition will be made to our list of apples.

### CROSS NO. 179.

In the hillside cross-bred orchard under the above number there fruited the past season the largest apple yet grown on the experimental farm Though the tree is quite small it bore 15 fruits nearly as large as the Wealthy apple, of good colour and flavour, and which ripened early. The tree in question is planted in a very exposed position, and appears to be reasonably hardy. The identity of the cross has not yet been established.

### CROSS-BRED SEEDLINGS, 1904.

A large number of cross-bred seedlings fruited for the first time this season, many of which were very promising. All of these show a very marked improvement over Pyrus baccata, the pistillate parent, and would be gladly welcomed by the farmers of Manitoba and the North-west. The most promising of these crosses yet fruited are:—

| | |
|---|---|
| Pyrus baccata x Wealthy. | Pyrus baccata x Beautiful Arcade. |
| " x Tetofsky. | " x Krimskoe. |

The Beautiful Arcade cross, though one of the smallest in size, is entirely free from astringency and has a fine aromatic flavour.

### SEEDLING OF TRANSCENDENT.

One of the seedlings of the Transcendent fruited during the past season for the first time. The fruit was handsome in appearance, and considerably larger than the parent variety, and much was expected from it. A test of its flavour when ripe, however, speedily dissipated our hopes, as it proved to be excessively astringent, and with hollow core.

### SEEDLINGS OF MARTHA CRAB.

These seedlings, which have been referred to in previous reports, are likely to prove one of the most satisfactory additions to the collection of apples. A number of them came into bearing for the first time this year, and, in some a marked improvement was shown over those which have fruited in the past. Two of them were superior to the 'Transcendent' crab, both in size and flavour. The best of them have been named and will be propagated so as to admit of a more general test.

### SEEDLINGS OF THE SNYDER CRAB.

Two seedlings of the Snyder crab fruited the past season, both of considerable merit. The fruit though somewhat small in size, was of excellent flavour and made a capital preserve. Most of the seedlings of Snyder have proved tender, but these are promising for hardiness.

### TONKA CRAB.

This variety still continues hardy and the original tree from which our scions were obtained again fruited the past season, but by reason of its out-of-the-way location and the consequent difficulty of protecting it the fruit was again stolen before it had gained maturity. A sufficient number of trees have been grafted, however, to perpetuate the variety, some of which show promise of fruit next season. As these are in a fenced orchard, we will doubtless have an opportunity of testing the mature product before long.

### TRANSCENDENT CRAB.

Several of the trees in the Pyrus orchard have been top-grafted with the Transcendent crab and have now passed through three winters. So far they have proven quite hardy, and this season some of them fruited for the first time. The fruit was of good size and entirely free from blemish. This is encouraging, as not many years ago we found it difficult to winter the Transcendent. Probably much of the success of the experiment is due to the splendid stock of the Pyrus baccata, the hardy Siberian crab introduced by the experimental farms.

### PRIDE OF MINNEAPOLIS.

Scions of this variety were received from H. L. Patmore in 1902, and top-grafted on Pyrus baccata. Though spoken of highly, we do not see very much to recommend it, judging by the fruit produced this year. It is thoroughly hardy, is very late, and of poor flavour, and not equal to the Transcendent crab in size.

### PYRUS BACCATA.

A very heavy crop of fruit was again harvested from this variety, many of the trees producing quite large fruit of fair flavour.

### PLUMS.

We have again the pleasure of recording a very heavy crop of this fruit at the Brandon farm, the majority of the trees being so heavily laden as to weigh the branches to the ground. The most interesting feature, however, was the fruiting for the first time of three native varieties, superior to anything we have yet noted, both in earliness and flavour. Three trees, received from Mr. M. Major, of Winnipeg, ripened their fruit early in August, fully two weeks earlier than any other trees on the farm. The product was of comparatively large size, deep red in colour when ripe, the skin very sweet and juicy, with no signs of astringency, while the stone was not out of proportion to the flesh (a serious drawback to many of the types under test.) The first fruit of all three trees was nearly identical, and consequently we have given them the same name, viz,, 'Major.' Another tree of exceptional merit was received from the Souris district, and though not quite equal to the former, is well worthy of propagation, and has been given the name of 'Souris.' The last one worthy of special mention is the only yellow variety yet fruited at the experimental farm. When ripe, this is a light yellow in colour, with a few faint reddish dots on the sunny side. The flavour is quite distinct, very sweet and this plum has been named 'Brandon.'

The first of these varieties is greatly superior to the average native plum and is delicious either as dessert or for preserving. Of the seedlings of the American plum (Prunus Americana) only those of 'Cheney' have been found satisfactory, none of the others ripening early enough, and the larger portion of these late varieties have been removed to make room for more promising specimens. A quantity of seed was gathered from the earliest and best native trees, was sown this fall, and it is hoped that a sufficient number of seedlings will be obtained to plant out a considerable area, so that further selection may be made.

### CURRANTS.

A large number of varieties of this fruit was received from the Central Experimental Farm in the spring of 1902. All became well established, and during the past season produced a sufficient crop of fruit to warrant comparisons. Just as the fruit commenced to ripen the currant worm appeared and threatened to defoliate the bushes, but a timely application of white hellebore, one or two ounces to a pailful of water, applied with a spray pump, quickly stopped their depredations, and no serious damage resulted. Following will be found the names of the varieties under test, together with notes on the same :—

CURRANTS, 1904.

| Variety. | Colour. | Flavour. | Length of Spike. | Fruit on Spike. | Weight from one Tree. |
|---|---|---|---|---|---|
| | | | In. | | Lbs. |
| White Imperial | White | Slightly acid | 2¼ | Thicklyset | 2¼ |
| Climax | " | Sweet | 2 | " | 1¼ |
| Large White | " | " | 2¼ | " | 1¼ |
| Defiance | Red | " | 2 | " | 1¾ |
| Houghton Castle | " | " | 2½ | " | 1½ |
| Giant Red | | Fairly sweet | 2½ | " | 3¼ |
| Verrier's White | White | Very fine | 3 | Thinly | 2¼ |
| White Grape | " | Slightly acid | 2½ | Thicklyset | 1½ |
| White Kaiser | " | Sweet | 2¼ | " | 1 1/16 |
| Mattie | Black | " thin skin | 2 | " | 1 1/16 |
| White Cherry | White | " | 2¼ | " | 2½ |
| Star | Black | Fairly sweet and juicy, thickish skin | | | 1¼ |
| Eagle | " | Sub-acid and juicy, thick skin | | | 1½ |
| Black Grape | " | Fairly sweet and dry, thin skin | | | 1¼ |
| Black English | " | " juicy, thin skin | | | 1¼ |
| Kentish Hero | " | Sub-acid and juicy, thickish skin | | | 1¾ |
| Merveille de Gironde | " | " " thin skin | | | 2¾ |
| Stirling | " | Sweet and juicy, thin skin | | | 2½ |
| London Red | Red | " | 2¼ | Thicklyset | 1½ |
| Lewis | " | " | 2 | Thinly " | 1 1/16 |
| Dominion | Black | Sub-acid, not juicy; skin moderately thick | | | 1½ |
| Beauty | " | Sweet and juicy, thickish skin | | | 1 5/16 |
| Baldwin's Black | " | Sub-acid and juicy, thick skin | | | 2¾ |
| Winona | " | Sweet and dry, thin skin | | | 1 1/16 |
| Standard | " | " thick skin | | | 2½ |
| Ethel | " | Fairly sweet and juicy, thin skin | | | 1¾ |
| Oxford | " | Sweet and juicy, thin skin | | | 1¼ |
| Brandenburg Black | " | " " thickish skin | | | 1 1/16 |
| Wilder | Red | Fairly sweet | 2½ | Thinly set | 1¼ |
| White Dutch | White | " | 2½ | " | 1¼ |
| Eclipse | Black | Sweet, thin skin | | | 1¼ |
| Orton | " | Sweet and juicy, thin skin | | | 1⅛ |
| Prince of Wales | " | Fairly sweet and juicy, thin skin | | | 1⅛ |
| Stewart | " | Slightly acid, thin skin | | | 1½ |
| Gewohnliche | " | Fairly sweet and dry, thin skin | | | 1¼ |
| Clipper | " | " " " | | | 1 1/16 |
| Percy | " | Sweet and juicy, thick skin | | | 1¼ |
| North Star | Red | " | 2¼ | Thicklyset | 2¼ |
| Moore's Seedling | " | " | 2½ | " | 2¾ |
| Cumber | " | Extremely acid | 2¾ | " | 2¾ |
| Fertile D'Angers | " | Sub-acid and juicy | 2¼ | " | 1¼ |
| Simcoe Red | " | Acid and juicy | 2 | Thinly set | 3¼ |
| Pomona | " | Sweet and juicy | 2½ | Thicklyset | 2¾ |
| Prince Albert | " | " | 3 | Thinly set | 2 |
| Early Scarlet | " | Sweet and dry | 2 | " | 1 1/16 |
| Frauendorfer | " | Slightly acid | 2½ | " | 1 1/16 |
| Red Grape | " | Sweet and juicy | 2 | Thicklyset | 1½ |
| Long Bunch Holland | " | " | 2 | " | 1¼ |
| Rankin's Red | " | " | 2 | " | 1¼ |
| Red Dutch | " | " | 2 | " | 3 |
| La Conde | " | " | 2 | " | 1¼ |
| Fay's Prolific | " | " | 1¾ | Thinly set | 1⅛ |
| New Red Dutch | " | " | 1¾ | Thicklyset | 2⅛ |
| Admirable | White | " | 2½ | " | 2¼ |
| Goliath | Red | " | 1½ | " | 1¼ |
| Versailles | " | " | 1¾ | " | 2 |

GOOSEBERRIES.

Twenty-five varieties of gooseberries were received from the Central Experimental Farm, Ottawa, and planted here on April 22, 1903. Nearly all of these survived the winter of 1903-4, and only a slight amount of winter-killing was noticeable. The plants being quite small, only one variety fruited this year, viz.: the Downing. The fruit of this was quite large, of an elongated shape, and with a perfectly smooth skin. The flavour was excellent.

RASPBERRIES.

The raspberry crop this season was much superior to that of recent years, and it may be that much of this improvement may be attributed to the following cause: For some time past it has been customary here when laying down the canes in the fall of the year for winter protection to use a plough for throwing a furrow over the tips of the canes. Though this method was effective in so far as protection was concerned, it appeared to seriously injure the fibrous roots which are so near the surface, and the following year the canes showed a more or less stunted growth. Two years ago this mode of operation was changed by pressing the canes flat with a long scantling and throwing green manure over the tips. This has resulted in a great improvement in both canes and fruit as compared with the old method, and, as the strawy manure is left on the ground during the ensuing summer, it acts as a mulch, conserving the moisture, and adding in no small degree to the success of the experiment.

STRAWBERRIES, 1904.

A number of plants of the Alpine ever-bearing strawberry were received from the Central Experimental Farm in the spring, and all were quite vigorous before winter set in. Though not as large as the standard varieties these are extremely hardy, and continue their fruit production throughout the entire season, which should make them specially valuable for Manitoba and the North-west.

HEDGES, 1904.

All the small test hedges on the farm continue to do well, one composed of the native Buffalo berry (*Shepherdia argentea*) calling forth much favourable comment from visitors. This hedge is now about 5 feet in height, and is very compact and symmetrical, lending itself readily to the pruning shears, and as it produces thorns abundantly it is almost impenetrable.

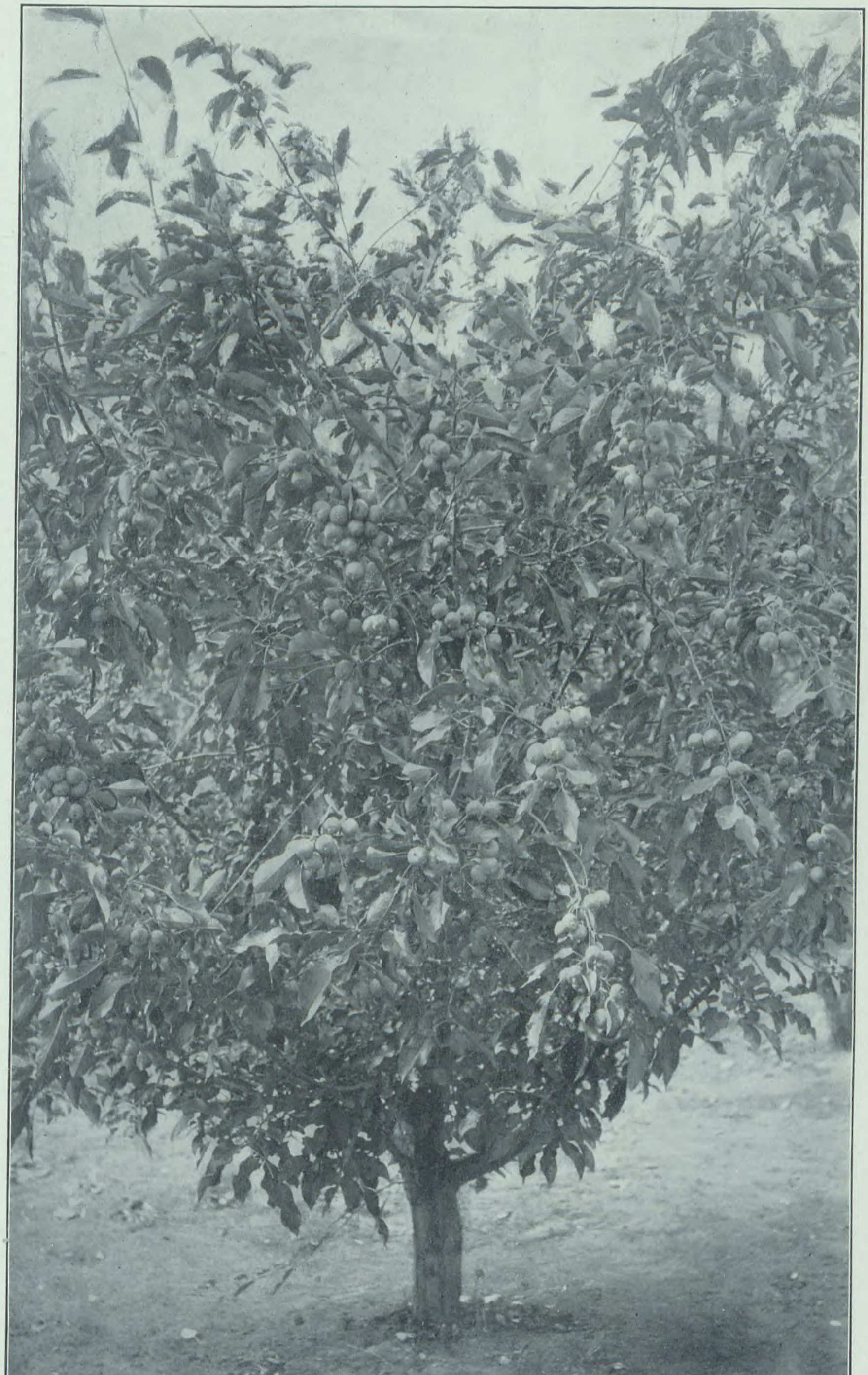
The shelter blocks in the south-west corner of the farm surrounded by double maple hedges having become too crowded, every alternate hedge was cut out during the past season, thus reducing the number of blocks about one-half, and giving increased space for planting.

FALL SOWING AS COMPARED WITH SPRING SOWING OF CARAGANA ARBORESCENS.

Until last year, we have invariably sown the seed of this desirable shrub in the spring, but an experiment was made during the fall of 1903 to ascertain if any advantage accrued from fall sowing. A number of drills were sown in the fall of 1903, and sufficient space left alongside for a duplicate sowing the spring following. The results point strongly to the advisability of fall sowing; the plants from the fall sown seed averaging 6 inches taller than those from the spring sown seed, and showing a much greater vigour.

EXPERIMENTS IN COVERING TENDER SHRUBS FOR WINTER PROTECTION, PHILADELPHUS (MOCK ORANGE.)

Mention was made on page 344 of last year's report of experiments made to ascertain the possibility of flowering this beautiful, but tender shrub, by means of winter protection. During the fall of 1903 a further test was made, the following varieties being included:—



Seedling of Martha Crab, at the Experimental Farm, Brandon, Man., 1904.

| | |
|---|---|
| *Philadelphus grandiflorus.* | *Philadelphus deutziaflorus.* |
| " *coronarius.* | " *inodorus.* |

The branches were bent to the ground and sufficient soil was thrown over the tips to retain them in that position. The result was entirely satisfactory, as all varieties flowered, *P. grandiflorus* and *P. deutziaflorus* very heavily. As there are many of these half-hardy shrubs, the branches of which kill-back more or less each winter, it would seem well worth while to go to this small amount of labour in order to secure flowers. This test was continued on a larger scale this year, and many other tender varieties were covered, the material used being fresh manure, and the results will be reported on next season.

## ARBORETUM, 1904.

Very little addition was made to the Arboretum during the past season, the principal portion of the work done being a generous thinning in portions of the plantation which were becoming crowded. Three trees of Populus Simoni were received from H. L. Patmoré, nurseryman, Brandon, two of which were living on the approach of winter.

## VEGETABLE GARDEN.

### ONIONS, 1904.

Thirty-eight varieties of onions were sown in the open on April 28 with Planet Jr. hand drill, in drills 16 inches apart. Although 12 inches apart is the usual distance recommended for this vegetable, we have found that 16 inches is preferable, as with the former distance the rows are too crowded to admit of easy cultivation. A gratifying feature in this test was the uniform germination, there being only two varieties whose germinating power was so low as to not admit of comparisons being made. About a month previous to pulling, the tops were pressed down to the ground, which greatly facilitated ripening, and when they were pulled on September 3, a large number of them were nearly ripe. They were brought inside on September 17, and after lying on the barn floor a week or two, were in good condition for storing. Several of the Italian varieties, though producing large bulbs, do not seem desirable for cultivation here as they lack firmness, and have a loose skin, which would detract form their keeping properties. *Red Madeira* appears to be one of the 'bunching' varieties only suitable for use in countries where they are able to stand the winter, and where they are used as spring onions. Of the pickling varieties *Adriatic Barletta* again proved its superiority, giving the largest percentage of suitable bulbs for this purpose. In connection with this vegetable we would again call attention to the necessity of early sowing. Various complaints have been received here, in regard to the non-ripening of onions, and inquiry has usually disclosed the fact, that the sowing was done too late.

It is important that sowing take place as soon as the soil is in condition in the spring, in fact if a situation is available which is protected from the spring wash, fall sowing may be employed to advantage, as by this means the earliest possible germination is secured. The following list contains the most suitable varieties for cultivation in this province.

1. Extra Early Flat Red.
2. Giant Yellow Globe.
3. Prize Taker Yellow.
4. Red Wethersfield.
5. Yellow Globe Danvers.
6. Southport Yellow Globe.
7. Early Red Globe.
8. Yellow Cracker.
9. Southport Red Globe.
10. Australian Brown.
11. Michigan Yellow Globe.
12. Early Flat Danvers.
13. Australian Yellow Globe.
14. Adriatic White Barletta.

Following will be found the result of the test arranged in order of productiveness:—

ONIONS—TEST OF VARIETIES.

| Variety. | Colour. | Shape. | Ripeness. | Size. | Yield per Acre. | Remarks. |
|---|---|---|---|---|---|---|
| | | | | | Bush. | |
| Giant Brown Rocca | Reddish brown.. | Globular.. | Nearly ripe. | Large ....... | 641 | Rather late for Manitoba. |
| White Tripoli ...... | White.......... | Flat...... | Not ripe.... | " ........ | 591 | Not suitable for storing. |
| Mammoth Pompeii.. | Deep red....... | " ...... | Nearly ripe. | " ........ | 580 | Not specially desirable. |
| Mammoth Silver King. | White.......... | Flattish .. | " " . | Med. to large. | 563 | Not desirable variety. |
| Prize Taker Yellow. | Deep yellow.... | Globular.. | Fully " . | " " .. | 549 | A good onion. |
| Red Tripoli ....... | Light red ...... | " .. | Nearly " . | " " .. | 527 | Rather late for Manitoba. |
| Southport Red Globe | " ...... | " .. | Fully " . | Medium ... | 500 | A desirable variety. |
| Early Red Globe.... | Deep red........ | " .. | " " . | Small to med.. | 492 | A good early variety. |
| Trebon's Large Yellow. | Pale yellow..... | " .. | " " . | Medium .... | 488 | A fine keeper. |
| Gibraltar .......... | Light " ..... | " .. | Nearly " . | Med. to large.. | 477 | A promising variety. |
| Prize Taker Red Globe. | Medium red.... | " .. | Fully " . | Medium .... | 475 | A first class variety. |
| Giant Yellow Rocca | " yellow . | " .. | Not " . | " ...... | 463 | Too late for Manitoba. |
| Southport Yellow Globe. | Deep " . | " .. | Fully " . | Med. to large.. | 450 | An excellent var. for Manitoba. |
| Red Wethersfield... | " red....... | Flattish .. | " " . | " " .. | 429 | A first class variety. |
| Giant Yellow Globe. | " yellow..... | Globular.. | " " . | Medium...... | 419 | A good early variety. |
| Yellow Globe Danvers. | " " ...... | " .. | " " . | Med. to large.. | 418 | A standard variety. |
| Spanish King.. .... | Yellow......... | Flattish .. | Nearly " . | Medium ..... | 409 | Rather late for Manitoba. |
| Extra Early Flat Red. | Bright red .... | " .. | Fully " . | Med. to small. | 407 | A very early variety. |
| Red Bassano .... | Deep " .... | " .. | Nearly " . | Medium .... | 401 | Rather late for Manitoba. |
| Golden Pheasant ... | " yellow..... | " .. | Fully " . | " ..... | 392 | A new variety of considerable merit. |
| Yellow Globe Danvers. | " " ..... | Globular.. | " " . | " ...... | 379 | Good early variety. |
| White Portugal..... | White.......... | Flattish .. | Not " . | " ...... | 375 | Not a desirable variety. |
| Australian Brown .. | Reddish brown.. | Globular.. | Fully " . | " ...... | 363 | A good early variety. |
| Northland.......... | Deep yellow.... | Flattish .. | " " . | " .... | 353 | " " |
| Yellow Cracker..... | " " .... | " .. | " " . | " ..... | 314 | " " |
| Michigan Yellow Globe. | " " .... | Globular.. | " " . | Med. to large.. | 298 | A first class variety. |
| Market Favorite Keeping. | Brown yellow... | Flattish .. | " " . | Medium...... | 291 | A good keeper. |
| Round Hard Dutch. | White ........ | Flat...... | " " . | Small to med.. | 291 | Poor as pickler or large onion. |
| Australian Yellow Globe. | Deep yellow .... | Globular.. | " " . | " " .. | 291 | Very badly mixed. |
| Red Madeira ....... | Very light pink. | " .. | Not " . | Med. to large.. | 200 | Late and very thick-necked. |
| Paris Silver Skin.... | White.......... | Flat...... | Fully " . | Small to med.. | 183 | Too many large tubers. |
| Small Barletta...... | " ...... | " .... | " " . | Small ........ | 175 | A first class pickler. |
| Small Silver Skin... | " ......... | " .... | " " . | " ........ | 163 | Of only fair quality. |
| White Queen ...... | " ......... | " .... | " " . | Small to v. sm. | 161 | Poor as pickler or large onion. |
| White Maggiagola.. | " .......... | " .... | " " . | " to med. | 156 | Too many large bulbs. |
| Early Flat Danvers | Deep yellow.... | Flattish .. | " " . | Medium...... | 84 | Germination too poor for proper comparison. |

Red Welsh, light red, of no value except a bunching onion (no bulbs formed).

ONION (SETS) 1904.

The following varieties of onion sets were tested during the past season :—

| | |
|---|---|
| Yellow Dutch sets, | Shallots sets |
| English Multiplier sets, | Top of Button sets, |
| White Multiplier sets, | Garlic sets. |

These were planted in the open on April 28, and all produced a good crop. Yellow Dutch sets are by far the most useful, as they usually give heavy returns and ripen very early. The Shallot is an excellent keeper, though small in size, and is much in demand here. The White Multiplier would be satisfactory for pickling purposes, but does not equal the seed onions for this purpose, and is a poor cropper.

SQUASH AND PUMPKIN.

Thirty-seven varieties of squash and pumpkin were sown in the open on May 23, 1904, and nearly all germinated well. As usual, a heavy crop was harvested, many of the varieties ripening. A number of complaints are received from growers throughout the province in regard to their inability to grow this vegetable satisfactorily, and we have deemed it advisable to mention one very important factor in the successful cultivation of this class of vegetables.

Squash and pumpkins produce the male and female flowers separately on the same plant, and in order to ensure the setting of the fruit, it is necessary that the pollen from the male flower should be brought into contact with the female flower. When there are bees in the immediate vicinity, this operation is accomplished most thoroughly by their agency, but in the absence of these insects hand pollination is sometimes necessary. The process is extremely simple and consists in removing the male or staminate flower as soon as it is fully open, and transferring it to the female or pistillate flower, which latter is readily distinguished by the immature fruit at its base. When the vines have attained a moderate length, the ends of the runners should be nipped off. This brings several flowers of both sexes into bloom simultaneously, allowing fertilization to be accomplished. If this measure is adopted, growers are likely to have much better success. The following varieties proved most suitable for Manitoba :—

PUMPKINS.

1. *Sweet or Sugar.*—A small variety of excellent flavour and texture, ripening early, and excellent for pie purposes.

2. *Japanese Pie.*—Somewhat similar to the foregoing.

3. *Winter Luxury.*—A medium sized variety, light yellow in colour, densely netted and resembling a large musk melon. Fairly early and of fine texture.

4. *Connecticut Field.*—A large yellow variety generally grown for feed purposes, but also makes a good pie, early and very productive.

*Mammoth Tours.*—This was the largest variety grown this season, and would be useful for feed purposes.

SQUASH.

*English Vegetable Marrow.*—A standard variety. Productive and early and one of the best for use as a vegetable.

*Long White Bush Marrow.*—A bush form of vegetable marrow. Early and productive and resembling the English vegetable marrow in texture and flavour.

*Extra Early Orange Marrow.*—This variety still holds its position as the best variety for Manitoba. It is quite equal to a pumpkin for pie purposes, very early and productive and a splendid keeper.

The results of this test were as follows :—

SQUASH AND PUMPKINS—TEST OF VARIETIES.

| No. | Variety. | Colour. | Texture and Flavour. | Ripeness. | Average Weight. |
|---|---|---|---|---|---|
| 1 | Connecticut Field | Deep yellow | Poor feed | 90 p. c. ripe | 28 pounds. |
| 2 | Golden Oblong | " | Fair | 25 " | 6 " |
| 3 | Grey Mammoth | Greyish green | For feed | 50 " | 28 " |
| 4 | Japanese Pie | | Very good | 80 " | 8 " |
| 5 | Large Cheese | Deep yellow | Somewhat coarse | 90 " | 18 " |
| 6 | Mammoth Tours | Grey and green | For feed | 75 " | 35 " |
| 7 | Negro | Deep yellow | Fair | 5 " | 7 " |
| 8 | Red Etampes | Reddish yellow | Very good | 5 " | 5½ " |
| 9 | Striped Custard | | Did not nearly approach maturity. | | |
| 10 | Sweet or Sugar | Deep yellow | Very good | 85 " | 6 " |
| 11 | Tennessee Sweet Potato | | Did not nearly approach maturity. | | |
| 12 | Winter Luxury | Light yellow | Very good | 75 " | 10 " |
| 13 | Bay State (Squash) | Greyish green | Not ripe | Not ripe | 10 " |
| 14 | Boston Marrow | | Did not nearly approach maturity. | | |
| 15 | Brazillian Sugar | Light yellow | Not ripe | " | 7 " |
| 16 | Canadian Crookneck | Dark green | " | " | 5 " |
| 17 | Cocozelle | Green white | Very good | 50 p. c. ripe | 9 " |
| 18 | Delicata (Squash) | Light yellow | " | 5 " | 11 " |
| 19 | Early Golden Bush | " | Poor | 10 " | 4 " |
| 20 | Early Golden Bush | " | " | 50 " | 3½ " |
| 21 | English Vegetable Marrow | Yellowish white | Very good | 90 " | 8 " |
| 22 | Essex Hybrid (Squash) | Terra cotta | Fair | 10 " | 10 " |
| 23 | Ex. Early Orange Marrow | Reddish yellow | Very good | 95 " | 7 " |
| 24 | Faxon (Squash) | Light " | " | 10 " | 11 " |
| 25 | Fordhook (Squash) | Dark green | Not ripe | Not ripe | 7½ " |
| 26 | Golden Hubbard | " yellow | Very good | 5 p. c. ripe | 7 " |
| 27 | Hubbard (Squash) | " green | " | A few ripe | 11 " |
| 28 | Long White Bush Marrow (Squash) | Yellowish white | " | 90 p. c. ripe | 9 " |
| 29 | Long Island Bush (Squash) | " " | " | 50 " | 3½ " |
| 30 | Marblehead " | Green and white | Not ripe | None ripe | 8 " |
| 31 | Mammoth Whale " | Light green | For feed | 75 p. c. ripe | 27 " |
| 32 | Pikes Peak " | Green and white | Very good | Nearly ripe | 9 " |
| 33 | Summer Crookneck " | Light yellow | Poor | 50 p. c. ripe | 3 " |
| 34 | Turban " | Terra cotta | Very good | 65 " | 11 " |
| 35 | Warty Hubbard | Dark green | " | A few ripe | 8 " |
| 36 | Warren | Light yellow | " | 10 p. c. ripe | 14 " |
| 37 | White Bush Scallop | White | " | 75 " | 4 " |

CUCUMBERS.

Nine varieties of cucumbers were sown in the open on May 23, 1904, in hills 5 feet apart each way, and as usual a very heavy crop of fruit was harvested before frost. Following is the result of the test arranged in order of earliness :—

| Variety. | Germination. | Average Weight. | Productiveness. | Average Length. |
|---|---|---|---|---|
| | | Ounces. | | Inches. |
| Early Frame | Very good | 4 | Very productive | 6 |
| Early Green Cluster | " | 4 | " " | 6 |
| Chicago Pickling | Good | 8 | Moderately prod'tive | 8 |
| Green Gherkin | " | 3½ | " " | 4 |
| Cumberland | Fair | 12 | Very " | 10 |
| Early White Spine | Good | 9 | Not " | 9 |
| Improved Long Green | " | 10 | " " | 9 |
| S. B. Evergreen | Poor | 9 | Fairly " | 8 |
| McKenzie's Prolific | Not one seed germinated. | | | |

N.B.—Early Frame, Early Green Cluster, Paris Pickling and Cumberland were the cream of the varieties tested.

### CABBAGE, 1904.

Ten varieties of cabbage were sown in cold frame on April 21, and set out in the open on May 31. With two exceptions the germination was exceptionally good and a heavy crop was harvested. Following will be found a list of varieties tested, together with average weights of heads, arranged in order of earliness:—

| Variety. | Germination. | Weight. | Shape. |
|---|---|---|---|
| | | Lbs. | |
| Paris Market | Good | 7¾ | Conical. |
| Extra Early Express | " | 6¾ | " |
| Early Enfield | Fair | 6 | " |
| Early Jersey Wakefield | Good | 7½ | " |
| Midsummer Savoy | " | 6 | Flattish. |
| Early Winningstadt | " | 10 | Conical. |
| Fottler's Drumhead | " | 29 | Flat. |
| Red Drumhead | " | 12 | " |
| Green Globe Savoy | " | 8 | Flattish. |
| Superb Dwarf Imperial | Did not germinate. | | |

### GARDEN PEASE, 1904.

Seven varieties of garden pease were sown in the open on May 10, in double rows 3 feet apart. With one exception the germination was good, and a splendid crop was harvested. All varieties ripening their seed.

Following is the result arranged in order of earliness:—

| Variety. | Length of pod. | Number of peas. | Flavor. | Productiveness. |
|---|---|---|---|---|
| S. & B. Extra Early | 2¼ in. | 5 to 6 | Fair | Mod. productive. |
| Extra Early Manifold | 2¾ " | 5 " 6 | Good | Very productive. |
| Gradus | 4¼ " | 8 " 9 | Very good | Not " |
| American Wonder | 2¾ " | 5 " 6 | Good | Very " |
| Yorkshire Hero | 4¼ " | 7 " 8 | Very good | Fairly " |
| Improved Stratagem | 4½ | 8 " 9 | " | " " |
| Extra Early Leviathan | Did not germinate. | | | |

We would again call special attention to the variety *Gradus*. This is beyond question the earliest large pea yet tested here. The pods are long, and well filled with pease of large size and exceptional quality, and though not a productive variety, the qualities of earliness and flavour which it possesses, make it well worthy of a place in the garden.

### TOMATOES.

Four varieties of tomatoes were sown in boxes in hot-bed on April 8, 1904, and after transplanting were transferred to the open ground on June 8, 1904. The varieties represented were, Simmers' Earliest, Red Currant, Sparks' Earliana and Earliana. All produced some ripe fruit, there being comparatively little difference between the two Earliana's either in productiveness or earliness, both of them were earlier ripening than Simmers' Earliest. The Red Currant tomato is a small fruited variety, producing its fruit in long bunches, similar to the Currant, and is of fine flavour, making a capital preserve. It has also the merit of earliness. The Earliana seems to be the variety best suited to north-western conditions.

### TOBACCO, 1904.

Six varieties of tobacco were grown during the past season. The seed was sown in boxes in the hot-bed on April 15, and after transplanting, the plants were set out in the open on June 15, and were especially strong and vigorous. Despite the somewhat cool season, the product attained a greater degree of maturity than in any previous tests, and it seems quite probable that we may yet succeed in growing tobacco satisfactorily in Manitoba. The plants were set out in rows 3 feet apart, and 3 feet apart in the row. During the summer the flowers were pinched off as fast as they appeared, all suckers were removed, and beyond some damage occasioned by heavy winds, the leaves were nearly perfect.

Following are the leaf measurements of the different varieties under test, together with the stage of ripeness reached.

No. 1. White Burley.—Dimensions of leaf: Length, 2 feet 5 inches; breadth, 16 inches. Commencing to colour.

No. 2. Small Red Canadian.—Dimensions of leaf: Length, 26 inches; breadth, 17 inches. Commencing to colour.

No. 3. Primus.—Dimensions of leaf: Length, 26 inches; breadth, 15 inches. Quite immature.

No. 4. Connecticut.—Dimensions of leaf: Length, 28 inches; breadth, 14½ inches. Quite immature.

No. 5. Simmers' Spanish.—Dimensions of leaf: Length, 24 inches; breadth, 12 inches.

No. 6. Quesnel.—Dimensions of leaf: Length, 16 inches; breadth, 12 inches. Nearly ripe. The earliest of all tested.

It will be seen from the above that the most promising varieties for Manitoba of those tested are: Quesnel, White Burley and Small Red Canadian.

## FLOWER GARDEN.

With the overflowing of the Assiniboine river the past spring, and the consequent flooding of the site of our annual flower garden, the prospects for a floral display did not seem at all promising in the early part of the season. After the water receded, the soil was sour, owing to the length of time it had been covered, and it did not seem possible for plants to thrive in it. However, the bed was given a thorough digging, fully two spades deep, and left in a rough condition for a week or ten days in order to give it an opportunity for mellowing. At the expiration of this time a thorough raking was given and the seedlings were planted. The plants grew luxuriantly and flowered profusely, the garden being fully as attractive as in previous years. The following annuals may be of interest :—

*Abronia umbellata.*—A pretty little trailer of easy cultivation and producing compact little trusses of pink flowers profusely.

*Bartonia Aurea.*—This was one of the most satisfactory annuals ever grown here. The large bright yellow flowers are produced very abundantly, a single plant covering a space three feet square. Hardy and easy of cultivation.

*Nemophila maculata.*—A pretty little annual, very dwarf and compact in habit, flowering freely. The colour of the flowers being a very light blue with a dark blue blotch at the base of each petal. Seems to prefer a shady situation.

*Phacelia grandiflora.*—A member of the Borage family, not valuable, except for a collection.

*Whitlavia grandiflora.*—A very pretty and free flowering member of the Borage family. The flowers are of an intense blue colour, and are produced for a long period, slightly difficult to transplant.

*Schizanthus grandiflorus oculatus.*—This was one of the most admired of all the annuals grown this season. It is remarkably floriferous, the plant attaining a large size, and being literally covered with its small orchid-like flowers of every shade. Hardy and easy of cultivation.

*Sanvitallia procumbens.*—A trailing annual producing numerous small (sunflower-like) flowers of no special value.

### ANNUALS SOWN OUTSIDE.

As many farmers have not the time to spare for a hot-bed, we have for several years experimented in the sowing of annuals outside, and have found that a very creditable flower garden may be had by this means.

The varieties sown this year were as follows, the seed being sown thinly in rows, from May 6-10, two feet apart:—

*Nasturtium Lobbianum.*
*Sweet Alyssum.*
*Abronia umbellata.*
*Brachycome iberidifolia.*
*Candytuft.*
*Clarkia pulchella.*
*Clarkia pulcherrima.*
*Clarkia alba.*
*Coreopsis Drummondii.*
*Coreopsis tinctoria.*
*Coreopsis Hybrida.*
*Godetia rubicunda splendens.*
*Godetia Whitneyi.*
*Godetia Lady Albemarle.*
*Linum grandiflorum roseum.*
*Poppies mixed.*
*Portulaca double.*

All these flowered abundantly, the Godetia and Clarkia were especially showy and were much admired by visitors. By adopting this plan a very fine flower garden may be had with very little labour and expense.

### PERENNIAL FLOWERS.

All the herbaceous perennials growing on the farm made a fine showing during the past season. A number of the clumps were divided this fall, and a new border commenced on the hillside along the main road, which will allow of easy access to visitors.

### IRIS KOEMPFERI (JAPAN IRIS).

A very welcome addition was made to our collection of perennials by the receipt of a number of plants of this beautiful iris from the Central Experimental Farm, Ottawa. Nearly all became well established before winter, and a light covering of strawy manure was given them on the approach of severe weather. This is the most beautiful type of iris known, and we are looking forward with pleasure to their flowering next season.

### COLCHICUM AUTUMNALE.

Mention of this bulb was made on page 351 of last year's report, and we have deemed it advisable to again call attention to its unique merits. After severe weather has set in, and often when the ground is covered with snow, this pretty little flower pushes through and makes a really beautiful sight, contrasting strongly with its dull surroundings. A bed of this would be a valuable acquisition to any Manitoba garden.

### TENDER PERENNIAL BULBS.

A test was made some years ago to ascertain the possibility of flowering some of the tender bulbs, such as Hyacinths, Narcissi, &c., by means of specially heavy covering. The results were entirely satisfactory, the bulbs coming through the winter in good condition and flowering well. A similar experiment is being tried the present autumn. After planting, the bed was covered with two thicknesses of building tar paper, extending about four feet outside the bed, and on top of this, three feet of green manure was placed.

### PROPAGATION OF TREES FOR THE FORESTRY BRANCH OF THE DEPARTMENT OF THE INTERIOR.

All the one million and a half of trees grown here in 1903 for the above department were distributed this spring to farmers in different parts of the province. They were unusually large and vigorous for seedlings and proved highly satisfactory to the farmers receiving them.

About one million trees were grown here this year for future distribution by the Forestry Branch, these were all taken up quickly and with very little expense, by means of a tree-digging plough, and all were healed in in good season ready for spring shipping.

## DISTRIBUTION OF GRAIN, POTATOES, &c.

The usual distribution was mode of grain, potatoes, maple seed and rhubarb seed. The following quantities were sent out to applicants:—

| | |
|---|---|
| Seedling trees and shrubs, packages | 643 |
| Potatoes in 3-pound bags | 128 |
| Wheat in 3-pound bags | 134 |
| Oats in 3-pound bags | 166 |
| Barley in 3-pound bags | 60 |
| Pease in 3-pound bags | 49 |
| Maple seed in 1-pound bags | 77 |
| Grass seed, one pound bags | 22 |
| Rhubarb seed, packages | 33 |

### SUMMARY OF REPORTS RECEIVED FROM FARMERS SUPPLIED WITH GRAIN, &C.

| | |
|---|---|
| Number reporting on their experience with oats | 40 |
| " " " " potatoes | 30 |
| " " " " barley | 17 |
| " " " " wheat | 10 |
| " " " " pease | 13 |

| | Variety. | |
|---|---|---|
| Largest yield obtained from 3 lbs. | wheat (Red Fife) | 130 |
| " " " 3 " | oats (Banner) | 181 |
| " " " 3 " | barley (Odessa) | 120 |
| " " " 3 " | pease (Paragon) | 120 |
| " " " 3 " | potatoes (Lizzie's Pride) | 290 |

## SAMPLES FOR EXHIBITION PURPOSES.

A number of exhibits have been prepared and forwarded to England for two exhibitions held there during the past summer, an exhibit has also been prepared for the Universal Exposition to be held in Liege, Belgium, next year.

As usual exhibits were made at the Brandon Agricultural and Horticultural shows.

The Department of the Interior was also supplied with a large quantity of grain and grasses for the use of their immigration offices.

## FARMERS' MEETINGS.

The farmers' meetings attended by me during the year had much larger audiences than usual, and the interest in the work of the experimental farms has in no wise abated.

During the year meetings were attended and addresses given at the following places:—

Blythe, December 14, 1903.
Brandon. January 16, 1904.
Morris, January 29, 1904.
Bradwardine, February 5, 1904.
Minnedosa, February 11, 1904.
Brandon, February 18, 1904.
Winnipeg, February 24 to 26, 1904.
Oak Lake, March 3, 1904.

## VISITORS.

Owing to the Assiniboine river overflowing its banks, the road to the farm was impassable for some weeks in the spring, and as a consequence the number of visitors this year was not as large as usual, about 7,350 persons visited the farm during the year, as compared with 12,000 during 1902-3.

### METEOROLOGICAL TABLES.

| Months. | Highest temperature. | | Lowest temperature. | | Total rainfall. | Total snowfall. | Total amount of sunshine. |
|---|---|---|---|---|---|---|---|
| 1903. | Day. | Deg. | Day. | Deg. | Inches. | Inches. | Hours. |
| December | 2 | 38 | 13 | -32 | ........ | 11 | 76·9 |
| 1904. | | | | | | | |
| January | 7 | 34 | 24 | -43 | ........ | 8 | 103·1 |
| February | 27 | 35 | 8 | -39 | ........ | 27 | 130·2 |
| March | 6 | 33 | 2 | -9 | ........ | 43 | 136·0 |
| April | 30 | 77 | 15 | 9 | 1·72 | 6 | 186·4 |
| May | 28 | 78 | 14 | 24 | 1·02 | ........ | 261·7 |
| June | 16 | 83 | 6 | 36 | 3·24 | ........ | 235·8 |
| July | 23 | 84 | 6 | 36 | 1·76 | ........ | 299·1 |
| August | 11 | 88 | 7 | 36 | 2·21 | ........ | 228·0 |
| September | 7 | 77 | 26 | 26 | ·82 | ........ | 151·2 |
| October | 11 | 69 | 5 | 15 | ·42 | ........ | 133·6 |
| November | 2 | 67 | 30 | 11 | ........ | 3 | 140·8 |
| | | | | | 11·19 | 98 | 2,081·8 |

## CORRESPONDENCE.

The amount of correspondence shows a rapid increase this year, as 5,300 letters were received and 3,528 despatched, irrespective of circulars sent out.

I have the honour to be, sir,
Your obedient servant,

S. A. BEDFORD,
*Superintendent.*

# EXPERIMENTAL FARM FOR THE NORTH-WEST TERRITORIES.

## REPORT OF ANGUS MACKAY, SUPERINTENDENT.

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.,
November 30, 1904.

DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit to you the seventeenth annual report of the operations of the Experimental Farm for the North-west Territories at Indian Head, Assiniboia, during the year 1904.

The past season, for grain growers throughout the Territories, has been a success in many districts, while in others it has been very disappointing.

The winter was exceptionally fine up to the middle of January, when cold weather set in and continued up to April, with heavy falls of snow.

Seeding started late in April, and the soil being wet, very little was sown before the first week in May. Fine weather continued throughout May, and grain all came up evenly, and never made a more promising start; in fact, on well cultivated farms the growth early in June was too rank, and required a set-back for profitable returns. This set-back came in the form of dry, hot weather from June 10 to July 13, when a general rain set in and relieved all fears for the crop so far as moisture was concerned.

Wheat harvest commenced the last week in August, but was not general till September 1, and in many districts frost came on the night of September 10 while considerable grain was still standing, although in all districts the large bulk was in stook.

Drizzling rain retarded harvest work considerably, and continued up to the second week in October, when fine threshing weather set in, and from then to November 23 nothing could excel the wonderfully fine weather experienced throughout the whole of the Territories.

### CROPS ON THE EXPERIMENTAL FARM.

The crops on the experimental farm have seldom been better, more uniform, of better quality, or more easily secured than during the past season.

Leaving out a few of the varieties tested, which will be referred to when reached, the returns have been very satisfactory, and the quality above the average.

In no case was the straw as heavy or long as in many previous years, and in only a few places was the grain lodged, or down in the least. The heads, however, were both large and well filled.

Rust, which did injury in parts of Manitoba, did not reach the dangerous stage in the Territories before the grain was ready to cut. On the experimental farm practically no harm was done. While rust appeared on the leaves of the wheat, the grain was too far advanced for the crop to be injured.

Wheat, oats and barley were all in stook when frost visited the country on the night of September 10. Pease were in a good many cases not ripe, and were more or less injured. The yields of all varieties were good, however.

## EXPERIMENTS WITH WHEAT.

Thirty-six varieties were tested on 1-20 acre plots. In no case was the straw heavy, while in many sorts it was light. All were sown by hoe drill on April 29 on fallowed land; 1½ bushels seed was sown per acre, the soil being clay loam.

Preston was the first plot sown and among the first cut, and in this, as well as in the field tests, it was in stook before Red Fife was ripe, though the varieties were sown within a few hours of each other.

In this test Preston was cut on August 24 and Red Fife on September 6, a difference of thirteen days in favour of the former.

### SPRING WHEAT—TEST OF VARIETIES.

| Number. | Name of Variety. | Date of Ripening. | | No. of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Kind of Head. | Weight of Straw. | Yield per Acre. | | Weight per Bushel. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | In. | | In. | | Lbs. | Bush. | Lbs. | Lbs. |
| 1 | Monarch | Aug. | 31 | 124 | 40 | Strong | 3½ | Bald | 3,540 | 50 | 20 | 63½ |
| 2 | Advance | " | 31 | 124 | 36 | " | 3¼ | " | 3,480 | 49 | 45 | 59 |
| 3 | White Russian | Sept. | 3 | 127 | 37 | " | 3½ | " | 2,590 | 48 | 50 | 60½ |
| 4 | Power's Fife (Minn. 149) | " | 5 | 129 | 41 | " | 3½ | " | 2,320 | 48 | 40 | 63½ |
| 4 | McKendry's Fife (Minn. 181) | " | 8 | 132 | 36 | " | 4 | " | 3,300 | 45 | 30 | 62¾ |
| 6 | Minnesota, No. 163 | " | 6 | 130 | 36 | " | 3½ | " | 4,120 | 45 | 20 | 62½ |
| 7 | Australian, No. 19 | " | 7 | 131 | 37 | " | 3¼ | " | 4,640 | 44 | 20 | 62 |
| 8 | Red Fife | " | 6 | 130 | 36 | " | 3½ | " | 3,900 | 43 | 5 | 62½ |
| 9 | Laurel | " | 5 | 129 | 42 | " | 3½ | " | 3,780 | 42 | 50 | 62 |
| 10 | Wellman's Fife | " | 6 | 130 | 37 | " | 3¼ | " | 4,900 | 42 | 50 | 62½ |
| 11 | Stanley | Aug. | 25 | 118 | 36 | " | 3½ | " | 2,515 | 42 | 25 | 64 |
| 12 | Benton | " | 25 | 118 | 34 | " | 3 | " | 3,445 | 42 | 15 | 63 |
| 13 | Clyde | Sept. | 1 | 125 | 40 | " | 3¼ | " | 3,210 | 41 | 50 | 62 |
| 14 | Australian, No. 9 | Aug. | 31 | 124 | 38 | " | 3 | " | 3,600 | 41 | 40 | 63½ |
| 15 | Chester | " | 27 | 120 | 33 | " | 3¼ | " | 2,620 | 41 | 10 | 65½ |
| 16 | Percy | " | 27 | 120 | 39 | " | 3½ | " | 3,295 | 41 | 5 | 63 |
| 17 | Weldon | Sept. | 5 | 129 | 38 | " | 3¾ | " | 2,860 | 40 | 20 | 63¾ |
| 18 | Countess | Aug. | 25 | 118 | 35 | " | 2½ | " | 3,095 | 40 | 5 | 63 |
| 19 | Hayne's Blue Stem (Minn. 169) | Sept. | 8 | 132 | 41 | " | 3½ | " | 3,600 | 40 | — | 60½ |
| 20 | Preston | Aug. | 24 | 117 | 36 | " | 3½ | Bearded | 3,600 | 39 | 40 | 65 |
| 21 | Red Fern | " | 31 | 124 | 37 | " | 4 | " | 2,955 | 38 | 45 | 64½ |
| 22 | White Fife | Sept. | 6 | 130 | 37 | " | 3¼ | Bald | 4,020 | 38 | 40 | 63½ |
| 23 | Admiral | Aug. | 25 | 118 | 35 | " | 3 | Bearded | 2,330 | 38 | 10 | 64½ |
| 24 | Huron | " | 25 | 118 | 35 | " | 3¼ | " | 2,455 | 36 | 5 | 64 |
| 25 | Early Riga | " | 20 | 113 | 28 | " | 2½ | Bald | 2,515 | 35 | 45 | 62 |
| 26 | Dawn | " | 24 | 117 | 28 | " | 3 | " | 2,335 | 34 | 25 | 65 |
| 27 | Byron | " | 22 | 115 | 32 | " | 3 | Bearded | 2,175 | 33 | 5 | 65¼ |
| 28 | Rio Grande | Sept. | 3 | 127 | 37 | " | 3½ | " | 3,400 | 32 | 45 | 64¼ |
| 29 | Hastings | Aug. | 25 | 118 | 33 | " | 2¾ | Bald | 2,050 | 32 | 20 | 64 |
| 30 | Pringle's Champlain | Sept. | 3 | 127 | 36 | " | 3¼ | Bearded | 2,460 | 31 | 25 | 64¾ |
| 31 | Colorado | Aug. | 28 | 121 | 33 | " | 2¾ | " | 3,160 | 31 | 5 | 65 |
| 32 | Crawford | " | 25 | 118 | 31 | " | 2½ | Bald | 2,400 | 30 | — | 64 |
| 33 | Hungarian | " | 31 | 124 | 33 | " | 2¾ | Bearded | 2,860 | 29 | 50 | 64 |
| 34 | Herisson Bearded | Sept. | 3 | 127 | 34 | " | 1¾ | " | 2,960 | 28 | 55 | 66 |
| 35 | Plumper | Aug. | 31 | 124 | 31 | " | 3 | " | 2,530 | 27 | 50 | 63½ |
| 36 | Fraser | " | 25 | 118 | 30 | " | 2½ | " | 1,885 | 27 | 35 | 65 |

### TEST OF VARIETIES IN FIELD LOTS.

In this test eight sorts were used. Red Fife, Preston, Stanley and Percy were sown on new land which had been fallowed; Red Fife, Laurel, Wellman's Fife, White Fife and Huron were on old land fallowed previous year. All were sown by hoe drill at the rate of 1½ bushels per acre.

In this test Huron heads the list in yield, as it has done in the past three years under the same conditions, and as Huron is equal to Red Fife or Preston in milling qualities, and, like Preston, is earlier than Red Fife, it is worthy of trial in many sections of country.

Like Preston, Huron is a cross-bred variety, White Fife and Ladoga being the parents. Preston's parents were Red Fife and Ladoga.

| Number. | Name of Variety. | Character of Soil. | Size of Plot. | Date of Sowing. | Date of Ripening. | No. of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Kind of Head. | Yield per Acre. | | Weight per Bushel. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Acres | | | | Inches | | Inches | | Bush. | Lbs. | Lbs. |
| 1 | Huron, Old land... | Clay loam. | 2 | May 4 | Aug. 30 | 118 | 38 | Strong.... | $3\frac{1}{4}$ | Bearded | 42 | 47 | 63 |
| 2 | White Fife " | " | 2 | " 4 | Sept. 9 | 128 | 43 | " .... | $3\frac{3}{4}$ | Bald ... | 42 | 30 | $61\frac{1}{2}$ |
| 3 | Laurel " | " | 6 | April 30 | " 7 | 130 | 44 | Medium.. | 4 | " ... | 41 | 30 | 62 |
| 4 | Well'an's Fife " | " | 3 | May 4 | " 8 | 127 | 45 | Strong.. . | 4 | " ... | 41 | 4 | 63 |
| 5 | Red Fife " | " | 10 | " 2 | " 8 | 129 | 42 | " .... | $3\frac{1}{3}$ | " ... | 40 | 57 | $63\frac{1}{2}$ |
| 6 | Red Fife, New land | " | 5 | April 29 | " 5 | 129 | 37 | " .... | $3\frac{1}{4}$ | " ... | 39 | 35 | $62\frac{1}{2}$ |
| 7 | Stanley " | " | 5 | " 30 | Aug. 28 | 120 | 44 | " .... | $3\frac{1}{2}$ | " ... | 38 | 20 | 60 |
| 8 | Preston " | " | 7 | " 28 | " 26 | 120 | 37 | " .... | $3\frac{1}{2}$ | Bearded | 38 | .. | $63\frac{1}{2}$ |
| 9 | Percy " | " | 4 | " 30 | " 30 | 122 | 36 | " .... | 3 | Bald ... | 31 | 22 | $63\frac{1}{2}$ |

WHEAT—FIELD LOTS.

| Number. | Variety. | Cultivation. | Acres. | Yield per Acre. | | Total Yield. | |
|---|---|---|---|---|---|---|---|
| | | | | Bush. | Lbs. | Bush. | Lbs. |
| 1 | Huron.... | Fallow.... | 2 | 42 | 47 | 85 | 34 |
| 2 | White Fife........ | " ..... | 2 | 42 | 30 | 85 | .. |
| 3 | Laurel.......... | " ..... | 6 | 41 | 30 | 249 | .. |
| 4 | Wellman's Fife........ | " ..... | 3 | 41 | 4 | 123 | 12 |
| 5 | Red Fife........ | " ..... | 10 | 40 | 57 | 409 | 30 |
| 6 | Red Fife........ | " ..... | 5 | 39 | 35 | 197 | 55 |
| 7 | Stanley.......... | " ..... | 5 | 38 | 20 | 191 | 40 |
| 8 | Preston.......... | " ..... | 7 | 38 | .. | 266 | .. |
| 9 | Percy .......... | " ..... | 4 | 31 | 22 | 125 | 28 |
| | | | 44 | | | 1,733 | 19 |

Or an average of 39 bushels, 23 lbs. per acre.

COMPARISON OF FIELD LOTS OF WHEAT FOR THE LAST FOUR YEARS.

In view of the large demand for an early maturing variety of wheat, I give the date of seeding and ripening, time to mature and yield of four early and two late varieties. The six sorts have been grown in field lots each year under the same conditions with exception of seeding, which on account of weather could not all be done on the same date. Preston, Stanley and Huron mature in practically the same number of days.

| Variety. | — | 1901. | | | 1902. | | | 1903. | | | 1904. | | | Average No. of days to mature. | Days less than Red Fife. | Average Yield. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | — | Yield. | | — | Yield. | | — | Yield. | | — | Yield. | | | | | |
| | | | Bush. | Lbs. | | Bush. | Lbs. | | Bush. | Lbs. | | Bush. | Lbs. | | | Bush. | Lbs. |
| Red Fife | Sown | May 2 | 48 | .. | April 14 | 38 | 30 | April 9 | 35 | 49 | April 29 | 39 | 35 | 131¾ | ...... | 40 | 28 |
| | Ripe | Aug. 27 | .. | .. | Aug. 25 | .. | .. | Sept. 4 | .. | .. | Sept. 5 | .. | .. | ........ | ...... | .. | .. |
| | Days | 117 | .. | .. | 133 | .. | .. | 148 | .. | .. | 129 | .. | .. | ........ | ...... | .. | .. |
| Preston (Red Fife and Ladoga) | Sown | May 4 | 45 | 45 | April 17 | 29 | .. | April 14 | 38 | .. | April 28 | 38 | .. | 122 | 9¾ | 37 | 41 |
| | Ripe | Aug. 16 | .. | .. | Aug. 22 | .. | .. | Aug. 29 | .. | .. | Aug. 26 | .. | .. | ........ | ...... | .. | .. |
| | Days | 104 | .. | .. | 127 | .. | .. | 137 | .. | .. | 120 | .. | .. | ........ | ...... | .. | .. |
| Stanley (Red Fife and Ladoga) | Sown | May 6 | 40 | 45 | April 17 | 34 | .. | April 14 | 37 | 18 | April 30 | 38 | 20 | 121 | 10¾ | 37 | 35 |
| | Ripe | Aug. 16 | .. | .. | Aug. 20 | .. | .. | Aug. 29 | .. | .. | Aug. 28 | .. | .. | ........ | ...... | .. | .. |
| | Days | 102 | | .. | 125 | .. | .. | 137 | .. | .. | 120 | .. | .. | ........ | ...... | .. | .. |
| Percy (White Fife and Ladoga) | Sown | May 3 | 36 | 18 | April 16 | 32 | 30 | April 14 | 30 | 18 | April 30 | 31 | 22 | 124½ | 7¼ | 32 | 37 |
| | Ripe | Aug. 20 | .. | .. | Aug. 22 | .. | .. | Aug. 31 | .. | .. | Aug. 30 | .. | .. | ........ | ...... | .. | .. |
| | Days | 109 | .. | .. | 128 | .. | .. | 139 | .. | .. | 122 | .. | .. | ........ | .. | .. | .. |
| Huron (White Fife and Ladoga) | Sown | May 4 | 45 | .. | May 6 | 39 | 20 | April 16 | 40 | 24 | May 4 | 42 | 47 | 119¼ | 12½ | 41 | 52 |
| | Ripe | Aug. 22 | .. | .. | Aug. 26 | .. | .. | Aug. 31 | .. | .. | Aug. 30 | .. | .. | ........ | ...... | .. | .. |
| | Days | 110 | .. | .. | 112 | .. | .. | 137 | .. | .. | 118 | .. | .. | ........ | ...... | .. | .. |
| Wellman's Fife | Sown | May 2 | 39 | 20 | April 30 | 36 | .. | April 9 | 35 | 10 | May 4 | 41 | 4 | 128¼ | 3½ | 37 | 53 |
| | Ripe | Aug. 23 | .. | .. | Aug. 30 | .. | .. | Sept. 7 | .. | .. | Sept. 8 | .. | .. | ........ | ...... | .. | .. |
| | Days | 113 | .. | .. | 122 | .. | .. | 151 | .. | .. | 127 | .. | .. | ........ | ...... | .. | .. |

FOUR YEARS TEST OF FALLOW AGAINST STUBBLE FOR GROWING WHEAT

In this test Red Fife wheat was used.

| Cultivation. | 1901. | | 1902. | | 1903. | | 1904. | |
|---|---|---|---|---|---|---|---|---|
| | Bush. | Lbs. | Bush. | Lbs. | Bush. | Lbs. | Bush. | Lbs. |
| Fallow | 49 | | 32 | 40 | 35 | 49 | 40 | 57 |
| Stubble | 38 | 32 | 25 | .. | 16 | .. | 31 | 28 |
| Difference | 10 | 8 | 7 | 40 | 19 | 49 | 9 | 29 |

Difference in four years in favour of fallow, 47 bushels 6 lbs.
Or an average of 11 bushels 46 lbs. per year.

## SPRING WHEAT.

### TEST OF FERTILIZERS.

Six plots of 1-40 acre each were sown on May 16 with Red Fife wheat, with hoe drill, at the rate of 1½ bushels per acre.

Although very little difference could be seen in the growth of straw, there was considerable variation in both straw and grain when threshed. The land was fallowed the previous year, the soil being clay loam.

SPRING WHEAT—TEST OF FERTILIZERS.

| Name of Variety. | Date of Ripening. | No. of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Weight of Straw. | Yield per Acre. | |
|---|---|---|---|---|---|---|---|---|
| | | | In. | | In. | Lbs. | Bush. | Lbs. |
| Plot No. 1—Nitrate of soda, 100 lbs. per acre (half sown when grain was 2 in. high, balance when 6 in. high) | Sept. 9 | 116 | 46 | Strong | 3¼ | 3,040 | 28 | 40 |
| Plot No. 2—Nitrate of soda, 200 lbs. per acre (half sown when grain was 2 in. high, balance when 6 in. high) | " 9 | 116 | 46 | " | 3¼ | 2,640 | 23 | .. |
| Plot No. 3—Superphosphate No. 1, 400 lbs. per acre (sown before grain and harrowed | " 9 | 116 | 44 | " | 3¼ | 3,100 | 29 | 20 |
| Plot No. 4—Check plot, unfertilized | " 9 | 116 | 45 | " | 3¼ | 2,860 | 26 | 20 |
| Plot No. 5—Muriate of potash, 200 lbs. per acre (sown before grain and harrowed) | " 9 | 116 | 44 | " | 3¼ | 3,160 | 29 | .. |
| Plot No. 6—Superphosphate No. 1, 200 lbs. per acre; muriate of potash, 100 lbs. per acre; nitrate of soda, 100 lbs. per acre (half sown before grain and harrowed, balance when the grain was 2 in. high) | " 9 | 116 | 45 | " | 3¼ | 3,280 | 31 | 40 |

COMPARISON OF RESULTS FOR THREE YEARS OF FERTILIZER TEST.

| No. of Plot. | 1901. | | 1902. | | 1903. | 1904. | | Average for 3 years. | |
|---|---|---|---|---|---|---|---|---|---|
| | Bush. | Lbs. | Bush. | Lbs. | | Bush. | Lbs. | Bush. | Lbs. |
| Plot No. 1 | 61 | 20 | 28 | .. | Rusted | 28 | 40 | 39 | 20 |
| Plot No. 2 | 58 | 40 | 30 | 40 | " | 23 | .. | 37 | 27 |
| Plot No. 3 | 52 | .. | 26 | 40 | " | 29 | 20 | 36 | .. |
| Plot No. 4 (untreated) | 62 | 40 | 29 | 20 | " | 26 | 20 | 39 | 27 |
| Plot No. 5 | 65 | 20 | 30 | 40 | " | 29 | .. | 41 | 40 |
| Plot No. 6 | 65 | 20 | 32 | .. | " | 31 | 40 | 43 | .. |

On account of all the plots being destroyed by rust in 1903, comparison can only be made for the three years. From these it will be seen that plot No. 6 (treated with superphosphate No. 1, muriate of potash and nitrate of soda) gave the best results.

## SMUT TEST.

Three plots of Red Fife wheat were sown in this test—one untreated, one treated with bluestone at the rate of 1 lb. to 10 bushels of seed, and one treated with formalin, 6 oz. formalin to 10 bushels of seed, 10 gallons of water being used in each case. The seed treated with bluestone was dipped one minute; that with formaline 5 minutes.

Not a single head of smut was found in either of the three plots, showing that the season was not favourable to smut.

## TEST OF EMMER AND SPELT.

Two varieties of Emmer and two of Spelt were sown on one-fortieth acre plots, by hoe drill, on fallowed land, clay loam, and Common Emmer was also sown on one acre lot. It will be noticed that in yield of both straw and grain, the Common Emmer gave much the best results.

EMMER AND SPELT—TEST OF VARIETIES.

| Name of Variety. | Date of Sowing. | Date of Ripening. | No. of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Kind of Head. | Weight of Straw. | Yield per Acre. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | In. | | In. | | Lbs. | Lbs. |
| Common Emmer | May 14. | Sept. 9. | 118 | 42 | Medium | 2 | Bearded | 5,580 | 3,100 |
| White Spelt | " 14. | " 14. | 123 | 46 | Strong | 4½ | Bald | 2,660 | 1,720 |
| Red Emmer | " 14. | " 12. | 121 | 51 | " | 3 | Bearded | 1,540 | 1,520 |
| Red Spelt | " 14. | " 14. | 123 | 55 | " | 4½ | Bald | 1,200 | 1,120 |
| Common Emmer (field lot) | " 17. | " 13. | 119 | 36 | Medium | 2¼ | Bearded | ...... | 2,744 |

MACARONI WHEAT—TEST OF VARIETIES.

Four varieties were sown on plots of 1-20 acre each, fallowed land, clay loam. All gave good yields. The straw of the Goose wheat was weak and lodged considerably.

| Name of Variety. | Date of Sowing. | Date of Ripening. | No. of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Kind of Head. | Weight of Straw. | Yield per Acre. | | Weight per Bushel. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | In. | | In. | | Lbs. | Bush. | Lbs. | Lbs |
| 1 Roumanian | April 29 | Sept. 5. | 129 | 44 | Strong | 3 | Bearded | 3,850 | 47 | 50 | 65 |
| 2 Mahmoudi | " 29 | " 3. | 127 | 39 | " | 2½ | " | 2,910 | 43 | 20 | 62½ |
| 3 Goose | " 29 | Aug. 31. | 124 | 38 | " | 2¼ | " | 3,655 | 43 | 5 | 64 |
| 4 Yellow Gharnovka | " 29 | Sept. 5. | 129 | 39 | " | 2¾ | " | 4,655 | 41 | 45 | 64 |

## SUMMER FALLOWS.

In view of the great importance of properly preparing land for crops, and of the large number of new settlers coming into the country, I make no excuse for repeating

CUTTING WESTERN RYE GRASS. COCKING BROME HAY.
EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.

what was said in my last two reports respecting summer-fallows, and breaking up and cultivating new prairie land.

It is very gratifying to know that throughout the Territories, summer-fallowing is rapidly becoming general. No matter where farming is carried on, the farmers realize that to be sure of a crop they must prepare a portion of their land the year before the crop is grown, and apart from the value of the stored moisture, there is the inestimable advantage of keeping weeds from overrunning the farm.

The true worth of properly prepared fallows has been clearly demonstrated in past years in every grain-growing district of Assiniboia.

The work of preparing land for crop by fallowing is carried on in so many ways in different parts of the Territories, that perhaps a few words on some of the methods employed may be of help to at least some of the new settlers.

It has been observed in Alberta and Saskatchewan that the land to be fallowed is not, as a rule, touched until the weeds are full grown and in many cases, bearing fully matured seed. It is then ploughed.

By this method, which, no doubt, saves work at the time, the very object of a summer-fallow is defeated. In the first place, moisture is not conserved because the land has been pumped dry by the heavy growth of weeds; and, secondly, instead of using the summer-fallow as a means of eradicating weeds, a foundation is laid for years of labour and expense by the myriads of foul seeds turned under.

The endless fields of yellow-flowered weeds, generally Ball Mustard (*Neslia paniculata*), testify to the indifferent work done in many districts, and while no weed is more easily eradicated by a good system of fallows, there is no weed that is more easily propagated or takes greater advantage of poor work on fallows or of fall or spring cultivation.

As has been pointed out in my previous reports, early and thorough work on fallows is absolutely necessary to success, and I here repeat the methods and results of tests carried on for some years past.

*First Method.*—Ploughed deep (6 to 8 inches) before last of June; surface cultivated during the growing season, and just before or immediately after harvest ploughed 5 or 6 inches deep.

Result.—Too much late growth if season was at all wet ; grain late in ripening, and a large crop of weeds if the grain was in any way injured by winds.

*Second Method.*—Ploughed shallow (3 inches deep) before the last of June ; surface cultivated during the growing season, and ploughed shallow (3 to 4 inches deep) in the autumn.

Result.—Poor crop in a dry year; medium crop in a wet year. Not sufficiently stirred to enable soil to retain the moisture.

*Third Method.*—Ploughed shallow (3 inches) before the last of June; surface cultivated during the growing season, and ploughed deep (7 to 8 inches) in the autumn.

Result.—Soil too loose and does not retain moisture. Crop light and weedy in a dry year.

*Fourth Method.*—Ploughed deep (7 to 8 inches) before the last of June ; surface cultivated during the growing season.

Result.—Sufficient moisture conserved for a dry year, and not too much for a wet one. Few or no weeds, as all the seeds near the surface have germinated and been killed. Surface soil apt to blow more readily than when either of the other methods is followed. For the past fourteen years, the best, safest and cleanest grain has been grown on fallow worked in this way, and the method is therefore recommended.

Fallows that have been ploughed for the first time after the first of July, and especially after July 15, have never given good results ; and the plan too frequently followed of waiting till weeds are full grown, and often ripe, and ploughing under with the idea of enriching the soil, is a method that cannot be too earnestly advised against.

In the first place, after the rains are over in June or early in July, as they usually are, no amount of work, whether deep or shallow ploughing, or surface cultivation, can put moisture in the soil. The rain must fall on the first ploughing and be conserved by surface cultivation.

Weeds, when allowed to attain their full growth, take from the soil all the moisture put there by the June rains, and ploughing under weeds with their seeds ripe or nearly so, is adding a thousand-fold to the myriads already in the soil, and does not materially enrich the land.

### BREAKING AND BACK-SETTING.

In view of the fact that every year brings to the Territories many new settlers, who are unacquainted with the methods of breaking up and preparing new land for crop, a few suggestions with regard to this very important work may not be amiss.

In all sections where the sod is thick and tough, breaking and back-setting should be done ; while in districts where scrub abounds and the sod is thin, deep breaking is all that is necessary.

The former is generally applicable to Assiniboia, and the latter to Alberta and Saskatchewan, especially to the northern parts of these Territories where the land is more or less scrubby.

### SHALLOW-BREAKING.

(To be back-set.)

The sod should be turned over as thin as possible, and for this purpose a walking plough with a 12 or 14-inch share, is the best. When the breaking is completed (which should not be later than the second week in July), rolling will hasten the rotting process and permit back-setting to commence early in August.

### BACK-SETTING.

Back-setting is merely turning the sod back to its original place, and at the same time bringing up two or three inches of fresh soil to cover it. The ploughing should be done in the same direction as the breaking and the same width of furrow turned. Two inches below the breaking is considered deep enough, but three to four inches will give better results.

After back-setting, the soil cannot be made too fine, and the use of disc or Randall harrow to cut up every piece of unrotted sod, will complete the work.

### DEEP BREAKING.

Deep breaking, which in many sections of the country is the only practicable way of preparing new land, and which is, unfortunately, done in some instances where breaking and back-setting would give more satisfactory results, consists in the turning over of the sod as deeply as possible; usually from four to five inches.

When the sod has rotted, the top soil should be worked and made as fine as possible. The use of harrow and disc will fill up all irregularities on the surface, and make a fine, even seed-bed.

Whether the land is broken shallow or deep, it is necessary to have the work completed early, so as to take advantage of the rains which usually come during June or early in July. These rains cause the sod to rot, and without them, or if the ploughing is done after they are over, the sod remains in the same condition as when turned, and no amount of work will make up for the loss.

To some districts near the foot-hills of the mountains and in districts where scrub abounds and the sod is thin, these remarks may not apply; but as a rule, throughout the Territories, early breaking, whether deep or shallow, is advisable.

### WORKING LAND AFTER FIRST CROP.

Inquiries are often made as to what should be done after taking off the first crop on new land, the question being as to whether the land should be ploughed, or cultivated, or sown without any cultivation whatever.

This, however, can only be determined by circumstances. In districts with heavy clay soil, a satisfactory crop may be expected from burning the stubble of the former crop and sowing with or without cultivation; although a shallow cultivation after the stubble is burnt usually gives the best results.

In districts with light soils and especially with gravelly subsoil, cultivation before seeding is necessary.

After taking the second crop from breaking or back-setting, there can be no doubt that the land should be well fallowed to put it in proper condition for succeeding crops. If the fallow is well made and the process repeated every third year, the settler will have started on the right road to future success.

### SMUT.

On account of many new settlers coming into the country each year that can have no idea of the prevalence of smut, especially in the wheat crop, and the serious loss caused by this fungous disease, I submit the results obtained during the past years on this farm for their guidance.

Bunt or stinking smut in wheat is a fungous disease that attacks the grain more or less each year, and where at all bad, the crop is rendered unsaleable, and with only a few heads affected, if threshed in damp weather, the grade and price are reduced. No district is proof against smut, and though more prevalent in some seasons than others, it is wise to guard against all danger from this source each year. Three remedies have been tried repeatedly; these are, treating the seed with Bluestone (Copper Sulphate), with Formalin and with Massel powder. Bluestone, from cheapness, ease in application and effectual cure, has proven the best for wheat, while formalin has given the best results with smut in oats and barley. While formalin is not more expensive than bluestone, the application is more difficult in the seed having to be soaked longer.

For wheat apparently free from smut, 1 pound of bluestone crushed and dissolved in warm water and mixed with 10 gallons water, and the seed sprinkled with, or dipped in the solution, is sufficient for 10 bushels. For wheat at all affected, 1 pound bluestone to 5 bushels seed is required. The seed can be sprinkled or dipped as is most convenient, but, in sprinkling, care must be taken that every grain is wet with the solution.

For smut in oats or barley, 1 pound of formalin (which is a liquid), is sufficient for 50 bushels seed. If the seed is smutty the solution should be 8 or 9 ounces formalin to 10 gallons of water; if not smutty, 4½ ounces to the same quantity of water.

The seed should be soaked from 5 minutes to 2 hours, according to condition of grain and strength of solution.

## EXPERIMENTS WITH OATS.

The yield of all varieties in both uniform plots and field lots, while not as high as in former years, was quite satisfactory. As will be seen, Banner again heads the list in both tests. The dry spell in June and first week in July reduced the yield considerably.

### OATS—TEST OF VARIETIES.

Forty-two varieties were sown on May 7, on 1-20 acre plots (excepting three, which were on 1-40 acre), by hoe drill at the rate of two bushels per acre. The soil was clay loam, fallowed during the preceding season. In all the early ripening varieties the yield was reduced by blackbirds, both before being cut and while in stook.

| Number. | Name of Variety. | Size of Plot. | Date of Ripening. | No. of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Kind of Head. | Weight of Straw. | Yield per Acre. | | Weight per Bushel. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Ac. | | | In. | | In. | | Lbs. | Bush. | Lbs. | |
| 1 | Banner | 1/20 | Aug. 26. | 111 | 42 | Strong.. | 8 | Branching.. | 2,820 | 123 | 28 | 41 |
| 2 | Irish Victor | 1/20 | " 27. | 112 | 44 | " .. | 8 | " .. | 4,400 | 102 | 17 | 41½ |
| 3 | Golden Tartarian | 1/20 | Sept. 3. | 119 | 42 | " .. | 9 | Sided | 4,740 | 101 | 26 | 38½ |
| 4 | Waverley.. | 1/20 | Aug. 27. | 112 | 50 | " . | 8 | Branching.. | 4,960 | 101 | 21 | 42¼ |
| 5 | Milford Black | 1/20 | Sept. 2. | 118 | 45 | " .. | 8 | Sided | 4,480 | 101 | 13 | 38½ |
| 6 | Danish Island | 1/20 | Aug. 27. | 112 | 45 | " .. | 8 | Branching.. | 3,740 | 98 | 28 | 41½ |
| 7 | Kendal White | 1/20 | " 27. | 112 | 42 | " .. | 8 | " .. | 5,040 | 98 | 28 | 41 |
| 8 | Golden Giant | 1/20 | Sept. 3. | 119 | 47 | " .. | 9 | Sided | 4,820 | 98 | 28 | 36 |
| 9 | Pioneer | 1/40 | Aug. 20. | 105 | 42 | " .. | 8 | Branching.. | 5,440 | 98 | 18 | 39½ |
| 10 | Goldfinder | 1/20 | " 29. | 114 | 41 | " .. | 8 | " .. | 3,440 | 97 | 22 | 38 |
| 11 | White Giant | 1/20 | " 26. | 111 | 42 | " .. | 7 | " .. | 4,280 | 97 | 2 | 41 |
| 12 | American Triumph | 1/20 | " 28. | 113 | 40 | " .. | 7 | " .. | 2,320 | 95 | 30 | 40½ |
| 13 | Columbus | 1/20 | " 28. | 113 | 40 | " .. | 8 | " .. | 2,000 | 94 | 19 | 37½ |
| 14 | Abundance | 1/20 | " 27. | 112 | 45 | " .. | 9 | " .. | 4,420 | 93 | 23 | 41 |
| 15 | Storm King | 1/20 | " 28. | 113 | 41 | " .. | 8 | Sided | 6,220 | 93 | 19 | 39 |
| 16 | Golden Beauty | 1/20 | " 27. | 112 | 41 | " .. | 8 | Branching.. | 4,040 | 93 | 3 | 41 |
| 17 | Pense Black | 1/20 | Sept. 2. | 118 | 46 | " .. | 8 | Sided | 5,800 | 92 | 21 | 38½ |
| 18 | Milford White | 1/20 | Aug. 28. | 113 | 44 | " .. | 10 | " | 4,320 | 90 | 20 | 42 |
| 19 | Olive Black | 1/20 | Sept. 2. | 118 | 47 | " .. | 8 | " | 5,320 | 89 | 32 | 40 |
| 20 | Twentieth Century | 1/20 | Aug. 25. | 110 | 45 | " .. | 7 | Branching.. | 4,620 | 89 | 14 | 41½ |
| 21 | Scotch Potato | 1/20 | " 28. | 113 | 45 | " .. | 8 | " .. | 4,120 | 87 | 22 | 40 |
| 22 | Pense White | 1/20 | " 29. | 114 | 43 | " .. | 8 | Sided | 6,220 | 87 | 2 | 40 |
| 23 | American Beauty | 1/20 | " 27. | 112 | 42 | " .. | 7 | Branching.. | 3,940 | 86 | 11 | 42 |
| 24 | Kendal Black | 1/20 | Sept. 2. | 118 | 44 | " .. | 8 | Sided | 4,020 | 84 | 4 | 40 |
| 25 | Bavarian | 1/20 | Aug. 27. | 112 | 40 | " .. | 7 | Branching.. | 3,440 | 83 | 18 | 39½ |
| 26 | Siberian | 1/20 | " 28. | 113 | 50 | " .. | 10 | Sided | 5,320 | 82 | 12 | 38 |
| 27 | Golden Fleece | 1/20 | Sept. 1. | 117 | 45 | " .. | 8 | Branching.. | 6,000 | 82 | 7 | 40 |
| 28 | Swedish Select | 1/20 | Aug. 23. | 108 | 41 | " .. | 7 | " .. | 5,580 | 80 | 30 | 42 |
| 29 | Improved Ligowo | 1/20 | " 25. | 110 | 42 | " .. | 7 | " .. | 4,100 | 80 | 15 | 43 |
| 30 | Sensation | 1/20 | " 22. | 107 | 41 | " .. | 8 | Sided | 2,720 | 80 | 5 | 44 |
| 31 | Joanette | 1/40 | Sept. 3. | 119 | 35 | " .. | 8 | Branching.. | 4,380 | 79 | 14 | 35½ |
| 32 | Early Golden Prolific.. | 1/20 | Aug. 27. | 112 | 44 | " .. | 8 | " .. | 3,240 | 78 | 28 | 40½ |
| 33 | Holstein Prolific | 1/20 | " 27. | 112 | 42 | " .. | 8 | " .. | 2,380 | 78 | 13 | 40 |
| 34 | Improved American. | 1/20 | " 27. | 112 | 43 | " .. | 9 | " .. | 4,520 | 76 | 1 | 40½ |
| 35 | *Black Beauty | 1/20 | " 20. | 105 | 43 | " .. | 7 | " .. | 4,500 | 75 | 30 | 36½ |
| 36 | Lincoln | 1/20 | " 28. | 113 | 41 | " .. | 7 | " .. | 4,680 | 75 | 25 | 42 |
| 37 | *Wide Awake | 1/20 | " 27. | 112 | 41 | " .. | 8 | " .. | 3,320 | 75 | 5 | 43 |
| 38 | *Thousand Dollar | 1/20 | " 22. | 107 | 43 | " .. | 7 | " .. | 4,600 | 73 | 3 | 41½ |
| 39 | *Mennonite | 1/20 | " 22. | 107 | 47 | " .. | 8 | " .. | 4,000 | 71 | 26 | 39 |
| 40 | *Buckbee's Illinois | 1/20 | " 23. | 108 | 46 | " .. | 8 | " .. | 4,400 | 71 | 6 | 40 |
| 41 | *Olive White | 1/20 | " 22. | 107 | 46 | " .. | 8 | Sided | 2,040 | 69 | 26 | 39¾ |
| 42 | *Tartar King | 1/40 | " 24. | 109 | 45 | " .. | 8 | " | 3,650 | 69 | .. | 38½ |

* The plots of these varieties were badly eaten by blackbirds, both before and after being cut.

### OATS—FIELD LOTS.

Nine varieties were sown from May 6 to 13, by hoe drill, at the rate of two bushels per acre. Soil, clay loam, fallowed. Banner oats were also sown on Brome sod, broken and back-set the previous year after a crop of hay had been taken off.

The effects of the dry, hot weather were realized when the binders started. The field of 50 acres, in which six of the nine sorts were sown, was surrounded by hedges, and for 100 feet inside these the straw was much heavier, caused by the large quantity of snow lodged there during the winter. Inside the wet belt the dry weather reduced the yield of straw, as well as of grain, very materially.

OATS.—FIELD LOTS.

| | Name of Variety. | Size of Plot. | Date of Sowing. | Date of Ripening. | No. of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Kind of Head. | Yield per Acre. | | Weight per Bushel. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acres. | | | | In. | | In. | | Bush. | Lbs. | Lbs. |
| 1 | Banner............ | 10 | May 9 | Aug. 26 | 109 | 43 | Strong | 8 | Branching | 85 | 24 | 38 |
| 2 | Wide Awake........ | 4½ | " 12 | Sept. 1 | 112 | 39 | " | 7 | " | 85 | 21 | 42 |
| 3 | Black Beauty....... | 2½ | " 13 | " 3 | 113 | 35 | " | 7 | " | 85 | 3 | 37½ |
| 4 | Abundance......... | 10 | " 9 | Aug. 27 | 110 | 43 | " | 8 | " | 77 | 5 | 41½ |
| 5 | Banner............ | 4 | " 6 | " 24 | 110 | 34 | " | 8 | " | 73 | 14 | |
| 6 | Goldfinder.......... | 5 | " 10 | " 30 | 112 | 44 | " | 9 | " | 72 | 27 | 38 |
| 7 | Improved Ligowo... | 5 | " 12 | Sept. 1 | 112 | 40 | " | 7 | " | 72 | | 41½ |
| 8 | Thousand Dollar.... | 5 | " 10 | Aug. 27 | 109 | 43 | " | 7 | " | 71 | 24 | 41 |
| 9 | Tartar King........ | 5 | " 12 | " 27 | 107 | 46 | " | 8½ | Sided. | 70 | 22 | 37½ |
| 10 | Waverley .......... | 9 | " 10 | " 27 | 109 | 45 | " | 8 | Branching | 70 | 1 | 42½ |

OAT CROP AND AVERAGE YIELD.

| Variety. | Cultivation. | Acres. | Yield per Acre. | | Total Yield. | |
|---|---|---|---|---|---|---|
| | | | Bush. | Lbs. | Bush. | Lbs. |
| Banner........................ | Fallow ................. | 10 | 85 | 24 | 857 | 2 |
| Wide Awake.................... | " ................. | 4½ | 85 | 21 | 385 | 9 |
| Black Beauty.................. | " ................. | 2½ | 85 | 3 | 212 | 24 |
| Abundance..................... | " ................. | 10 | 77 | 5 | 775 | |
| Banner........................ | Backsetting, Brome-sod.. | 4 | 73 | 14 | 293 | 22 |
| Goldfinder.................... | Fallow................. | 5 | 72 | 27 | 363 | 33 |
| Improved Ligowo............... | " ................. | 5 | 72 | | 360 | |
| Thousand Dollar............... | " ................. | 5 | 71 | 24 | 358 | 18 |
| Tartar King................... | " ................. | 5 | 70 | 22 | 353 | 8 |
| Waverley ..................... | " ................. | 9 | 70 | 1 | 630 | 9 |
| | | 60 | | | 4,589 | 23 |

Or an average of 76 bushels, 16 lbs. per acre.

COMPARISON OF FIELD LOTS OF OATS FOR LAST FOUR YEARS.

Date of ripening and yield of nine varieties of oats grown in field lots under the same conditions.

| Variety. | 1901. | | | 1902. | | | 1903. | | | 1904. | | | Average. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Date ripe. | Bush. | Lbs. | Date ripe. | Bush. | Lbs. | Date ripe. | Bush. | Lbs. | Date ripe. | Bush. | Lbs. | Bush. | Lbs. |
| Banner............... | Aug. 19 | 117 | .. | Aug. 21 | 87 | .. | Aug. 25 | 119 | 2 | Aug. 26 | 85 | 24 | 102 | 6 |
| Abundance........ .... | " 22 | 124 | 20 | " 23 | 80 | .. | " 29 | 106 | .. | " 27 | 77 | 5 | 96 | 32 |
| Wide Awake.... ...... | " 15 | 96 | .. | " 23 | 87 | .. | " 25 | 98 | 14 | Sept. 1 | 85 | 21 | 91 | 17 |
| Improved Ligowo.... . | " 17 | 83 | .. | " 25 | 77 | 20 | " 25 | 87 | .. | " 1 | 72 | .. | 79 | 30 |
| Thousand Dollar.. ..... | " 23 | 92 | 4 | Sept. 2 | 64 | 8 | " 31 | 93 | 8 | Aug. 27 | 71 | 24 | 80 | 11 |
| Goldfinder............ | " 28 | 104 | .. | " 2 | 89 | 17 | " 31 | 91 | 21 | " 30 | 72 | 27 | 89 | 16 |
| Tartar King........... | " 18 | 104 | 10 | Aug. 20 | 85 | .. | " 22 | 86 | 12 | " 27 | 70 | 22 | 86 | 16 |
| Waverley ......... .. | " 19 | 94 | .. | " 25 | 82 | .. | " 27 | 82 | 3 | " 27 | 70 | 1 | 82 | 1 |
| Black Beauty..... ..... | " 19 | 93 | .. | Sept. 5 | 81 | 12 | " 31 | 97 | 13 | Sept. 3 | 85 | 3 | 89 | 7 |

FOUR YEARS TEST OF FALLOW AGAINST STUBBLE FOR GROWING OATS.

In this test Banner oats were used.

| Cultivation. | 1901. | | 1902. | | 1903. | | 1904. | |
|---|---|---|---|---|---|---|---|---|
| | Bush. | Lbs. | Bush. | Lbs. | Bush. | Lbs. | Bush. | Lbs. |
| Fallow | 117 | .. | 87 | .. | 119 | 2 | 85 | 24 |
| Stubble | 97 | 32 | 32 | 26 | 47 | 12 | 70 | 24 |
| Difference | 19 | 2 | 54 | 8 | 71 | 24 | 15 | .. |

Difference in four years in favour of fallow, 160 bushels; or an average of 40 bushels per year.

OATS—SMUT TEST.

Three plots were sown in this test; (1) Treated with bluestone, 1 pound to 10 bushels of seed; (2) Formalin, 6 ounces to 10 bushels, and (3) untreated.

No smut could be found in either of the three plots.

## EXPERIMENTS WITH BARLEY.

TEST OF VARIETIES.

This test consisted of 19 varieties of two-rowed and 20 varieties of six-rowed barley. All were sown on fallowed land. On May 14, by hoe drill, at the rate of two bushels of seed per acre. Soil, clay loam.

All varieties gave large yields, but were coloured by rains.

TWO ROWED BARLEY—TEST OF VARIETIES.

| Number. | Name of Variety. | Date of Ripening. | Number of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Weight of Straw. | Yield per Acre. | | Weight per Bushel. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | In. | | In. | Lbs. | Bush. | Lbs. | Lbs. |
| 1 | Standwell | Sept. 3 | 112 | 33 | Strong | 2½ | 3,610 | 67 | 9 | 52½ |
| 2 | Invincible | " 3 | 112 | 35 | " | 3 | 3,835 | 67 | 4 | 53¼ |
| 3 | Swedish Chevalier | " 1 | 110 | 34 | " | 3¾ | 4,510 | 63 | 16 | 53½ |
| 4 | Primus | Aug. 27 | 105 | 33 | " | 3 | 3,865 | 62 | 24 | 55 |
| 5 | Princess | Sept. 6 | 115 | 34 | " | 3¼ | 3,020 | 60 | 20 | 54 |
| 6 | Hauncher | Aug. 30 | 108 | 33 | " | 3 | 4,080 | 60 | 20 | 55 |
| 7 | Danish Chevalier | Sept. 7 | 116 | 33 | " | 2¾ | 3,200 | 59 | 8 | 51½ |
| 8 | French Chevalier | " 7 | 116 | 32 | " | 4 | 3,200 | 58 | 16 | 51 |
| 9 | Canadian Thorpe | Aug. 31 | 109 | 37 | " | 3 | 3,460 | 55 | 40 | 52 |
| 10 | Fulton | " 20 | 98 | 35 | " | 2½ | 3,855 | 50 | 45 | 50¾ |
| 11 | Beaver | Sept. 7 | 116 | 34 | " | 4 | 4,940 | 50 | 45 | 51 |
| 12 | Gordon | Aug. 22 | 100 | 40 | " | 2½ | 2,345 | 49 | 23 | 50 |
| 13 | Harvey | " 22 | 100 | 37 | " | 3 | 3,705 | 49 | 23 | 51½ |
| 14 | Sidney | " 20 | 98 | 36 | " | 3½ | 2,830 | 48 | 46 | 53 |
| 15 | Clifford | " 21 | 99 | 34 | " | 3¼ | 3,890 | 48 | 46 | 51½ |
| 16 | Logan | " 22 | 100 | 40 | " | 3 | 4,915 | 47 | 29 | 51½ |
| 17 | Dunham | " 23 | 101 | 32 | " | 3½ | 2,325 | 46 | 27 | 53 |
| 18 | Jarvis | " 22 | 100 | 38 | " | 3¾ | 3,685 | 46 | 27 | 51 |
| 19 | Newton | Sept. 5 | 114 | 33 | " | 2½ | 4,420 | 40 | .. | 51½ |

SIX-ROWED BARLEY—TEST OF VARIETIES.

| Number. | Name of Variety. | Date of Ripening. | No. of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Weight of Straw. | Yield per Acre. | | Weight per Bushel. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | In. | | In. | Lbs. | Bush. | Lbs. | Lbs. |
| 1 | Nugent | Aug. 20. | 98 | 29 | Strong. | 2½ | 3,180 | 67 | 24 | 52 |
| 2 | Claude | " 19. | 97 | 34 | " | 2½ | 3,390 | 66 | 32 | 51½ |
| 3 | Stella | " 20. | 98 | 34 | " | 2 | 3,160 | 65 | 20 | 53½ |
| 4 | Argyle | " 17. | 95 | 37 | " | 2¼ | 2,740 | 64 | 28 | 52¾ |
| 5 | Common | " 13. | 91 | 30 | " | 2½ | 3,000 | 64 | 28 | 53 |
| 6 | Yale | " 21. | 99 | 34 | " | 3 | 4,120 | 64 | 8 | 52½ |
| 7 | Odessa | " 16. | 94 | 34 | " | 2 | 3,660 | 62 | 24 | 51 |
| 8 | Rennie's Improved | " 16. | 94 | 35 | " | 2½ | 3,010 | 62 | 9 | 53½ |
| 9 | Summit | " 19. | 97 | 31 | " | 3½ | 3,830 | 61 | 42 | 53 |
| 10 | Brome | " 19. | 97 | 32 | " | 2¾ | 3,220 | 60 | 40 | 52 |
| 11 | Baxter | " 16. | 94 | 28 | " | 2 | 3,650 | 59 | 13 | 53 |
| 12 | Royal | " 15. | 93 | 32 | " | 2¾ | 2,760 | 58 | 36 | 51½ |
| 13 | Oderbruch | " 14. | 92 | 32 | " | 3 | 3,245 | 57 | 19 | 52½ |
| 14 | Empire | " 19. | 97 | 35 | " | 2½ | 3,800 | 57 | 4 | 53½ |
| 15 | Mansfield | " 15. | 93 | 33 | " | 2¼ | 2,915 | 57 | .. | 50½ |
| 16 | Trooper | " 15. | 93 | 34 | " | 2¼ | 3,210 | 57 | .. | 51½ |
| 17 | Garfield | " 15. | 93 | 35 | " | 2½ | 2,455 | 53 | 41 | 51½ |
| 18 | Albert | " 15. | 93 | 33 | " | 2¾ | 3,000 | 53 | 36 | 52½ |
| 19 | Mensury | " 15. | 93 | 37 | " | 2¼ | 2,710 | 53 | 26 | 49½ |
| 20 | Champion | " 12. | 90 | 33 | " | 2½ | 2,880 | 41 | 7 | 47½ |

BARLEY—FIELD LOTS.

In this test nine varieties were used, five of six-rowed and four of two-rowed sorts. Mensury, Odessa, Royal, Mansfield and Sidney were sown on fallow, by hoe drill, two bushels of seed per acre. Claude was sown on corn land, and Invincible, Standwell and Canadian Thorpe on Brome sod broken after a crop of hay was taken off, and back-set late in the fall. Soil, clay loam.

The dates of breaking and back-setting are given below, and show that to be successful early work is required.

| Variety. | Broken. | Backset. |
|---|---|---|
| Invincible | 4-8 July | 17-20 August. |
| Canadian Thorpe | 4-10 August | 26-28 September. |
| Standwell | 7-10 " | 3-7 November. |

| Name of Variety. | Cultivation. | Size of Plot. | Date of Sowing. | Date of Ripen'g. | No. of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Kind of Head. | Yield per Acre. | | Weight per Bushel. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | In. | | In. | | Bush. | Lbs. | Lbs |
| 1 Mansfield | Fallow | 2¼ | May 13. | Aug. 23. | 102 | 28 | Strong. | 2¼ | Six-rowed | 56 | 32 | 52½ |
| 2 Mensury | " | 4 | " 12. | " 22. | 102 | 34 | " | 2¼ | " | 55 | 41 | 52 |
| 3 Royal | " | 2 | " 13. | " 20. | 99 | 24 | " | 2½ | " | 55 | 25 | 52 |
| 4 Invincible | Backsetting, Brome-sod. | 2¼ | " 7. | " 25. | 110 | 22 | " | 2½ | Two-rowed | 55 | 10 | 53½ |
| 5 Claude | Corn land | 2½ | " 7. | " 20. | 105 | 30 | " | 3 | Six-rowed | 53 | 22 | 50 |
| 6 Odessa | Fallow | 5½ | " 13. | " 24. | 103 | 28 | " | 2½ | " | 53 | 18 | 52 |
| 7 Sidney | " | 4½ | " 16. | " 25. | 101 | 33 | " | 3¼ | Two-rowed | 43 | 42 | 52 |
| 8 Canadian Thorpe | Backsetting, Brome-sod. | 5 | " 14. | " 26. | 104 | 26 | " | 3 | " | 29 | . | 53 |
| 9 Standwell | " | 6 | " 14. | " 26. | 104 | 24 | " | 2½ | " | 26 | 4 | 52 |

BARLEY CROP AND AVERAGE YIELD.

| Variety. | Cultivation. | Acres. | Yield per Acre. | | Total Yield. | |
|---|---|---|---|---|---|---|
| | | | Bush. | Lbs. | Bush. | Lbs. |
| Mansfield | Fallow | 2¼ | 56 | 32 | 127 | 24 |
| Mensury | " | 4 | 55 | 41 | 223 | 20 |
| Royal | " | 2 | 55 | 25 | 111 | 2 |
| Invincible | Backsetting, Brome-sod | 2¼ | 55 | 10 | 124 | 10 |
| Claude | Corn land | 2½ | 53 | 22 | 133 | 31 |
| Odessa | Fallow | 5½ | 53 | 18 | 293 | 27 |
| Sidney | " | 4½ | 43 | 42 | 197 | 21 |
| Canadian Thorpe | Backsetting, Brome-sod | 5 | 29 | .. | 145 | .. |
| Standwell | " " | 6 | 26 | 4 | 156 | 24 |
| | | 34 | | | 1,512 | 15 |

Or an average of 44 bushels and 23 lbs. per acre.

COMPARISON OF FIELD LOTS OF BARLEY FOR THE LAST FOUR YEARS.

Date of ripening and yield of nine varieties of barley grown in field lots under the same conditions.

| Variety. | 1901. Date ripe. | Bush. | Lbs. | 1902. Date ripe. | Bush. | Lbs. | 1903. Date ripe. | Bush. | Lbs. | 1904. Date ripe. | Bush. | Lbs. | Average Bush. | Lbs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Mensury | Aug. 10 | 59 | 40 | Aug. 24 | *51 | 12 | Aug. 12 | 56 | 12 | Aug. 22 | 55 | 41 | 55 | 38 |
| 2. Odessa | " 11 | 58 | 40 | " 24 | *65 | .. | " 12 | 48 | 28 | " 24 | 53 | 18 | 56 | 21 |
| 3. Mansfield | " 14 | *57 | 4 | " 24 | *57 | 44 | " 25 | 50 | .. | " 23 | 56 | 32 | 55 | 20 |
| 4. Royal | " 12 | *63 | 16 | Sept. 4 | 56 | .. | " 10 | 67 | 3 | " 20 | 55 | 25 | 60 | 23 |
| 5. Claude | " 11 | 66 | 12 | Aug. 26 | *66 | 32 | " 25 | 66 | .. | " 20 | 53 | 22 | 63 | 4 |
| 6. Invincible | " 22 | 49 | 32 | Sept. 6 | 63 | 16 | " 28 | 59 | 25 | " 25 | 55 | 10 | 56 | 45 |
| 7. Standwell | " 22 | 48 | 16 | " 6 | 49 | 24 | " 25 | 63 | 20 | " 26 | 26 | 4 | 46 | 40 |
| 8. Sidney | " 15 | 60 | 10 | " 1 | 66 | .. | " 21 | 54 | 20 | " 25 | 43 | 42 | 56 | 6 |
| 9. Canadian Thorpe | " 18 | 44 | .. | " 1 | 68 | 36 | " 21 | 53 | 39 | " 26 | 29 | .. | 48 | 43 |

*These yields are from the uniform test plots, as there were no field lots of the varieties in the year in question.

FOUR YEARS TEST OF FALLOW AGAINST STUBBLE FOR GROWING BARLEY.

The same variety cannot be given for the four years, as different sorts of barley were sown on stubble each year:—

| Variety Sown. | 1901. Sidney. | | 1902. Rennie's Improved. | | 1903. Canadian Thorpe. | | 1904. Mensury. | |
|---|---|---|---|---|---|---|---|---|
| | Bush. | Lbs. | Bush. | Lbs. | Bush. | Lbs. | Bush. | Lbs. |
| Fallow | 60 | 10 | 51 | .. | 53 | 39 | 55 | 41 |
| Stubble | 50 | 36 | 26 | 12 | 20 | 40 | 37 | 24 |
| Difference | 9 | 22 | 24 | 36 | 32 | 47 | 18 | 76 |

Difference in favour of Fallow in 4 years, 85 bushels 26 lbs.
Or an average of 21 bushels, 6 lbs per year.

### BARLEY—SMUT TEST.

Bluestoned, Formalined and untreated seed was sown of barley, the same as in wheat and oats. The result was, no smut whatever, in either treated or untreated plots.

## ROTATION OF CROPS.

The rotation test commenced in 1899 was continued the past year. As soon as crops were taken off in fall of 1903, each half acre was ploughed and harrowed. Before seeding in the spring the land was cultivated by cultivator or gang plow. Soil, clay loam. Sown at the rate of 1½ bushels of wheat, and 2 bushels of barley and oats per acre by hoe drill.

The leguminous crops were ploughed under as they obtained their best growth.

## ROTATION CROPS.

The following rotation has been carried out since 1899 on half-acre plots. Since 1899, two rotations have been completed, the order of the plots in 1902, 1903 and 1904 being the same as in 1899, 1900 and 1901 respectively :—

| No. | 1899 and 1902. | 1900 and 1903. | 1901 and 1904. |
|---|---|---|---|
| 1 | Wheat | Oats | Soja Beans. |
| 2 | " | Wheat | Pease. |
| 3 | " | Oats | Tares. |
| 4 | " | Wheat | Red Clover. |
| 5 | " | Barley | Alsike and Lucern. |
| 6 | Pease | Wheat | Wheat. |
| 7 | Tares | " | Oats. |
| 8 | Soja Beans | " | " |
| 9 | Red Clover | " | Wheat. |
| 10 | Alsike and Lucern | " | Barley. |
| 11 | Rape | " | Summer-fallow. |
| 12 | Wheat | " | " |
| 13 | " | Oats | " |
| 14 | " | Barley | " |
| 15 | " | Wheat | Oats. |
| 16 | " | Barley | " |
| 17 | Oats | Soja Beans | Wheat. |
| 18 | Wheat | Pease | " |
| 19 | Oats | Tares | " |
| 20 | Wheat | Red Clover | " |
| 21 | Barley | Alsike and Lucern | " |
| 22 | Rye | Summer-fallow | " |

ROTATION TEST.—Results obtained in 1904. Plots, ½ acre each. Soil, clay loam.

| Number. | Name of Variety. | Date of Sowing. | Date of Ripening. | No. of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Kind of Head. | Yield per Acre. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | In. | | In. | | Bush. | Lbs. |
| 1 | Soja Beans | May 18 | | Ploughed under Aug. 6. | | | | | | |
| 2 | Pease | " 18 | | " " 6. | | | | | | |
| 3 | Tares | " 18 | | " " Oct. 3. | | | | | | |
| 4 | Red Clover | " 28 | | " " 3. | | | | | | |
| 5 | Alsike and Lucern | " 28 | | " " 3. | | | | | | |
| 6 | Wheat, Red Fife | " 4 | Sept. 5 | 124 | 35 | Strong | 3 | Bald | 31 | 23 |
| 7 | Oats, Banner | " 13 | " 1 | 111 | 39 | " | 7 | Branching | 70 | 24 |
| 8 | " | " 13 | 1 | 111 | 38 | " | 7 | " | 47 | 28 |
| 9 | Wheat, Red Fife | " 3 | " 5 | 125 | 35 | " | 2¾ | Bald | 29 | 2 |
| 10 | Barley, Mensury | " 13 | Aug. 20 | 99 | 30 | " | 2½ | 6-rowed | 37 | 24 |
| 11 | Summer-fallow | | | | | | | | | |
| 12 | " | | | | | | | | | |
| 13 | " | | | | | | | | | |
| 14 | " | | | | | | | | | |
| 15 | Oats, Banner | May 13 | Sept. 1 | 111 | 44 | Strong | 7 | Branching | 82 | 14 |
| 16 | " | " 13 | " 1 | 111 | 36 | " | 7 | " | 50 | 20 |
| 17 | Wheat, Red Fife | " 3 | " 5 | 125 | 36 | " | 3¼ | Bald | 39 | 12 |
| 18 | " " | " 3 | " 5 | 125 | 38 | " | 3 | " | 36 | 8 |
| 19 | " " | " 3 | " 5 | 125 | 38 | " | 3 | " | 36 | .. |
| 20 | " " | " 3 | " 5 | 125 | 37 | " | 3 | " | 32 | 6 |
| 21 | " " | " 3 | " 5 | 125 | 38 | " | 3 | " | 28 | 54 |
| 22 | " " | " 3 | " 5 | 125 | 40 | " | 3¼ | " | 36 | .. |

## EXPERIMENTS WITH PEASE.

Thirty-one varieties of pease were tested on one-twentieth acre plots, on fallowed land, sown by hoe drill, on May 16, at the rate of 2 bushels of small, 2½ bushels medium and 3 bushels of large pease per acre. Soil, clay loam.

While all varieties gave large yields, nearly all were late in maturing, caused by the moist weather in August. Nine varieties were badly injured by frost on the night of September 10, and eight others more or less injured, leaving 14 that matured properly.

In addition to the uniform plots, White Wonder and Arthur, two early, medium sized sorts were sown 1½ acres of the former and 2½ acres of the latter), on fallowed land by hoe drill on May 17. Both sorts were entirely ripe when frost came, and the yield and sample satisfactory.

### TEST OF GARDEN PEASE IN FIELD PLOTS.

To ascertain the yield of garden pease sown by grain drill, 8 varieties were sown alongside the uniform test plots of field pease on May 16, on plots of one-twentieth acre. Champion of England being a very late variety, did not ripen before the frost came. All the others did so, giving good yields.

Following were the yields per acre :—

| | Bush. | Lbs. |
|---|---|---|
| Laxton's Charmer | 58 | 40 |
| Horsford's Market Garden | 52 | 40 |
| American Wonder | 50 | |
| Stratagem | 48 | |
| Shropshire Hero | 48 | |
| Premium Gem | 42 | 40 |
| Champion of England | 42 | |
| Alaska | 41 | 20 |

PEASE—TEST OF VARIETIES.

| Name of Variety. | Date of Ripening. | | No. of Days Maturing. | Character of Growth. | Length of Straw. | Length of Pod. | Size of Pea. | Yield per Acre | | Weight per Bushel. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | In. | In. | | Bush. | Lbs. | Lbs |
| 1 Picton | Sept. | 9 | 116 | Strong | 60 | 2¼ | Medium | 68 | 20 | 58½ |
| 2 Prussian Blue | " | 9 | 116 | " | 70 | 2 | " | 67 | .. | 62½ |
| 3 Daniel O'Rourke | " | 5 | 112 | " | 60 | 2½ | Small | 67 | .. | 62½ |
| 4 Prince | " | 10 | 118 | " | 55 | 2½ | " | 66 | .. | 60¼ |
| 5 Agnes | " | 7 | 114 | " | 50 | 2¾ | Large | 65 | 20 | 61 |
| 6 Black Eyed Marrowfat | " | 16 | 123 | " | 65 | 3 | " | 63 | 40 | 60½ |
| 7 Pride | " | 10 | 117 | " | 55 | 2½ | Small | 63 | 20 | 59 |
| 8 Crown | " | 4 | 111 | " | 55 | 2 | " | 62 | 40 | 61½ |
| 9 White Wonder | " | 1 | 108 | " | 60 | 2½ | Large | 62 | 20 | 62 |
| 10 Archer | " | 10 | 117 | " | 72 | 2½ | Medium | 61 | 40 | 52½ |
| 11 Arthur | " | 8 | 115 | " | 55 | 2 | Large | 61 | 40 | 63 |
| 12 German White | " | 10 | 117 | " | 55 | 2½ | Medium | 61 | 40 | 62½ |
| 13 Paragon | " | 13 | 120 | " | 65 | 3 | " | 61 | 20 | 59 |
| 14 Chancellor | " | 9 | 116 | " | 60 | 3 | Small | 59 | 20 | 63 |
| 15 Carleton | " | 18 | 125 | " | 55 | 2 | Medium | 59 | | 53½ |
| 16 English Grey | " | 11 | 118 | " | 60 | 2¼ | Large | 58 | 20 | 53 |
| 17 Pearl | " | 11 | 118 | " | 60 | 2½ | Medium | 58 | 20 | 57 |
| 18 Golden Vine | " | 4 | 111 | " | 45 | 2 | Small | 58 | | 62½ |
| 19 Early Britain | " | 9 | 116 | " | 65 | 2 | " | 55 | 40 | 51½ |
| 20 Large White Marrowfat | " | 12 | 119 | " | 70 | 2¾ | Large | 55 | | 60½ |
| 21 Duke | " | 14 | 121 | " | 75 | 2½ | Medium | 54 | | 55 |
| 22 Wisconsin Blue | " | 9 | 116 | " | 60 | 2¼ | Small | 54 | | 58½ |
| 23 King | " | 14 | 121 | " | 60 | 2½ | " | 51 | 20 | 60½ |
| 24 Mummy | " | 9 | 116 | " | 50 | 2 | " | 50 | 40 | 61½ |
| 25 Nelson | " | 9 | 116 | " | 55 | 3 | Medium | 48 | 40 | 61½ |
| 26 Kent | " | 17 | 124 | " | 65 | 2 | " | 45 | 40 | 56 |
| 27 Mackay | " | 17 | 124 | " | 65 | 2¼ | Large | 45 | 40 | 56 |
| 28 Gregory | " | 11 | 118 | " | 60 | 2¼ | Medium | 40 | | 57 |
| 29 Prince Albert | " | 10 | 117 | " | 55 | 2 | Small | 37 | 40 | 53½ |
| 30 Victoria | " | 14 | 121 | " | 65 | 2 | Medium | 35 | 20 | 55 |
| 31 Macoun | " | 17 | 124 | " | 60 | 2½ | " | 31 | 40 | 60½ |

## EXPERIMENTS WITH INDIAN CORN.

Twenty varieties of corn were tested in hills and in rows. Both hills and rows were 35 inches apart. The corn was sown on clay loam on May 21, but in nearly all varieties one-third to one-half of the seed did not germinate, causing re-seeding during the first week in June.

Three varieties were also sown in rows at different distances apart. The yield per acre of all the varieties was computed from the weight of two rows, each 66 feet long.

In addition, six acres were sown with corn for ensilage. On account of poor germination, although re-sown, the crop was poor and unsatisfactory.

The corn land had been fallowed the previous year, and was in good condition.

The corn was cut on September 13, cut up and put in the silo.

INDIAN CORN—TEST OF VARIETIES.

| | Name of Variety. | Character of Growth. | Height. | Condition when Cut. | Weight per Acre Grown in rows | | Weight per Acre Grown in hills. | |
|---|---|---|---|---|---|---|---|---|
| | | | Inches | | Tons. | Lbs. | Tons. | Lbs. |
| 1 | Angel of Midnight | Strong | 70 | Tasselled | 22 | 770 | 14 | 710 |
| 2 | King Philip | " | 93 | " | 19 | 500 | 20 | 1,800 |
| 3 | Salzer's All Gold | " | 85 | " | 18 | 1,400 | 23 | 1,630 |
| 4 | North Dakota White | " | 78 | In silk | 18 | 300 | 22 | 880 |
| 5 | Compton's Early | " | 85 | Tasselled | 18 | 300 | 22 | 220 |
| 6 | Champion White Pearl | " | 90 | " | 15 | 1,130 | 16 | 1,000 |
| 7 | White Cap Yellow Dent | " | 83 | " | 15 | 800 | 19 | 830 |
| 8 | Pride of the North | " | 88 | Not tasselled | 14 | 1,700 | 14 | 1,920 |
| 9 | Eureka | " | 100 | Tasselled | 13 | 1,500 | 22 | |
| 10 | Red Cob Ensilage | " | 90 | Not tasselled | 13 | 1,500 | 21 | 680 |
| 11 | Giant Prolific Ensilage | " | 80 | Tasselled | 13 | 1,280 | 24 | 180 |
| 12 | Longfellow | " | 80 | In silk | 12 | 1,410 | 18 | 1,400 |
| 13 | Thoro'bred White Flint | " | 90 | Not tasselled | 11 | 1,650 | 22 | 1,540 |
| 14 | Superior Fodder | " | 85 | " | 11 | 1,320 | 18 | 1,400 |
| 15 | Early Butler | " | 95 | " | 11 | 880 | 18 | 80 |
| 16 | Evergreen Sugar | Medium | 64 | Tasselled | 10 | 350 | 15 | 580 |
| 17 | Mammoth Cuban | Strong | 92 | " | 10 | 20 | 15 | 1,680 |
| 18 | Cloud's Early Yellow | " | 80 | " | 9 | 700 | 16 | 780 |
| 19 | Early Mastodon | " | 96 | " | 9 | 700 | 13 | 290 |
| 20 | Selected Leaming | Medium | 80 | Not tasselled | 3 | 600 | 7 | 630 |

INDIAN CORN—TEST OF SEEDING AT DIFFERENT DISTANCES.

| Name of Variety. | Distance Between Rows | Character of Growth. | Height. | Weight per Acre grown in Rows | |
|---|---|---|---|---|---|
| | Inches. | | Inches. | Tons. | Lbs. |
| Longfellow | 21 | Strong | 80 | 16 | 1,948 |
| " | 28 | " | 75 | 10 | 1,255 |
| " | 35 | " | 82 | 13 | 1,168 |
| " | 42 | " | 78 | 9 | 1,803 |
| Champion White Pearl | 21 | " | 70 | 9 | 860 |
| " " | 28 | " | 75 | 9 | 704 |
| " " | 35 | " | 72 | 7 | 829 |
| " " | 42 | " | 70 | 6 | 259 |
| Selected Leaming | 21 | Weak | 72 | 5 | 1,882 |
| " " | 28 | " | 72 | 5 | 1,336 |
| " " | 35 | " | 65 | 4 | 1,848 |
| " " | 42 | " | 73 | 3 | 601 |

Sown in rows by grain drill, May 21; cut September 13. Land fallowed previous year. Soil, clay loam.

## EXPERIMENTS WITH FLAX.

Five varieties were tested on 1-20 acre plots of fallowed land, sown May 23, by grain drill, at the rate of 40 lbs. seed per acre.

Common flax was sown on 1-20 acre plots, at the rate of 20, 30, 40 and 50 lbs. of seed per acre.

Common flax was sown on ¾ acre that had grown flax the previous year, the land being ploughed in the fall, and cultivated just before seeding.

In addition, one acre of flax was sown on fallowed land, and two plots of nearly an acre each on low spots of land that came in too late for a grain crop.

The results of all tests were as follows:—

FLAX—TEST OF VARIETIES

| Name of Variety. | Character of Soil. | Size of Plot. | Date of Sowing. | Date of Ripening. | No. of Days Maturing. | Length of Straw. | Character of Straw. | Weight of Straw. | Yield per Acre. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ac. | | | | In. | | Lbs. | Bush. | Lbs. |
| White Flowering.... | Clay loam .. | 1/20 | May 23.. | Sept. 1.. | 101 | 22 | Strong . | 2,960 | 19 | 36 |
| Yellow Seeded.... | " .. | 1/20 | " 23.. | " 1.. | 101 | 28 | " .. | 3,440 | 18 | 32 |
| Improved Russian... | " .. | 1/20 | " 23.. | Aug. 26.. | 95 | 32 | " .. | 3,180 | 18 | 12 |
| Riga ............... | " .. | 1/20 | " 23.. | Sept. 1.. | 101 | 34 | " .. | 3,060 | 17 | 48 |
| Common............ | " .. | 1/20 | " 23.. | " 1.. | 101 | 33 | " .. | 3,200 | 12 | 28 |

FLAX—TEST OF SOWING DIFFERENT QUANTITIES OF SEED PER ACRE.

| Seed per Acre. | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 lbs............... | ............ | 1/20 | May 23.. | Aug. 31.. | 100 | 25 | Strong . | 1,640 | 16 | 24 |
| 30 " ............... | ............ | 1/20 | " 23.. | " 31.. | 100 | 25 | " .. | 2,700 | 16 | 44 |
| 40 " ............... | ............ | 1/20 | " 23.. | " 31.. | 100 | 26 | " .. | 1,680 | 18 | 24 |
| 50 " ............... | ............ | 1/20 | " 23.. | " 31.. | 100 | 26 | " .. | 1,500 | 16 | 44 |

| Name of Variety. | Cultivation. | Size of Plot. | Date of Sowing. | Date of Ripening. | No. of Days Maturing. | Length of Straw. | Character of Straw. | Yield per Acre. | |
|---|---|---|---|---|---|---|---|---|---|
| | | Ac. | | | | In. | | Bush. | Lbs. |
| Flax............. | Flax stubble, ploughed.. | ¾ | May 23.. | Aug. 22.. | 91 | 30 | Strong . | 9 | 33 |
| " ............. | Fallow................. | 1 | " 23.. | " 30.. | 99 | 26 | " .. | 19 | 18 |
| " ............. | " ................. | ¾ | " 27.. | " 29.. | 94 | 24 | " .. | 13 | .. |
| " ............. | " ................. | ¾ | " 27.. | " 29.. | 94 | 25 | " .. | 12 | 24 |

## EXPERIMENT WITH SPRING RYE.

Sown May 16, on 1-20 acre plot of fallowed land. Ripe August 15; time to mature, 91 days. Straw strong; 42 inches long; weight of straw per acre, 1,880 lbs. Length of head, 3 inches. Yield per acre, 18 bushels.

## EXPERIMENT WITH TARES.

Sown on 1-20 acre plot of fallowed land, May 18. Ripe September 9; time to mature, 114 days. Length of straw, 28 inches; pod, 2½ inches. Yield per acre, 26½ bushels, weighing 54 lbs. per bushel.

## EXPERIMENT WITH CANARY GRASS.

*(Phalaris canariensis.)*

Sown May 16, on 1-20 acre plot of fallowed land. Ripe August 18; time to mature, 94 days. Straw strong, 32 inches long; weight of straw per acre, 2,200 lbs. Length of head, 1¼ inches. Yield per acre, 15 bushels 20 lbs., weighing 49 lbs. per bushel.

## EXPERIMENT WITH SOJA BEANS.

Sown May 17, in rows 21, 28 and 35 inches apart. These were killed by frost, and did not mature or even form pods.

## EXPERIMENT WITH HORSE BEANS.

Sown May 17, in rows 21, 28 and 35 inches apart. Cut Sept. 10.

| Variety. | Rows, Distance Apart. | Height. | Yield per Acre. Dry Fodder. | |
|---|---|---|---|---|
| | Inches. | Inches. | Tons. | Lbs. |
| Horse beans | 21 | 38 | 3 | 880 |
| " | 28 | 34 | 3 | 896 |
| " | 35 | 35 | 2 | 946 |

## EXPERIMENTS WITH MILLETS.

Six varieties were sown May 23, on 1-40th acre plots of fallowed land. All were very poor and did not mature. Cut for feed September 10.

| Variety. | Height. | Yield per acre; Dry fodder. | |
|---|---|---|---|
| | Ins. | Tons. | Pounds. |
| Moha Hungarian | 37 | 3 | .. |
| White Round French | 36 | 2 | 800 |
| Italian | 39 | 3 | 400 |
| Cat Tail | 31 | Very little germinated. | |
| Early Pearl | 35 | " | " |
| Moha Green Caliiornian | 39 | 3 | 800 |

## HAY CROP.

The hay crop the past season was light. Brome averaged about 1¾ tons per acre, and Western Rye Grass 1½ tons per acre.

One-half acre of Brome, ploughed 2 inches deep in May, 1903, disced and rolled flat, gave this year one ton of hay without re-seeding.

All the Brome and Rye Grass fields have been cut for hay from 3 to 6 years.

Timothy gave 850 lbs. on a ½ acre plot.

The ½ acre of Alfalfa sown in 1902 was almost entirely killed by the spring frosts.

## TEST OF GRASSES.

In May the following clovers and grasses were sown in plots of ¼ to ½ acre each:—

Western Red Clover, Lucern, Alsike, Turkestan Alfalfa, Utah Alfalfa, Mixture of Red Clover, Alsike, Orchard and Blue Grass, Mixture of Orchard, Blue Grass and Common Alfalfa, Meadow Fescue, Red Top, Kentucky Blue Grass, English Blue Grass, Western Rye Grass.

Three varieties of Alfalfa, Common, Utah and Turkestan, were tested for the Department of Agriculture, Regina.

With the exception of Red Top, which failed to germinate, all the varieties did well. The three kinds of Alfalfa and the Red Clover did extra well.

Common Alfalfa attained a height of 20 inches, Turkestan 18 inches, and Utah Alfalfa 17 inches. All the clovers were quite well headed out before the growing season was over.

Cattle were pastured on the grasses to a small extent after the growing season, for fear of smothering out the plants from too rank a growth.

## EXPERIMENTS WITH FIELD ROOTS.

With the exception of carrots, the root crop was very satisfactory. After the carrots were in full leaf, they were eaten close to the ground by the larvæ of a small moth or butterfly, and never recovered from the injury.

Turnips and mangels were good, with the second seeding rather the better.

The land for all the roots had been fallowed the previous year, with two deep ploughings and surface cultivation, and when frost came in the fall, 10 loads of manure per acre were spread on the surface, and cultivated in, shallow, just before sowing the seed in the spring.

The rows were made by grain drill, on the flat, and the seed sown by a Planet Junior turnip drill. All the rows were 28 inches apart.

Soil, clay loam. The yields per acre were obtained by weighing the roots from two rows, each 66 feet long.

### TURNIPS—TEST OF VARIETIES.

Twenty varieties were sown on May 19, and again on May 27. The roots from both seedings were taken up on October 18.

| Number. | Name of Variety. | Character of Soil. | Yield per Acre. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1st Plot. | | | | 2nd Plot. | | | |
| | | | Tons. | Lbs. | Bush. | Lbs. | Tons. | Lbs. | Bush. | Lbs. |
| 1 | Drummond Purple-top | Clay loam | 29 | 268 | 971 | 8 | 29 | 1,541 | 992 | 21 |
| 2 | Skirving's | " | 28 | 854 | 947 | 34 | 30 | 814 | 1,013 | 34 |
| 3 | New Century | " | 26 | 1,318 | 888 | 38 | 30 | 248 | 1,004 | 8 |
| 4 | Imperial Swede | " | 26 | 1,036 | 883 | 56 | 29 | 834 | 980 | 34 |
| 5 | Emperor | " | 26 | 1,036 | 883 | 56 | 28 | 430 | 940 | 30 |
| 6 | Jumbo | " | 26 | 611 | 876 | 51 | 24 | 227 | 803 | 47 |
| 7 | Magnum Bonum | " | 26 | 187 | 869 | 47 | 30 | 1,946 | 1,032 | 26 |
| 8 | Good Luck | " | 26 | 46 | 867 | 26 | 30 | 1,521 | 1,025 | 21 |
| 9 | Hall's Westbury | " | 25 | 1,904 | 865 | 4 | 25 | 1,621 | 860 | 21 |
| 10 | Halewood's Bronze-top | " | 25 | 1,480 | 858 | .. | 20 | 448 | 674 | 8 |
| 11 | Perfection Swede | " | 25 | 1,338 | 855 | 38 | 31 | 228 | 1,037 | 8 |
| 12 | Elephants Master | " | 24 | 1,641 | 827 | 21 | 23 | 247 | 770 | 47 |
| 13 | Mammoth Clyde | " | 23 | 1,944 | 799 | 4 | 25 | 1,763 | 862 | 43 |
| 14 | Bangholm Selected | " | 23 | 813 | 780 | 13 | 26 | 753 | 879 | 13 |
| 15 | Kangaroo | " | 22 | 1,964 | 766 | 4 | 26 | 1,177 | 919 | 37 |
| 16 | Sutton's Champion | " | 22 | 1,974 | 766 | 4 | 26 | 1,743 | 895 | 43 |
| 17 | Hartley's Bronze | " | 22 | 974 | 749 | 34 | 26 | 1,036 | 883 | 56 |
| 18 | East Lothian | " | 21 | 570 | 709 | 30 | 22 | 1,540 | 759 | .. |
| 19 | Selected Purple Top | " | 21 | 287 | 704 | 47 | 28 | 6 | 933 | 26 |
| 20 | Carter's Elephant | " | 20 | 1,438 | 690 | 38 | 26 | 1,884 | 898 | 4 |

## MANGELS—TEST OF VARIETIES.

Sixteen varieties were sown on May 19 and 27. All were taken up October 3.

| Number. | Name of Variety. | Character of Soil. | Yield per Acre. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1st Plot. | | | | 2nd Plot. | | | |
| | | | Tons. | Lbs. | Bush. | Lbs. | Tons. | Lbs. | Bush. | Lbs. |
| 1 | Prizewinner Yellow Globe | Clay loam | 23 | 1,237 | 787 | 17 | 27 | 1,581 | 926 | 21 |
| 2 | Triumph Yellow Globe | " | 23 | 388 | 773 | 8 | 27 | 1,581 | 926 | 21 |
| 3 | Half-long Sugar White | " | 21 | .. | 700 | .. | 26 | 1,743 | 895 | 43 |
| 4 | Giant Yellow Intermediate | " | 19 | 1,176 | 652 | 56 | 18 | 347 | 605 | 47 |
| 5 | Selected Mammoth Long Red | " | 19 | 327 | 638 | 47 | 16 | 953 | 549 | 13 |
| 6 | Yellow Intermediate | " | 19 | 186 | 636 | 26 | 16 | 1,094 | 551 | 34 |
| 7 | Giant Yellow Globe | " | 18 | 1,903 | 631 | 43 | 26 | 1,743 | 895 | 43 |
| 8 | Leviathan Long Red | " | 18 | 1,478 | 624 | 38 | 23 | 1,944 | 799 | 4 |
| 9 | Half-long Sugar Rosy | " | 18 | 1,054 | 617 | 34 | 14 | 1,134 | 485 | 34 |
| 10 | Prize Mammoth Long Red | " | 18 | 206 | 603 | 26 | 17 | 1,498 | 591 | 38 |
| 11 | Mammoth Yellow Intermediate | " | 17 | 650 | 577 | 30 | 23 | 1,237 | 787 | 17 |
| 12 | Mammoth Long Red | " | 16 | 1,094 | 551 | 34 | 17 | 1,781 | 596 | 21 |
| 13 | Gate Post | " | 16 | 528 | 542 | 8 | 23 | 247 | 770 | 47 |
| 14 | Lion Yellow Intermediate | " | | * | | * | 25 | 914 | 848 | 34 |
| 15 | Selected Yellow Globe | " | | * | | * | 23 | 621 | 777 | 51 |
| 16 | Giant Sugar | " | | * | | * | 22 | 1,823 | 763 | 43 |

* These varieties were not sown at first seeding.

### CARROTS—TEST OF VARIETIES.

Ten varieties were sown May 19 and were pulled October 20. The second plots were not sown.

| Number. | Name of Variety. | Character of Soil. | Yield per Acre. 1st Plot. Tons. | Lbs. | Bush. | Lbs. |
|---|---|---|---|---|---|---|
| 1 | Improved Short White | Clay loam | 7 | 284 | 238 | 4 |
| 2 | White Belgian | " | 6 | 1,294 | 221 | 34 |
| 3 | Half-long Chantenay | " | 5 | 1,314 | 188 | 34 |
| 4 | Giant White Vosges | " | 4 | 1,051 | 150 | 51 |
| 5 | New White Intermediate | " | 4 | 768 | 146 | 8 |
| 6 | Long Yellow Stump-rooted | " | 2 | 1,657 | 94 | 17 |
| 7 | Carter's Orange Giant | " | 2 | 1,091 | 84 | 51 |
| 8 | Early Gem | " | 2 | 1,091 | 84 | 51 |
| 9 | Mammoth White Intermediate | " | 1 | 1,536 | 58 | 56 |
| 10 | Ontario Champion | " | 1 | 1,536 | 58 | 56 |

### SUGAR BEETS—TEST OF VARIETIES.

First plots sown May 19 and second plots May 27. Both were pulled October 6.

| Number. | Name of Variety. | Character of Soil. | Yield per Acre. 1st Plot. Tons. | Lbs. | Bush. | Lbs. | 2nd Plot. Tons. | Lbs. | Bush. | Lbs. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Royal Giant | Clay loam | 17 | 367 | 572 | 47 | 23 | 388 | 773 | 8 |
| 2 | Danish Red Top | " | 14 | 1,134 | 485 | 34 | 18 | 1,054 | 617 | 34 |
| 3 | Improved Imperial | " | 14 | 286 | 471 | 26 | 16 | 1,094 | 551 | 34 |
| 4 | Red Top Sugar | " | 14 | 286 | 471 | 26 | 18 | 1,196 | 619 | 56 |
| 5 | Danish Improved | " | 12 | 1,598 | 426 | 38 | 18 | 1,478 | 624 | 38 |
| 6 | French Very Rich | " | 11 | 1,194 | 386 | 34 | 12 | 43 | 400 | 43 |
| 7 | Vilmorin's Improved | " | 10 | 1,921 | 365 | 21 | 9 | 1,800 | 330 | .. |
| 8 | Wanzleben | " | 9 | 810 | 313 | 30 | 9 | 1,658 | 327 | 38 |

## EXPERIMENTS WITH POTATOES.

Forty-one varieties of potatoes were planted on May 20. The land was fallowed the same as for roots, and ten loads of manure applied per acre.

While the potatoes were all of a fair size, sound, and of splendid quality, the yield in no case was equal to that of 1903.

The sets were dropped in drills 30 inches apart, and the potatoes were dug on September 29. The yield per acre was obtained by weighing the potatoes from one row 132 feet long. Soil, clay loam. There was no rot in any of the varieties.

POTATOES—TEST OF VARIETIES.

| Number. | Name of Variety. | Character of Soil. | Planted. | Dug. | Character of Growth. | Average Size. | Total Yield per Acre. Bush. | Lbs. | Form and Colour. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Penn Manor | Clay loam. | May 20.. | Sept. 29.. | Medium .. | Large .... | 435 | 36 | Long, red. |
| 2 | Uncle Sam | " | " 20.. | " 29.. | Strong ... | " .... | 420 | 12 | Oval, white. |
| 3 | Sabean's Elephant | " | " 20.. | " 29.. | " .... | " .... | 409 | 12 | Long " |
| 4 | Late Puritan | " | " 20.. | " 29.. | " .... | " .... | 404 | 48 | Oval " |
| 5 | General Gordon | " | " 20.. | " 29.. | " .... | " .... | 393 | 48 | " pink. |
| 6 | American Giant | " | " 20 | " 29.. | " .... | " .... | 391 | 36 | Long, white. |
| 7 | Prolific Rose | " | " 20.. | " 29.. | " ... | Medium.. | 374 | .. | " red. |
| 8 | Early Envoy | " | " 20.. | " 29.. | Medium.. | Large .... | 374 | .. | Oval, pink. |
| 9 | Reeve's Rose | " | " 20.. | " 29.. | Strong ... | Medium.. | 374 | .. | " red. |
| 10 | Country Gentleman | " | " 20.. | " 29.. | " ... | " .. | 371 | 48 | Long, pink. |
| 11 | Money Maker | " | " 20.. | " 29.. | " ... | Large .... | 371 | 48 | Oval, white. |
| 12 | State of Maine | " | " 20.. | " 29.. | " .... | " .... | 369 | 36 | " |
| 13 | Early St. George | " | " 20.. | " 29.. | " .... | Medium.. | 365 | 12 | Long, red. |
| 14 | Pingree | " | " 20.. | " 29.. | Medium.. | " .. | 360 | 48 | " white. |
| 15 | Dreer's Standard | " | " 20.. | " 29.. | " .. | " .. | 352 | .. | Oval " |
| 16 | American Wonder | " | " 20.. | " 29.. | Strong ... | Large .... | 345 | 24 | Long " |
| 17 | Burnaby Mammoth | " | " 20.. | " 29.. | " .... | Medium.. | 345 | 24 | " pink. |
| 18 | Carman No. 3 | " | " 20.. | " 29.. | " .... | Large .... | 343 | 12 | Oval, white. |
| 19 | Seedling No. 7 | " | " 20.. | " 29.. | " .... | " ... | 330 | .. | " red. |
| 20 | Holborn Abundance | " | " 20.. | " 29.. | " .... | " .... | 327 | 48 | " white. |
| 21 | Pearce | " | " 20.. | " 29.. | " .... | " .... | 323 | 24 | Long, pink. |
| 22 | Delaware | " | " 20.. | " 29.. | " .... | " .... | 323 | 24 | Oval, white. |
| 23 | Vick's Extra Early | " | " 20.. | " 29.. | " .... | " .... | 321 | 12 | " pink. |
| 24 | Carman No. 1 | " | " 20.. | " 29.. | " .... | " .... | 314 | 36 | " white |
| 25 | Enormous | " | " 20.. | " 29.. | " .... | " .... | 314 | 36 | Long " |
| 26 | Rose No. 9 | " | " 20.. | " 29.. | Medium.. | " .... | 314 | 36 | " red. |
| 27 | Everett | " | " 20.. | " 29.. | " .. | " .... | 312 | 24 | " pink. |
| 28 | Irish Cobbler | " | " 20.. | " 29.. | " .. | " .... | 305 | 48 | Oval, white. |
| 29 | Rochester Rose | " | " 20.. | " 29.. | Strong ... | " .. | 305 | 48 | Long, red. |
| 30 | Early Rose | " | " 20.. | " 29.. | Medium.. | " .... | 288 | 12 | Oval " |
| 31 | Maule's Thoroughbred | " | " 20.. | " 29.. | Strong ... | Medium.. | 281 | 36 | " pink. |
| 32 | Early White Prize | " | " 20.. | " 29.. | Medium.. | Small.... | 279 | 24 | " white. |
| 33 | Empire State | " | " 20.. | " 29 | Strong ... | Large ... | 275 | .. | " " |
| 34 | Swiss Snowflake | " | " 20.. | " 29.. | Medium.. | Medium.. | 259 | 36 | Long, red. |
| 35 | Canadian Beauty | " | " 20.. | " 29.. | Strong ... | Large .... | 257 | 24 | Oval, pink. |
| 36 | Bovee | " | " 20.. | " 29.. | Light .... | " .... | 244 | 24 | " |
| 37 | I. X. L | " | " 20.. | " 29.. | Strong ... | Medium.. | 239 | 48 | Long, pink. |
| 38 | Clay Rose | " | " 20 | " 29.. | " .... | Large .... | 237 | 36 | Oval " |
| 39 | Early Andes | " | " 20.. | " 29.. | Medium.. | Medium.. | 228 | 48 | " " |
| 40 | Rawdon Rose | " | " 20.. | " 29.. | " .. | Large ... | 226 | 36 | " " |
| 41 | Cambridge Russet | " | " 20.. | " 29.. | Strong .. | Medium.. | 226 | 36 | Long, russet. |

## SUMMARY OF CROPS, 1904.

| | Bushels. |
|---|---|
| *Wheat :* | |
| 8 varieties, 44 acres | 1,733 |
| 8 half acres, rotation test | 135 |
| 36 uniform test plots | 92 |
| | 1,960 |
| *Oats :* | |
| 9 varieties, 60 acres | 4,589 |
| 4 half acres, rotation test | 125 |
| 42 uniform test plots | 157 |
| | 4,871 |

| | Bushels. | |
|---|---|---|
| *Barley :* | | |
| 9 varieties, 34 acres | 1,512 | |
| 1 half acre, rotation test | 18 | |
| 39 uniform test plots | 90 | |
| | 1,620 | |
| *Pease :* | | |
| 2 varieties, 4 acres | 170 | |
| 31 uniform test plots | 85 | |
| | 255 | |
| Flax | 52 | |
| Rye | 1 | |
| | Tons. | Lbs. |
| Emmer and Spelt | .... | 2,254 |
| Corn, ensilage | 45 | |
| *Hay:* | | |
| Brome grass | 35 | |
| Rye grass | 25 | |
| Timothy | .... | 850 |
| | 60 | 850 |
| | Bushels. | |
| Roots | 3,000 | |
| Potatoes | 100 | |
| | 3,100 | |

## VEGETABLE GARDEN.

The experiments with vegetables were fairly successful this year. A few varieties of beans did not mature. Cucumbers, citrons and melons were poor. The balance of the vegetables were satisfactory.

### ASPARAGUS.

Old beds of Barr's Mammoth, Barr's Elmira and Conover's Colossal were in use from May 21 to July 14, producing a good crop.

Asparagus seed was sown on May 18.

### BEANS.—Sown May 21.

| Imported Seed. | In Use, Green. | Ripe. | Remarks. |
|---|---|---|---|
| Dwarf Extra Early | July 26 | Sept. 14 | Green; very good crop. |
| " Emperor of Russia | Aug. 1 | Did not mature | " good crop. |
| " Fame of Vitry | " 5 | " | " " |
| " Black Speckled | " 3 | " | " " |
| " Golden Skinless | " 2 | " | Wax; " |
| " Matchless | " 1 | " | Green; fair crop. |
| Experimental Farm Seed. | | | |
| Currie's Rust-proof | July 30 | Sept. 14 | Wax; very good crop. |
| Challenge Black Wax | " 28 | " 14 | " " |
| Early Six Weeks | " 30 | " 14 | Green; " |
| Dwarf Kidney | " 28 | " 14 | Wax; fair crop. |
| Detroit Wax | " 30 | Did not mature | " " |

### BEETS.

Sown May 9, in use July 25; pulled October 5.
Nutting's Dwarf Improved, 847 bushels per acre; large, smooth.
Early Blood Red Turnip, 435 bushels per acre; medium size, good quality.
Flat Egyptian, 1,060 bushels per acre; large, good.
Long Smooth Blood, 411 bushels per acre; small, good.
Superb Northern Red, 686 bushels per acre; medium long.
Reselected Perfection, 686 bushels per acre; medium size.

### BROCOLI.

Sown in hot-house April 1 and 20; set out May 30 and June 7; in use, August 6.
Extra Early White.

### BRUSSELS SPROUTS.

Sown in hot-house April 1 and 20; set out May 30 and June 7.
Dwarf Improved, in use August 5; fair crop.
Northern Prize, in use August 5; fair crop.

### CARROTS.

Sown May 9, in use July 26; pulled October 5.
Long Blood, 609 bushels per acre; large and smooth, good.
French Horn, 602 bushels per acre; medium size.
Half-long Chantenay, 484 bushels per acre; large and smooth, good.
Half-long Luc, 226 bushels per acre; medium size, good quality.

### CELERY.

Large Red Ribbed, Paris Golden Yellow, Rose Ribbed Paris, Giant Pascal and White Plume were sown in hot-house, April 1; transplanted, May 2; set out, June 17; in use, September 1.

The crop was of fairly good quality.

### CABBAGE.

Sown in hot-house, April 1; set out, May 30; second seeding, April 20; set out, June 7.

| Name of Variety. | 1st Seeding. | | 2nd Seeding. | | Remarks. |
|---|---|---|---|---|---|
| | In Use. | Average Weight. | In Use. | Average Weight. | |
| | | Lbs. | | Lbs. | |
| Winningstadt Early | Sept. 10 | 9 | Sept. 15 | 8 | Good. |
| Early Jersey Wakefield | " 5 | 9 | " 10 | 11 | " |
| Extra Early Express | " 1 | 8 | " 6 | 9 | " |
| Paris Market | " 1 | 10 | " 6 | 9 | " |
| Midsummer Savoy | " 1 | 11 | " 6 | 10 | " |
| Green Globe Savoy | " 6 | 8 | " 12 | 8 | " |
| Fottler's Drumhead | " — | 5 | " — | 5 | Poor. |
| Large Red Drumhead | " 10 | 12 | " — | 11 | Good. |
| Early Enfield Market | July 30 | 8 | Aug. 4 | 7 | " |

## KALE.

Drumhead Kale was sown in hot-house April 1; set out May 30, but was a failure.

## CAULIFLOWER.

Sown in hot-house April 1; set out May 30. Second seeding April 20; set out June 7.

| Name of Variety. | 1st Seeding. | | 2nd Seeding. | | Remarks. |
|---|---|---|---|---|---|
| | In Use. | Average Weight. | In Use. | Average Weight. | |
| | | Lbs. | | Lbs. | |
| Half Early Paris | July 21 | 6 | July 30 | 6 | Good quality, except that a few heads grew too loosely. |
| Earliest Dwarf Erfurt | " 21 | 6 | " 30 | 6 | |
| Early Snowball | " 21 | 6 | " 30 | 6 | |

## GARDEN CORN.

| Name of Variety. | In Use, Green. | Ripe. | Remarks. |
|---|---|---|---|
| Red Squaw, sown May 20 | Aug. 23 | Sept. 13 | Good crop. |
| White Squaw, " | " 23 | " 13 | " |
| Peep o' Day, " | " 13 | | Did not mature. |
| New Premo, " | " 13 | | " |
| Golden Bantum, " | | | " |

## CUCUMBERS.

Early White Spine and Cumberland were sown May 2 in hot-house; set out May 29; in flower July 10; ripe September 15. A fair crop.

## CITRONS.

Preserving.—Sown in hot-house, May 2; set out, May 27 ; in flower, July 10; ripe, September 16. Medium size.

## LETTUCE.

1st sowing, May 9; in use, June 16. 2nd sowing, June 4; in use, July 16. All varieties were of good quality.

The following sorts were sown:—Cabbage—Neapolitan, Tom Thumb, Blond Stonehead, All the Year Round, Red Edged Victoria and Trocadero Red Edged. Cos—Green Paris and Early Trianon.

## MELONS.

The following varieties were sown in hot-house, May 2; set out, May 27. Did not mature.

Musk melon—Extra Early Green and Hamilton Market.

Water melon—Cole's Early and Phinney's Early.

The same varieties were sown in the open May 27, but did not come up.

ONIONS.

Sown in hot-house, April 1; set out, May 30; lifted, September 29.

| Variety. | Yield per Acre. Bush. | Lbs. | Size and Quality. |
|---|---|---|---|
| Large Red Wethersfield | 217 | 48 | Large, good. |
| Danver's Yellow Globe | 205 | 42 | " |
| Market Favorite | 145 | 12 | Medium, good. |
| Trebon's Large Yellow | 108 | 54 | Small, good. |
| Giant Prizetaker | 72 | 36 | Medium, good. |
| Spanish King | 60 | 30 | Small, good. |

Sown in open, May 9; lifted, September 30.

| | | | |
|---|---|---|---|
| Giant Prizetaker | 181 | 30 | Large, good. |
| Trebon's Large Yellow | 145 | 12 | Medium, fair. |
| Spanish King | 133 | 6 | Poor and thick-necked. |
| Danver's Yellow Globe | 121 | .. | Medium, fair. |
| Market Favorite | 121 | .. | Small, fair. |
| Paris Silverskin | 121 | .. | " |
| Large Red Wethersfield | 96 | 48 | " |

PUMPKINS.

Sown in hot-house, May 2; set out, May 27.
Large Yellow Field. Weight of pumpkin, 61 pounds.
New Japanese Pie. Did not fruit.

PEPPERS.

Ruby King, sown in hot-house, April 7; set out, June 10. Did not mature.

SQUASH.

Long White Bush Marrow, sown in hot-house May 2; set out, June 9; ripe, September 13. Average weight, 14 lbs. Fruit good quality, but a poor crop.

This was also sown in open, May 27, but did not come up.

KOHL RABI.

Early Purple Vienna, sown in hot-house, April 1; set out, May 30; in use, July 28; average weight, 9 pounds.

TURNIPS.

Sown, May 20; in use, August 1; pulled, October 7. Good quality.

| | Yield per acre. Bushels. |
|---|---|
| Early White Strap-leaved | 940 |
| Extra Early White Milan | 825 |
| Early Stone | 716 |
| Robertson's Golden Ball | 614 |

## TOMATOES.

Sown in hot-house, April 1; set out, May 30; in flower, June 23.

*In use, Green.*

Earliana, September 16; some ripened; large and smooth.
Sparks' Earliana, September, 10; a little rough when ripe.
Up-to-date, September 10; some ripened; light crop.
Earliest of All, September 10; some ripened; good crop and quality.

## PARSNIPS.

Sown, May 9; in use, September 13; lifted, October 6.
Hollow Crown, yield per acre, 355 bushels; fair quality.
The Student, yield per acre, 508 bushels; large and good quality.

## GARDEN PEASE.

| Variety. | Sown May 14 and 26. | | | | |
|---|---|---|---|---|---|
| | 1st Seeding. | | 2nd Seeding. | | Remarks. |
| | In use, green. | Ripe. | In use, green. | Ripe. | |
| Admiral | July 28 | Sept. 14 | Aug. 1 | Sept. 14 | Fair crop. |
| American Wonder | Aug. 1 | " 14 | " 10 | " 14 | " |
| Anticipation | " 1 | " 28 | " 10 | " 28 | Good. |
| Alaska | " 1 | " 28 | .......... | " 28 | " |
| Burpee's Profusion | July 28 | " 17 | .......... | " 25 | " |
| Extra Early | " 16 | " 6 | July 23 | " 23 | " |
| Everbearing | Aug. 1 | " 24 | Aug. 12 | " 24 | " |
| First of All | July 14 | " 30 | July 23 | " 14 | Fair. |
| First and Best | " 14 | " 6 | " 23 | " 16 | " |
| Surprise | " 14 | " 6 | " 23 | " 16 | " |
| Stratagem | " 30 | " 25 | Aug. 12 | " 25 | Good. |
| Shropshire Hero | Aug. 6 | " 24 | " 6 | " 24 | " |
| Laxton's Charmer | July 28 | " 24 | " 10 | " 24 | " |
| Champion of England | Aug. 1 | " 25 | " 12 | " 25 | " |
| Horsford's Market Garden | July 28 | " 25 | " 10 | " 25 | " |
| Wm. Hurst | " 14 | " 6 | July 23 | " 16 | " |
| Rural New Yorker | " 14 | " 6 | " 23 | " 14 | Fair. |
| Premium Gem | " 14 | " 6 | " 24 | " 10 | " |
| Nott's Excelsior | " 15 | Aug. 30 | " 24 | Aug. 30 | " |
| Harrison's Glory | .......... | .......... | .......... | .......... | No crop. |
| Yorkshire Hero | Aug. 1 | Sept. 24 | Aug. 10 | Sept. 24 | Fair. |

RADISH.

| Sown May 9 and June 4. | 1st Seeding. — In use. | 2nd Seeding. — In use. | Remarks. |
|---|---|---|---|
| Early Deep Scarlet | June 9 | June 30 | Came up slow and were stringy. |
| Scarlet Forcing | " 21 | " 30 | " " |
| Early Scarlet White-tipped | " 18 | " 30 | " " |
| Early Scarlet Turnip | " 18 | " 30 | " " |
| French Breakfast | " 21 | " 30 | " " |
| Olive-shaped Scarlet | " 18 | " 30 | " " |

Winter Radish, sown May 9; pulled, October 22.
Black Spanish, large and smooth.
Scarlet China, medium smooth.

PARSLEY.

Champion Moss-curled, sown May 9; in use, July 15; good crop.

SUMMER SAVORY.

Sown, May 9; in use, July 16; good crop.

SAGE.

Sown, May 9; in use, July 16; did well.

SPINACH.

Victoria, sown May 14; very good crop.
Flat Seeded, sown May 14; very good crop.

RHUBARB.

Sown, May 14; transplanted, June 25.

Victoria.
Myatt's Linnæus.
Experimental Farm Seed:
Scarlet Nonpareil.
Monarch Seedling,
Salt's Perfection.
Tobolsk.
} All made good growth.

Old beds in use, May 21 to September 30; good crop.

## THE FLOWER GARDEN.

The flower garden was never better than the past season. While nearly all the flowers were good, Stocks, Asters and Pansies were extra fine. In the perennials, Paeonies and Irises were very good. Tulips were fine, but bloom was cut short by dry weather.

ANNUALS—Propagated in hot-house. Sown April 2.

| Variety. | Set out. | Bloom. From | Bloom. To | Remarks. |
|---|---|---|---|---|
| Asters, 10 varieties | May 31 | July 20 | Oct. 1 | Grand show. |
| Antirrhinum, 3 varieties | " 31 | " 20 | Sept. 26 | Fair show. |
| Abronia Umbellata | June 1 | " 10 | " 15 | Very good. |
| Ageratum, Dwarf Imperial | " 1 | June 23 | " 10 | Fine border. |
| Alyssum maritimum | " 1 | " 23 | Oct. 20 | Very fine. |
| Adonis | " 10 | July 25 | Sept. 10 | Small red flower. |
| Alonsoa | " 2 | " 5 | " 25 | Fair show. |
| Anagallis | " 2 | " 23 | | Very fine flowers. |
| Balsam, Camellia-flowered | " 1 | June 29 | Frost | Very good. |
| Brachycome Iberidifolia | " 1 | " 25 | Sept. 20 | Good border. |
| Bartonia Aurea | " 1 | " 26 | | Fair show. |
| Chrysanthemum, 3 varieties | " 1 | July 18 | Oct. 1 | Fair blooms. |
| Calliopsis | " 1 | " 20 | " 1 | Very fine. |
| Calendula, Royal Marigold | " 1 | June 29 | " 20 | Good blooms. |
| Candytuft, Empress | " 1 | " 29 | " 20 | " |
| Clarkia | " 1 | " 23 | " 10 | Very good. |
| Celosia, 2 varieties | " 1 | | | Did not bloom. |
| Coreopsis, 3 varieties | " 1 | July 18 | Sept. 10 | Fair blooms. |
| Dianthus, 8 varieties | " 1 | " 10 | Oct. 20 | Very fine |
| Gaillardia picta Lorenziana | " 1 | " 18 | " 1 | Good show. |
| Godetia, 4 varieties | " 1 | " 10 | " 1 | " |
| Helianthus nanus | " 2 | " 15 | " 20 | Very fine. |
| Helichrysum, 2 varieties | " 1 | " 15 | " 15 | Fair show. |
| Hollyhock, double | " 2 | " 10 | " 20 | Very good. |
| Iberis Gibraltarica | " 2 | | | Did not bloom. |
| Kaulfussia, mixed | " 2 | | | " |
| Linum gr. fl. roseum | " 2 | July 20 | Sept. 10 | Some fine blooms. |
| Lobelia erinus, Crystal Palace | " 1 | " 10 | " 15 | Very fine, good border. |
| Lupinus, mixed | " 1 | " 20 | " 20 | |
| Mignonette | " 1 | " 15 | Oct. 10 | Very good. |
| Mathiola bicornis | " 4 | June 28 | " 1 | Fair show. |
| Nicotiana, 7 varieties | " 1 | Aug. 15 | Frost | Fine blossoms. |
| Nemophila Maculata | " 1 | July 1 | Oct. 20 | Good border. |
| Nurembergia Gracilis | " 2 | Aug. 5 | Sept. 25 | Fair. |
| Poppy, 5 varieties | " 1 | " 1 | " 25 | " |
| Phacelia campanularia | " 1 | July 25 | " 16 | Very good. |
| " grandiflora | " 1 | " 25 | " 16 | " |
| Portulaca | " 1 | June 25 | " 19 | Fine blooms. |
| Phlox Drummondii, 3 varieties | " 1 | " 23 | Oct. 20 | Grand show. |
| Petunia, 4 varieties | " 1 | July 10 | Sept. 20 | Extra fine. |
| Pansies, 8 varieties | " 1 | June 20 | Nov. 10 | " |
| Scabiosa, 3 varieties | " 1 | Aug. 1 | Sept. 10 | Fine show. |
| Sweet William | " 1 | Biennial | Biennial | Did not bloom. |
| Salpiglossis variabilis | " 1 | June 10 | Oct. 1 | Fine blooms. |
| Schizanthus, 2 varieties | " 1 | " 23 | " 1 | " |
| Sanvitalia procumbens | " 2 | July 15 | Sept. 10 | Not very good. |
| Stocks, 10 weeks | " 1 | June 28 | Oct. 20 | Fine large blooms. |
| Tropaeolum, 5 varieties | " 1 | July 12 | " 5 | Fair show. |
| Tagetes, 2 varieties | May 31 | June 23 | " 10 | Good border. |
| Verbena hyb. auriculæflora | " 31 | July 10 | " 20 | Very fine show. |
| Whitlavia gr. fl | June 2 | " 1 | " 1 | Bloomed well. |
| Wahlenbergia | " 10 | | | Did not bloom. |
| Zinnia elegans, 2 varieties | " 1 | July 10 | Oct. 1 | Fine show. |

ANNUALS.—Sown in the open, May 19.

| Variety. | Bloom. From | Bloom. To | Remarks. |
|---|---|---|---|
| Alyssum, Sweet | Aug. 1 | Oct. 20 | Very good. |
| Asters | " 23 | " 10 | Poor. |
| Antirrhinum | " 4 | " 10 | Good. |
| Ageratum | | " — | Did not grow. |
| Calliopsis | Aug. 8 | " 1 | Fair show. |
| Candytuft | July 10 | Sept. 28 | Good flowers. |
| Calendula | " 20 | Oct. 10 | " |
| Clarkia | " 20 | " 10 | Good. |
| Chrysanthemum | " 22 | Sept. 24 | Very fair. |
| Coreopsis | Aug. 20 | Oct. 1 | " |
| Eschscholtzia, 4 varieties | July 18 | Sept. 24 | Bloomed very fully. |
| Dianthus | Aug. 8 | Oct. 10 | " |
| Godetia | " 8 | " 10 | Fair show. |
| Helichrysum | | | Did not grow. |
| Marigold | July 24 | Sept. 24 | Fair show. |
| Mignonette | " 20 | Oct. 10 | Very good. |
| Phlox Drummondii | Aug. 2 | " 20 | " |
| Poppies | July 28 | Sept. 26 | Good. |
| Salpiglossis | Aug. 8 | Oct. 1 | " |
| Scabiosa | " 10 | Sept. 10 | " |
| Tropæolum | July 19 | " 20 | Good show. |
| Whitlavia | Aug. 1 | " 24 | " |
| *Sweet Pease, 33 varieties | July 26 | " 28 | Good succession of bloom. |

*Sown May 10.

## PERENNIALS.

The old beds of perennials, most of which were planted out in 1900, made very strong growth, and presented a fine succession of bloom throughout the season.

## BULBS.

*Tulips.*—In flower from May 15 to June 2. Very fine, but suffered from the drought, which shortened the flowering period.

*Dahlias.*—Set out June 2; in flower July 18 till frost. The double ones were especially fine.

*Gladioli.*—Set out June 10; in flower August 8. Did well.

*Iris.*—Beds of Iris planted in 1900 bloomed freely from June 4 to July 19.

## PAEONIES.

In flower from June 10 to July 15.

Last spring a large number of Japanese Iris, and some Cannas and Dahlias were sent up from the Central Experimental Farm, Ottawa. These were planted out and made satisfactory growth. A number of the Dahlias flowered very fully till September 17. Following will be found a list of those living at the close of the season.

JAPANESE IRISES.

Hana-aoi.
Momiji-no-taki.
Kumomano-sora.
Gold Bound.
Uji-no-hotaru.
Ho-o-jo.
Sofu-no-koi.
Shishi-ikari.
Kumo-isho.
Shichinkwa.
Violet Cap.
Mahogany.
Neptune.
Zenobia.
Kigan-no-misao.
Kasui-no-iro.
Samidare.
Shippo.
Oscar.
Shishi-odori.
Tsurugi-no-mai.

CANNAS.

Austria.
Baron de Poilly.
C. Bernardin.
Gladiator.
Mdlle. Berat.
Paul Marquant.
Pennsylvania.
Queen Charlotte.

DAHLIAS.

Aurata.
Bishop of Durham.
Clifford W. Bruton.
Constance.
Empress of India.
Ernest Glasse.
Gem.
Grand Duke Alexis.
Gilt Edge.
Herbert Turner.
Iridescent.
John Sladden.
John Cowan.
Lady H. Grosvenor.
Little Morris.
Lord Hawke.
Mantas la Villa.
Mrs. Wheeler.
Mrs. Dodds.
Mrs. Beedle.
Mammoth Queen.
Matchless.
Perfect Vallon.
Paragon.
Snowclad.
Snowflake.
Wm. Agnew.
Wm. Pearce
Woman in White.

In the Annual Report for 1903 a list of perennial flowers is given, most of which were sent from the Central Experimental Farm in 1900. Nearly all of these proved hardy. Included in this list was a number of varieties of iris, pæony and many other attractive perennials. Particulars as to the species and varieties tested will be found on pages 382-4 of that report.

## TREES AND SHRUBS.

All trees and shrubs made large growth during the past season. All were well out in leaf by May 24, and no set-back took place up to the time of frost in September.

So rapid has been the growth of trees about fruit, and other garden plots, the last few years, that it has been found necessary to cut out in some cases, and cut back in many, the hedges surrounding these plots. While every season these hedges have been severely trimmed, they have outgrown such work, and are becoming an injury to all produce growing at all close to them. Maple and willow hedges are giving the most trouble in this respect.

Over 100,000 maple trees, in addition to a large number of shrubs have been taken up and heeled in for next spring's distribution.

## ARBORETUM.

Three specimens of Populus Angustifolia were sent up from Ottawa last spring, and some cuttings of Basket Willow, which were planted out in the Arboretum. The Poplars took root readily and made strong growth, but the Willows were very slow in making a start, and had only made a weak growth at the close of the season.

All the other varieties of trees and shrubs under observation in the Arboretum, numbering about 300, a list of which was given in my report for 1903, made a better growth than usual. Many of the tender and half-hardy species were injured to a larger extent by the severe winter than they generally are, but the effects of this were soon overcome when the spring growth started.

The following trees and shrubs have done the best on the Indian Head Farm, and can be recommended for cultivation throughout the Territories:—

| *Botanical Name—* | *Common Name—* |
|---|---|
| Acer Negundo. | Box Elder. |
| Acer Tataricum Ginnala. | Ginnalian Maple. |
| Alnus glutinosa. | Common Alder. |
| Betula populifolia. | White Birch. |
| Caragana arborescens. | Siberian Pea Tree. |
| Cornus stolonifera. | Red Osier Dogwood. |
| Cotoneaster integerrima. | Common Cotoneaster. |
| Crataegus chlorosarca. | |
| " coccinea. | Scarlet Haw. |
| " Crus galli. | Cockspur Thorn. |
| Fraxinus americana. | White Ash. |
| " pennsylvanica lanceolata. | Green Ash. |
| Lonicera Alberti. | Albert Regel's Honeysuckle. |
| " tatarica. | Tartarian Honeysuckle. |
| Populus balsamifera. | Balsam Poplar. |
| " deltoidea. | Cottonwood. |
| Rhamnus cathartica. | Common Buckthorn. |
| " frangula. | Breaking Buckthorn. |
| Ribes aureum. | Missouri Currant. |
| " Sibirica. | Siberian Currant. |
| Salix pentandra. | Laurel-leaved Willow. |
| " purpurea pendula. | Pendulous Purple Willow. |
| " Voronesh. | Voronesh Willow. |
| Syringa chinensis. | Rouen Lilac. |
| " Josikea. | Josika's Lilac. |
| " vulgaris. | Common Lilac. |
| Ulmus americanus. | American Elm. |
| Viburnum opulus. | Highbush Cranberry. |

### ARBORETUM.

The Arboretum was very attractive during the past season, and proved of interest to visitors at all times from the early spring till late in the fall. On account of the abundant rains, everything made extra strong growth.

## FRUIT TREES.

Crab apples (Pyrus Baccata), Currants Red, White and Black, Raspberries Red and Black, and Gooseberries, gave fair crops of fruit this year. Plums were a poor crop, and none of the fruit ripened before frost came. Native fruit was destroyed by spring frosts.

I am sorry to report that considerable injury was done to many of the young cross-bred apple trees by rabbits last winter. When first noticed, tar-paper was tied about each tree, which protected them till the deep snow of March, when the rabbits were able to reach the branches. In some cases the young trees were entirely girdled.

### PLANTING.

Last spring the following cross-bred apples and seedlings of cross-bred apples were received from the Central Experimental Farm, Ottawa, and planted:—

#### CROSS-BRED APPLES.

1 Manitou.
3 Alberta.
2 Dawn.
7 Tony.
2 Aurora.
4 Northern Queen.
2 Elsa.
2 Eve.
1 Bow.

#### SEEDLINGS OF CROSS-BRED APPLES.

| | | | | | |
|---|---|---|---|---|---|
| 5 | seedlings of | Apple from Winnipeg. | 2 | seedlings of | Columbia. |
| 19 | " | Aurora. | 2 | " | Olive. |
| 11 | " | Martha. | 2 | " | Charles. |
| 19 | " | Alberta. | 2 | " | Carrie. |
| 17 | " | Tony. | 6 | " | Prairie Gem. |
| 12 | " | Carleton. | 10 | " | Cluster. |
| 7 | " | Progress. | 6 | " | Derby. |
| 2 | " | Cavan. | 2 | " | Parker. |
| 17 | " | Pioneer. | 12 | " | Prince. |
| 1 | " | Ruby. | 13 | " | Sparta. |
| 2 | " | Eve. | 3 | " | Eaton. |
| 2 | " | Hunter. | 4 | " | Eastman. |

#### PLUMS.

Twelve seedlings of Mankato were received and set out.

#### STRAWBERRIES.

Twelve roots of each of the following varieties of strawberries were sent from the Central Experimental Farm and planted. A number of the roots died, but the others made fair growth:—

Greenville.
Enhance.
Crescent.
Daisy.
Johnson's Early.
Bisel.
Daniel Boone.
Williams.

And Alpine Strawberries—
St. Antoine de Padowe.
St. Joseph.
Jean d'Arc.

## FRUIT CROP.

#### SIBERIAN CRAB. (PYRUS BACCATA.)

The Siberian Crabs planted in 1895 again bore large crops of fruit, which was ripe before frost came hard enough to injure them.

### CROSS-BRED APPLES.

A number of the cross-bred apple trees set out in 1901 blossomed, and a few bore a fair crop of fruit, which much excelled the Pyrus baccata in both size and quality.

### PLUMS.

A medium crop of fruit set, but owing to the unfavourable weather in August, it was very slow in maturing, and was frozen before any of it was ripe.

### SAND CHERRIES.

A few varieties of sand cherry blossomed, and some fruit set, but it was poor and of little value.

## SMALL FRUITS.

### CURRANTS.

Red, White and Black Currants all bore a heavy crop of fruit of excellent quality. The cross-bred varieties set out in 1902 nearly all fruited this year. Following is a list of the varieties under test :—

*Black.*—Pomona, Stewart, Clipper, Black Victoria, Black Naples, Native Black, Perry, Eagle, Monarch, Charmer, Beauty, Ontario, Stewart, Ethel, Sterling, Standard, Orton, Star, Madoc, Climax, Kerry, Eclipse, Oxford, Winona, Lewis, Prince of Wales.

*Red.*—Fay's Prolific, Wilder, North Star, Raby Castle, Red Dutch, Cherry, Versaillaise, Fertile d'Angers, Prince Albert, Victoria.

*White.*—White Imperial, White Grape, White Dutch.

### RASPBERRIES.

The first fruit that ripened was rather poor and dry, owing to the hot, dry weather, but the rains at the end of July caused the berries to fill out better, and a good crop was produced.

Marlboro, Miller, Dr. Reider, Kenyon Seedling, Caroline, Garfield, Mary, Turner, Hilborn Black and Older Black all fruited well.

### GOOSEBERRIES.

Houghton and Smith's Improved produced a good crop of fruit. The young plants set out in 1902 and 1903 did not fruit.

### STRAWBERRIES.

Vines all died in winter of 1902-3.

## CATTLE.

The herd now consists of 48 head, 25 pure-bred Shorthorns and 23 grade animals. The bull, 'Arbor,' bred by E. Porter, Lowfield, Kirkby, Lonsdale, England, is at the head of the herd.

### FEEDING TEST.

On November 7, 10 steers 1½ years old, and 8 steers 2½ years old, were purchased for feeding test. When tested for tuberculosis, two of each lot reacted. They were killed and examined, and the two young ones were found to be slightly, the two older steers seriously affected with tuberculosis.

Two steers raised on the farm were added, which brought the numbers up to 8 steers 1½ years old, and 8 steers 2½ years old.

It was desired to ascertain at which age the animals could be most economically fattened.

The test, which was for sixteen weeks, commenced on December 18, when the animals were divided into two lots, lot 1 comprising the 1½ year cattle, and lot 2 those aged 2½.

They were fed as follows:—

Lot 1. Each animal received per day :—Hay, 8 lbs.; ensilage, 15 lbs.; turnips, 10 lbs.

Meal was fed at the rate of 2 lbs. per head per day for first month, and increased 2 lbs. per head per day each month during the test.

Lot 2. Per head per day:—Hay, 12 lbs.; ensilage, 20 lbs.; turnips, 15 lbs.

Meal, 6 lbs each per day for first month, and increased by 2 lbs. each per day each month of test.

Turnips were only fed during the first half of test.

The meal used consisted of two parts barley, and one part small wheat.

Straw was also fed each lot, but account was not kept of the quantity consumed.

Before the test started the steers were fed the same ration as during the first month of test, and from end of test till sold, the same as during the last month of test.

Following will be found a statement of the monthly and total weights and gains of each lot during the test and till sold; the total amount and estimated value of the feed consumed from the time the steers were bought till they were sold; and a summary of the financial results of the transaction:—

MONTHLY and total weights and gains of each lot of steers.

| Lot. | Weight at start of test. | 1st 4 weeks. | | 2nd 4 weeks. | | 3rd 4 weeks. | | 4th 4 weeks. | | Total gain during test. | Weight when sold. | Gain from end of test till sold, 11 days. | Total gain. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Weight. | Gain. | Weight. | Gain. | Weight. | Gain. | Weight. | Gain. | | | | |
| | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. |
| Lot No. 1, 1½ years old... | 6,900 | 7,100 | 200 | 7,410 | 310 | 7,690 | 280 | 8,010 | 320 | 1,110 | 8,120 | 110 | 1,220 |
| Lot No. 2, 2½ years old... | 9,150 | 9,570 | 420 | 10,060 | 490 | 10,460 | 400 | 10,940 | 480 | 1,790 | 11,190 | 250 | 2,040 |
| Totals.... | 16,050 | 16,670 | 620 | 17,470 | 800 | 18,150 | 680 | 18,950 | 800 | 2,900 | *19,310 | 360 | 3,260 |

* Sold less 5 per cent shrinkage, leaving net weight 18,345 lbs.

Total weight and estimated value of feed consumed during the whole period—November 7 to April 19:

PREPARATORY FEEDING, 41 DAYS.

*Lot 1.*

| | |
|---|---|
| Hay, 2,624 lbs. at $5 per ton.......................... | $ 6 56 |
| Ensilage, 4,920 lbs. at $2 per ton.................... | 4 92 |
| Meal, 656 lbs. at ⅔c. per lb.......................... | 4 37 |
| Turnips, 3,280 lbs. at 5c. per bushel................. | 2 73 |
| | $18 58 |

*Lot 2.*

| | |
|---|---|
| Hay, 3,936 lbs. at $5 per ton | $ 9 84 |
| Ensilage, 6,560 lbs. at $2 per ton | 6 56 |
| Meal, 1,968 lbs. at ⅔c. per lb | 13 12 |
| Turnips, 4,920 lbs. at 5c. per bushel | 4 10 |
| | $33 62 |

Or for both lots, $52.20.

DURING TEST, 112 DAYS.

*Lot. 1.*

| | |
|---|---|
| Hay, 7,168 lbs. at $5 per ton | 17 92 |
| Ensilage, 13,440 lbs. at $2 per ton | 13 44 |
| Meal, 4,480 lbs. at ⅔c. per lb | 29 87 |
| Turnips, 4,480 lbs. at 5c. per bushel | 3 73 |
| | $64 96 |

*Lot 2.*

| | |
|---|---|
| Hay, 10,752 lbs. at $5 per ton | $ 26 88 |
| Ensilage, 17,920 lbs. at $2 per ton | 17 92 |
| Meal, 8,064 lbs. at ⅔c. per lb | 53 76 |
| Turnips, 6,720 lbs. at 5c. per bushel | 5 60 |
| | $104 16 |

Or for both lots, $169.12.

FROM END OF TEST TILL SOLD, 11 DAYS.

*Lot 1.*

| | |
|---|---|
| Hay, 704 lbs. at $5 per ton | $ 1 76 |
| Ensilage, 1,320 lbs. at $2 per ton | 1 32 |
| Meal, 704 lbs. at ⅔c. per lb | 4 69 |
| | $7 77 |

*Lot 2.*

| | |
|---|---|
| Hay, 1,056 lbs. at $5 per ton | $ 2 64 |
| Ensilage, 1,760 lbs. at $2 per ton | 1 76 |
| Meal, 1,056 lbs. at ⅔c. per lb | 7 04 |
| | $11 44 |

Or for both lots, $19.21.

SUMMARY OF COST OF FEEDING.

| | |
|---|---|
| Preparatory | $ 52 20 |
| During test | 169 12 |
| Till sold | 19 21 |
| | $240 53 |

Cost of feeding Lot 1—$91.31, or $11.41 per head.
Cost of feeding Lot 2—$149.22, or $18.65 per head.

SUMMARY of Financial result of the Transaction.

| Lot. | Price per head. | Amount paid. | Add cost of feed. | Total cost. | Weight sold. | At | Amount received. | Gain each lot. | Gain per head. |
|---|---|---|---|---|---|---|---|---|---|
| | $ cts. | $ cts. | $ cts. | $ cts. | Lbs. | cts. | $ cts. | $ cts. | $ cts. |
| No. 1 | 21 00 | 168 00 | 91 31 | 259 31 | 7,714 | 4 | 308 56 | 49 25 | 6 15 |
| No. 2 | 29 50 | 236 00 | 149 22 | 385 22 | 10,631 | 4 | 425 24 | 40 02 | 5 00 |
| Total | ........ | 404 00 | 240 53 | 644 53 | 18,345 | 4 | 733 80 | 89 27 | * |

* Or an average net gain of $5.58 per head.

## HORSES.

There are 13 horses, young and old, on the farm at present. Two of these are very old and of not much service, one of them having been brought up from Ontario when the farm was started in 1887.

During the summer, one of the driving horses died, and has not yet been replaced.

Last spring a fine colt was born, which keeps the number of horses the same as last year.

## SWINE.

Three breeds are kept.—Berkshire, Tamworth and Yorkshire White. The two first breeds have done much the best the past season.

Since sending in my last report, 1 Berkshire boar and 1 sow, and 3 Tamworth boars and 3 sows have been sold to farmers for breeding purposes.

At the present date, November 30, there are 17 Berkshire, 19 Tamworth and 2 Yorkshire White pigs on the farm.

## TEST OF PASTURING HOGS ON RAPE.

In compliance with a request of Dr. Elliott, Minister of Agriculture for the North-west Territories, a test was made during the past season of feeding some swine on rape, with the addition of a small quantity of meal.

One acre of corn land, ploughed the previous fall and harrowed, was sown with three pounds of rape seed, in drills 28 inches apart, on June 1. A good catch resulted and the rape made rapid growth. Up to July 19 the acre was scuffled twice, and all weeds in rows taken out by hoe. On July 19, a wire hog-fence was put around the lot, and a cross fence in the centre, cutting the acre in two. At this date the rape was meeting in the rows, when 10 pigs—5 Berkshire and 5 Tamworth grades were put in one of the half acres. Finding the pigs were making no impression on the rape, 7 pure bred Tamworths were added on July 23, when the test commenced.

The pigs were weighed when put in on September 23 and October 23, making a three months test. When taken from the half acre on October 23, one-third of the rape was still nearly meeting in the rows, and was afterwards eaten off by cattle.

During the first two months the swine were given 2,080 pounds of meal (oats and barley, half of each), which is equal to a little less than two pounds per head per day; in the third month they consumed 1,780 pounds, which equals three and a half pounds per head per day. Whether the rape had attained too rank a growth or not, before the pigs were put on, I cannot say, but during the entire period very little was eaten, and for the first month no impression whatever was made on the half acre. Until the meal ration was materially increased the animals were always hungry.

I give below the weights of the pigs at the different dates, with the amount of gain made:—

| | July 23. lbs. | Sept. 23. lbs. | Oct. 23. lbs. |
|---|---|---|---|
| 17 pigs weighed. . . . . . . . . . . . . . | 1,345 | 1,760 | 2,210 |
| Gain. . . . . . . . . . . . . . . . . . . . . . | | 415 | 450 |
| Average weight. . . . . . . . . . . . . . | 79 | 103 | 130 |
| Average gain. . . . . . . . . . . . . . | | 24½ | 26½ |

From July 23 to September 23 is 62 days, and from September 23 to October 23 is 30 days. It will be observed that after the quantity of meal was increased, the animals put on flesh more than twice as fast as before.

On the half acre on which no swine were pastured the yield of rape was 16 tons, or at the rate of 32 tons per acre. It attained a height of from two to three feet.

## POULTRY.

Plymouth Rock, Light Brahma and Black Minorca fowls are kept on the farm. Eggs for setting and young fowls are sold to applicants as far as they can be supplied.

## SEED GRAIN FOR DISTRIBUTION.

Early last winter two cars of 60,000 pounds each, of wheat, oats and barley were made up and shipped to Ottawa for distribution. In November this year, two more 60,000 pound cars loaded with wheat, oats, barley, pease, &c., were shipped to Ottawa.

In addition there is available for seed purposes, in excess of the requirements for the distribution from this farm a considerable quantity of grain which will be sold to settlers in lots of from two to six bushels, the large demand not permitting larger quantities to be sold to one applicant.

## MEETINGS ATTENDED.

During last winter I attended, in company with Dr. Elliott, Minister of Agriculture for the Territories, Institute meetings at North Portal, Estevan, Weyburn, Yellow Grass and Milestone, on the Soo line. Other meetings had to be cancelled on account of snow storms.

In February a two-days stock-judging school was held in Indian Head, which I attended and assisted at as far as possible. Stock from the Experimental Farm was provided for the judging.

## EXCURSIONS.

On June 16, the Regina fire brigade organized a large excursion from Regina and intermediate points to Indian Head, and large numbers visited the farm. Between 600 and 800 people thronged the gardens and other parts of the farm during the day.

On July 1, a very considerable number, 1,000 or more, drove or walked through the grounds from morning till late in the evening.

On July 12, the Orangemen of the surrounding districts met in Indian Head, and in great crowds inspected the farm throughout the day.

And on July 19, two large excursions, from Moosomin in the east to Moosejaw in the west, numbering over 1,500 people, and with an additional 300 or 400 from the town and district, spent the day on the farm. This excursion was under the auspices of the Department of Agriculture, Regina, and during the day, Dr. Elliott, Commissioner of Agriculture, and others, addressed the visitors. Mr. Gibson, manager of the creamery at Qu'Appelle Station, gave lessons in butter-making, and W. J. Black, B.S.A., of the *Farmer's Advocate*, gave valuable instruction in stock-judging, to a large and attentive audience. The weather was very fine, and the many visitors enjoyed the day greatly.

## DISTRIBUTION OF SAMPLES.

During the months of March, April and May, the following distribution of samples of the products of the farm was made to applicants throughout the Territories of Assiniboia, Alberta and Saskatchewan.

As usual, it was only possible to supply about half the number of applicants, although the number of samples sent out was considerably larger than in previous years :—

| | |
|---|---|
| Wheat | 420 bags, 3 lbs. each. |
| Oats | 542 " |
| Barley | 367 " |
| Pease | 176 " |
| Sundries (Flax, Rye and Spelt) | 153 " |
| Potatoes | 818 " |
| Tree Seeds, Maple | 810 bags, ½ lb. each. |
| Tree Seeds, Caragana | 900 packets. |
| Grass Seed, Brome | 166 bags, 1 lb. each. |
| Grass Seed, Western Rye | 66 " |
| Small Seeds | 446 packages, containing 7,940 packages of shrub-seed, flower-seed, root-seed, garden-seeds and corn. |
| Rhubarb Roots | 88 packages. |
| Fruit Bushes | 186 " |
| Tree and Shrub seedlings | 720 " |
| Express parcels containing Maple seedlings and other trees and shrubs | 105 parcels. |

## CORRESPONDENCE.

During the twelve months ending October 31, 1904, 5,849 letters, irrespective of reports on grain and other samples, were received, and 5,871 letters, not counting circulars of instruction sent with samples, were mailed from this office.

## METEOROLOGICAL.

| Month. | Temperature, Maximum. | | Temperature, Minimum. | | Snow-fall. | Rainfall. | | Hours of Bright Sunshine. |
|---|---|---|---|---|---|---|---|---|
| 1903. | Date. | Degrees | Date. | Degrees | Inches. | No. of days. | Inches. | |
| November | 2 | 73 | 19 | —16 | 11 | ........ | ........ | 82·6 |
| December | 26 | 39 | 12 | —27 | 14 | ........ | ........ | 75·8 |
| 1904. | | | | | | | | |
| January | 7 | 42 | 24 | —47 | 8·5 | ........ | ........ | 81·4 |
| February | 29 | 32 | 10 | —44 | 22·5 | ........ | ........ | 120·3 |
| March | 30 | 38 | 11 | —26 | 33 | ........ | ........ | 113·3 |
| April | 28 | 72 | 7 | 7 | 3·5 | 3 | ·19 | 165·8 |
| May | 20 | 78 | 24 | 24 | ........ | 9 | 1·94 | 165·6 |
| June | 18 | 90 | 4 | 34 | ........ | 13 | 2·74 | 221·7 |
| July | 23 | 92 | 26 | 38 | ........ | 8 | 3·81 | 299·5 |
| August | 26 | 86 | 27 | 33½ | ........ | 11 | 1·17 | 210·8 |
| September | 7 | 80 | 19 | 24 | ........ | 10 | 1·79 | 146·6 |
| October | 30 | 69 | 25 | 18 | ........ | 3 | ·32 | 145·8 |
| | | | | | 92·5 | 57 | 11·96 | 1,829·2 |

I have the honour to be, sir,
Your obedient servant,

ANGUS MACKAY,
*Superintendent.*

# EXPERIMENTAL FARM FOR BRITISH COLUMBIA.

## REPORT OF THOMAS A. SHARPE, SUPERINTENDENT.

AGASSIZ, B.C., November 30, 1904.

To Dr. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit the following report of the work done and progress made on the Experimental Farm at Agassiz during the year 1904.

The season while in some respects peculiar, has been on the whole, a favourable one.

The winter was mild, the lowest temperature recorded at this station in January, being 15, with a snowfall for the month of four inches and six and a quarter inches of rain. February, the coldest was 17 degrees of frost and nearly nine inches of rain and thirty-two inches of snow.

There was less rain and snow in March, the fall being 5¼ and 6½ inches respectively, and the coldest was 30 on two occasions, but the prevailing winds were north-west and north-east and there was very little progress in vegetation.

A temperature of 30 with a sharp frost on April 29 caught many of the fruit trees in bloom and a good deal of the bloom fell off, especially in the case of the plums.

The weather turned drier in May, the rainfall for the month being less than 2½ inches, which is much lower than usual, but the winds were cool and growth very backward.

June remained cool and although the rainfall was a little heavier than that of May, yet the grass and clover began to show need of more rain.

In July the rainfall was light and the weather became warm and growth was rapid, except in clover fields where the second crop had been cut, corn and all sorts of grain made rapid progress. The weather continued bright and warm throughout August, September and October with very light rainfall, very fine for harvest and all other farm work but almost too dry for root crops.

On the whole, the season, although rather dry during most of the summer has been very favourable for farm work, and even root crops, where the soil was kept stirred, have been satisfactory, and the weather for harvesting them exceptionally fine. Up to the present date we have not had a killing frost, roses and sweet pease being still in bloom in the open garden.

### FRUIT CROP.

The continued wet weather in May and early June damaged the cherry crop and to some extent injured the strawberry crop, but with clearer, warmer weather the larger fruits had a better chance. Plums and pears were light in many orchards owing to the frost in last of April, and the cool weather in April and May, but the sample was fine and there was less rot in the plums than usual. The apples, too, were freer from skin diseases, and owing to the bright sunny autumn were better coloured and finer than usual.

### HEDGES.

Many people are making inquiries as to the best hedges. In evergreens, wherever it will stand the climate the holly makes a very handsome hedge, making a close compact growth and, when old enough to produce berries, the glossy green leaves and bright red berries make it a thing of beauty.

The eastern hemlock, eastern arborvitae, Norway spruce, pyramidal arborvitae, and the native cedar all make very compact handsome hedges which look well always.

For flowering hedges, the weigelias, deutzias, Japan quince or Japanese snow-ball all look well when in bloom.

## ORNAMENTAL TREES AND SHRUBS.

There was a heavy fall of soft damp snow in February which clung to the trees and shrubs and some were crushed and injured, but none so much as to ruin them, with this exception, the growth has been very strong and many of the flowering trees and shrubs never looked better than they did this year. In flowering trees the double flowering thorns, pink, scarlet and white, the laburnum, and the flowering dogwood, pink and white, grow luxuriantly and flower profusely.

In shrubs the Japanese quince and Japanese snowball, the weigelias, spiraeas, hydrangeas, syringas, deutzias, philadephus and many others make a fine display of bloom from the last of March until June, and many of the shrubs and trees having variegated or purple foliage make a strikingly handsome appearance all summer.

The timber and nut trees in the forest belt continue to grow and thrive, and many of the trees planted on the mountain side are getting above the underbrush, and when the trees get their autumn tints are distinctly noticeable.

## NUT TREES.

The English and American black walnuts each produced a few nuts, and the Japanese walnut a fine crop. The chestnuts also, many of them, had a fair crop of nuts. Many requests for nuts and tree seeds are received from farmers throughout the province, and reports coming in of the nuts distributed in former years show that there is a live interest being taken in nut tree growing, as the trees when once well established, make a rapid growth and soon become handsome shade trees as well as nut producers. The filberts of all the nut producers are unsatisfactory, the crop on all the varieties being very poor, and the bluejays begin to carry them off before they are properly filled.

## DITCHING.

Considerable ditching has been done during the year, and the old ditches where open have been cleaned out, and many of the wet places along the foot of the mountains are now dry and will be cleared of brush and put under cultivation and pasture as rapidly as possible.

## NEW BREAKING.

About 8 acres have been ploughed and disked, and are now being ploughed again to be in readiness for a crop next year.

## LIVE STOCK.

The cattle here are all registered short-horns, and the herd consists of 9 cows,, 4 heifers, 3 bulls and 7 calves, 4 of these are bull calves, and 3 heifer calves. One short-horn cow was sold for beef, as she proved to be barren. One of the bull calves mentioned in my report last year has been sold as a breeder and the other is on hand.

## SHEEP.

The flock at present consists of fifteen ewes and ewe lambs, and six rams. Three ewes were lost since my last report, one died of old age, and the other two from unknown causes, as the flock has been at all times healthy. Two barren ewes and two rams were sold to the butcher, and one ram for a breeder. The Dorset Horned sheep appear to make a satisfactory cross with the common sheep, buyers being pleased with the results, and butchers say that the grade lambs dress very well.

## PIGS.

The stock now on hand consists of two Yorkshire White sows and a Yorkshire Write boar, all very fine individuals, and six young pigs of this breed. A Berkshire boar, three young sows and seven pigs, all fine thrifty animals.

## HORSES.

The horse stock is the same as last year, but an effort is being made to get a young heavy team, as the area under cultivation is getting greater and more team force is necessary.

Young heavy teams are very scarce, but it is hoped that before the work commences in spring a team will be got.

## BEES.

Seven swarms of bees were taken into winter quarters, but three of them died before spring, and the others were much reduced in strength when spring opened. Three fine swarms have been saved this season, and there are now seven strong colonies which are well supplied with honey to carry them over the winter.

## FOWLS.

There are now on the farm five breeds of fowls, Black Minorcas, Rose Comb Brown Leghorns, B. P. Rocks, Brahmas and Buff Orpingtons. As in former years, the Black Minorcas have been the best layers, and their eggs are large; the R. C. Brown Leghorns laid nearly as many eggs as the Black Minorcas, but their eggs were smaller.

Of the last three named breeds, the B. P. Rocks are the best layers.

Brahmas and Buff Orpingtons are about equal with us as layers, but the B. P. Rocks and Buff Orpingtons mature earlier than the Brahmas and all three breeds are good sitters, and good mothers, and are profitable as layers until two and a half years old, when they are apt to get too fat and lay fewer eggs.

The hens are kept in breeding pens, with yards attached, from January 1 to July 1. During the rest of the year they are allowed to run at large.

They are seldom troubled with any disease except sometimes a little rheumatism, which is caused by the wet weather; but crows, hawks and skunks carry off a good many chickens, even after they are well grown.

We have had an average of 60 per cent of chickens from eggs put into the incubator. These chickens are raised in a brooder, which is kept in a brooder-house, and have been strong and thrifty, but they have not been either stronger or healthier than chickens hatched and raised by hens, nor has the per cent of loss been greater from any cause.

The hens are fed mixed grains, ⅔ wheat, ⅙ oats and ⅙ pease, sunflower seeds in the autumn, and during the coldest weather in winter they get once a day boiled roots and chop mixed, and a cabbage head or some vegetable always before them.

The hen-house is whitewashed several times a year. The roosts and nest boxes are movable, so as to be easily cleaned and renewed, and they are given clean chaff or straw on a swept floor once a week.

## EXPERIMENTS WITH OATS.

Forty-three varieties of oats were sown on one-fortieth of an acre plots. The soil was a sandy loam, in fair condition, having been in corn the previous year and the corn had been planted on clover stubble with a luxuriant aftergrowth of clover turned under. The mountain close on the east side of the field and a fir wood on the west deprived it of the early morning and evening sunshine, and perhaps on this account aided the spread and growth of rust, which was more or less in evidence in all the varieties, and which lessened the yield to a considerable degree. All were sown April 16.

OATS—TEST OF VARIETIES.

| Number. | Name of Variety. | Date of Ripening. | No. of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Kind of Head. | Weight of Straw | Yield per Acre. | | Weight per Bushel. | Rusted |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | In. | | In. | | Lbs. | Bush. | Lbs. | Lbs. | |
| 1 | Golden Fleece | Aug. 8 | 114 | 44 | Medium | 10 | Branching | 5,520 | 67 | 2 | 36 | Slightly. |
| 2 | White Giant | " 13 | 119 | 46 | " | 9 | " | 5,400 | 61 | 16 | 35½ | " |
| 3 | Thousand Dollar | " 11 | 117 | 42 | " | 10 | " | 5,200 | 61 | 6 | 38 | Consid'ably. |
| 4 | Holstein Prolific | " 8 | 114 | 40 | Strong | 10 | " | 5,840 | 60 | 20 | 34½ | " |
| 5 | Irish Victor | " 12 | 118 | 40 | Medium | 10 | Sided | 5,520 | 60 | 10 | 36 | |
| 6 | Kendal White | " 13 | 119 | 42 | " | 8 | Half sided | 5,680 | 59 | 24 | 36 | Badly. |
| 7 | Pense Black | " 12 | 118 | 46 | " | 9 | Branching | 5,680 | 59 | 14 | 35½ | " |
| 8 | Banner | " 8 | 114 | 44 | " | 10 | " | 5,800 | 59 | 4 | 36 | Slightly. |
| 9 | Olive Black | " 12 | 118 | 44 | " | 8 | Sided | 5,840 | 58 | 28 | 35¼ | " |
| 10 | Improved Ligowo | " 8 | 114 | 46 | " | 9 | Branching | 5,600 | 58 | 18 | 36½ | " |
| 11 | Buckbee's Illinois | " 12 | 117 | 44 | " | 9 | " | 5,400 | 58 | 8 | 35 | Badly. |
| 12 | Improved American | " 13 | 119 | 46 | " | 9 | " | 5,600 | 57 | 32 | 34½ | Slightly. |
| 13 | Lincoln | " 13 | 119 | 46 | " | 10 | " | 5,920 | 57 | 22 | 35½ | Badly. |
| 14 | Tartar King | " 10 | 116 | 44 | " | 9 | Sided | 5,840 | 57 | 22 | 35½ | Slightly. |
| 15 | Waverley | " 10 | 116 | 44 | Stiff | 10 | Branching | 5,800 | 57 | 2 | 35 | " |
| 16 | Kendal Black | " 13 | 119 | 42 | Medium | 10 | Sided | 5,800 | 56 | 26 | 34½ | Badly. |
| 17 | Abundance | " 13 | 119 | 40 | " | 9 | Branching | 5,360 | 56 | 26 | 36 | " |
| 18 | Olive White | " 12 | 118 | 46 | " | 9 | Sided | 5,680 | 56 | 16 | 35½ | Consid'ably. |
| 19 | Pioneer | " 9 | 115 | 42 | " | 9 | Branching | 5,520 | 56 | 16 | 35 | Badly. |
| 20 | Bavarian | " 8 | 114 | 44 | " | 9 | " | 5,600 | 56 | 6 | 35 | Slightly. |
| 21 | Siberian | " 11 | 117 | 42 | " | 10 | " | 5,600 | 55 | 30 | 35½ | Badly. |
| 22 | American Triumph | " 8 | 114 | 42 | Stiff | 9 | " | 5,520 | 55 | 20 | 35½ | Consid'ably. |
| 23 | Pense White | " 9 | 115 | 38 | Medium | 10 | " | 5,600 | 55 | 10 | 34 | Badly. |
| 24 | Wide Awake | " 12 | 118 | 40 | " | 9 | " | 5,600 | 54 | 24 | 35 | " |
| 25 | Twentieth Century | " 12 | 118 | 40 | " | 11 | " | 5,800 | 54 | 14 | 34½ | Slightly. |
| 26 | Joanette | " 11 | 117 | 40 | " | 9 | " | 5,520 | 54 | 4 | 36 | " |
| 27 | Black Beauty | " 8 | 114 | 44 | " | 10 | " | 5,600 | 53 | 28 | 35 | Badly. |
| 28 | Milford White | " 12 | 118 | 44 | " | 9 | Sided | 5,520 | 53 | 18 | 35½ | " |
| 29 | Storm King | " 8 | 114 | 46 | " | 11 | " | 5,920 | 52 | 32 | 36½ | Consid'ably. |
| 30 | Swedish Select | " 9 | 115 | 46 | " | 9 | Branching | 5,120 | 52 | 27 | 35 | " |
| 31 | Golden Giant | " 15 | 121 | 44 | " | 9 | Sided | 5,680 | 52 | 22 | 34¾ | Badly. |
| 32 | Golden Tartarian | " 15 | 121 | 42 | Stiff | 11 | " | 5,840 | 52 | 12 | 35 | Consid'ably. |
| 33 | Scotch Potato | " 13 | 119 | 40 | Medium | 10 | Branching | 5,840 | 51 | 26 | 35½ | Slightly. |
| 34 | Danish Island | " 9 | 115 | 42 | " | 9 | " | 5,760 | 51 | 16 | 36 | " |
| 35 | Swedish Probstey | " 10 | 116 | 46 | " | 9 | " | 5,920 | 51 | 6 | 36 | Badly. |
| 36 | American Beauty | " 15 | 121 | 41 | " | 10 | " | 4,960 | 50 | 30 | 35 | " |
| 37 | Mennonite | " 9 | 115 | 44 | " | 10 | " | 5,600 | 50 | 25 | 35 | Slightly. |
| 38 | Early Golden Prolific | " 9 | 115 | 40 | " | 9 | " | 5,440 | 50 | 20 | 35 | " |
| 39 | Columbus | " 12 | 118 | 41 | Weak | 8 | " | 5,400 | 50 | 10 | 36 | Badly. |
| 40 | Golden Beauty | " 13 | 119 | 42 | Medium | 10 | " | 5,600 | 50 | .. | 34½ | " |
| 41 | Milford (black) | " 8 | 114 | 38 | " | 8 | " | 5,400 | 49 | 24 | 35 | " |
| 42 | Goldfinder | " 13 | 119 | 40 | " | 9 | " | 5,360 | 48 | 28 | 34½ | Consid'ably. |
| 43 | Sensation | " 12 | 118 | 46 | " | 11 | " | 5,840 | 47 | 22 | 35 | " |

## EXPERIMENTS WITH BARLEY.

Thirty-five varieties of barley were sown this year, twenty of which were six-rowed sorts, and fifteen two-rowed. The land for this test was a sandy loam which had been in clover and was top dressed in the spring of 1902 with about twelve tons of barn-yard manure, a heavy growth of clover was ploughed under in the fall of that year and repeatedly disked and harrowed in the spring of 1903, and a crop of potatoes grown on it, which left it in good condition for barley this season. The yields have been fairly good, and owing to bright, dry harvest weather, the sample is good. The plots were all one-fortieth of an acre and all sown April 23. There was no rust or smut on any of the varieties grown.

### SIX-ROWED BARLEY—TEST OF VARIETIES.

| Name of Variety. | Date of Ripening. | No. of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Kind of Head. | Weight of Straw. | | Yield per Acre. | | Weight per Bushel. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | In. | | In. | | Tons. | Lbs. | Bush. | Lbs. | Lbs. |
| Albert | Aug. 4 | 102 | 38 | Medium | 3 | Six-rowed | 3 | 1,520 | 63 | 36 | 48¾ |
| Mensury | 〃 4 | 102 | 38 | Strong | 3 | 〃 | 3 | 1,720 | 62 | 24 | 48½ |
| Claude | 〃 4 | 102 | 36 | Medium | 3 | 〃 | 3 | 1,320 | 60 | 40 | 48¼ |
| Oderbruch | 〃 2 | 100 | 42 | Strong | 3 | 〃 | 4 | .. | 58 | 6 | 48¼ |
| Brome | 〃 6 | 104 | 39 | Medium | 3 | 〃 | 3 | 1,640 | 57 | 24 | 49 |
| Odessa | 〃 1 | 99 | 44 | Strong | 3 | 〃 | 3 | 720 | 57 | 14 | 48 |
| Common | 〃 4 | 102 | 36 | Medium | 3 | 〃 | 3 | 1,200 | 56 | 12 | 48½ |
| Empire | 〃 5 | 103 | 40 | Strong | 3 | 〃 | 3 | 1,600 | 55 | 20 | 48½ |
| Argyle | 〃 5 | 103 | 40 | Medium | 3 | 〃 | 3 | 1,320 | 55 | .. | 49 |
| Baxter | 〃 2 | 100 | 36 | 〃 | 2½ | 〃 | 3 | 1,240 | 54 | 28 | 48¼ |
| Stella | 〃 12 | 110 | 36 | 〃 | 2½ | 〃 | 3 | 520 | 53 | 26 | 48¼ |
| Champion | 〃 1 | 99 | 38 | 〃 | 2½ | 〃 | 3 | 1,440 | 53 | 6 | 48 |
| Garfield | 〃 5 | 103 | 38 | 〃 | 2½ | 〃 | 3 | 1,420 | 51 | 12 | 48½ |
| Trooper | 〃 14 | 112 | 38 | Strong | 3 | 〃 | 3 | 760 | 50 | 50 | 48¼ |
| Summit | 〃 10 | 108 | 39 | Medium | 3 | 〃 | 3 | 1,200 | 50 | 40 | 48½ |
| Mansfield | 〃 6 | 104 | 38 | 〃 | 2½ | 〃 | 3 | 1,400 | 48 | 36 | 48 |
| Yale | 〃 13 | 111 | 40 | 〃 | 2½ | 〃 | 3 | 1,600 | 48 | 26 | 48¼ |
| Nugent | 〃 11 | 109 | 44 | 〃 | 3 | .......... | 3 | 1,420 | 47 | 24 | 48¼ |
| Royal | 〃 9 | 107 | 40 | 〃 | 3 | .......... | 3 | 1,720 | 46 | 12 | 48 |
| Rennie's Improved | 〃 2 | 100 | 40 | 〃 | 3 | .......... | 3 | 1,520 | 45 | .. | 48 |

### TWO-ROWED BARLEY—TEST OF VARIETIES.

| Name of Variety. | Date of Ripening. | No. of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Kind of Head. | Weight of Straw. | | Yield per Acre. | | Weight per Bushel. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | In. | | In. | | Tons. | Lbs. | Bush. | Lbs. | Lbs. |
| Logan | Aug. 10 | 109 | 40 | Bright & stiff. | 3½ | two-rowed | 3 | 1,600 | 67 | 44 | 49 |
| Danish Chevalier | 〃 12 | 111 | 40 | 〃 | 3½ | 〃 | 3 | 1,360 | 56 | 32 | 49 |
| Sidney | 〃 13 | 112 | 43 | Medium | 3½ | 〃 | 3 | 1,720 | 56 | 22 | 48 |
| Canadian Thorpe | 〃 10 | 109 | 41 | 〃 | 3½ | 〃 | 3 | 320 | 56 | 2 | 49 |
| Standwell | 〃 13 | 112 | 43 | 〃 | 3 | 〃 | 4 | 400 | 56 | 12 | 48 |
| Jarvis | 〃 11 | 110 | 46 | Strong | 3½ | 〃 | 3 | 1,840 | 52 | 24 | 48½ |
| French Chevalier | 〃 12 | 111 | 47 | Medium | 4 | 〃 | 3 | 1,720 | 52 | 4 | 49½ |
| Gordon | 〃 8 | 107 | 40 | 〃 | 3 | 〃 | 3 | 1,120 | 51 | 12 | 49 |
| Beaver | 〃 10 | 109 | 44 | 〃 | 3 | 〃 | 3 | 1,400 | 50 | 20 | 49 |
| Newton | 〃 13 | 112 | 40 | Strong | 3 | 〃 | 3 | 1,280 | 50 | 10 | 48½ |
| Fulton | 〃 9 | 108 | 40 | Medium | 3 | 〃 | 3 | 1,440 | 50 | .. | 49 |
| Dunham | 〃 9 | 108 | 43 | 〃 | 3½ | 〃 | 3 | 1,480 | 49 | 8 | 48½ |
| Harvey | 〃 8 | 107 | 38 | 〃 | 3 | 〃 | 3 | 1,600 | 48 | 16 | 48½ |
| Invincible | 〃 11 | 110 | 42 | Strong | 3 | 〃 | 3 | 1,400 | 46 | 12 | 48 |
| Clifford | 〃 9 | 108 | 44 | 〃 | 3 | 〃 | 3 | 1,840 | 45 | 40 | 48 |

## EXPERIMENTS WITH SPRING WHEAT.

Thirty-six varieties of spring wheat were tested in plots of one-fortieth of an acre each. The land was a sandy loam, had been in grass for two years, followed by corn in 1903, and although the yields are not heavy the sample is good as it had fine dry weather for harvest. The plots were sown at the rate of one and a half bushels per acre. All the plots were sown April 25, and were free from rust or smut.

SPRING WHEAT—TEST OF VARIETIES.

| Number. | Name of Variety. | Date of Ripening. | No. of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Kind of Head. | Weight of Straw. | Yield per Acre. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | In. | | In. | | Lbs. | Bush. | Lbs. |
| 1 | White Fife | Aug. 18 | 115 | 46 | Stiff | 3 | Beardless. | 5,400 | 33 | 20 |
| 2 | White Russian | " 19 | 116 | 48 | " | 4 | " | 5,800 | 32 | 40 |
| 3 | Wellman's Fife | " 19 | 116 | 46 | Medium | 3 | " | 5,600 | 32 | .. |
| 4 | Red Fife | " 17 | 114 | 48 | Stiff | 3 | " | 5,800 | 32 | .. |
| 5 | Stanley | " 17 | 114 | 48 | " | 3½ | " | 5,800 | 31 | 20 |
| 6 | Minnesota No. 163 | " 16 | 113 | 41 | " | 3½ | " | 5,700 | 30 | 10 |
| 7 | Admiral | " 16 | 113 | 48 | " | 3½ | " | 5,600 | 30 | .. |
| 8 | Benton | " 18 | 115 | 44 | Medium | 2½ | " | 6,080 | 29 | .. |
| 9 | Percy | " 13 | 110 | 46 | Stiff | 3 | " | 4,520 | 28 | 40 |
| 10 | Hayne's Blue Stem | " 16 | 113 | 48 | " | 3½ | " | 5,840 | 28 | 20 |
| 11 | Countess | " 12 | 109 | 44 | " | 4 | " | 6,000 | 27 | 40 |
| 12 | Powers' Fife | " 17 | 114 | 43 | " | 3 | " | 5,520 | 27 | 30 |
| 13 | McKendry's Fife | " 16 | 113 | 42 | Medium | 3 | " | 5,400 | 27 | 20 |
| 14 | Laurel | " 16 | 113 | 42 | " | 3 | " | 5,600 | 27 | 20 |
| 15 | Australian No. 9 | " 17 | 114 | 46 | Stiff | 3 | " | 5,800 | 27 | 10 |
| 16 | Byron | " 17 | 114 | 48 | " | 3 | Bearded | 5,680 | 27 | .. |
| 17 | Clyde | " 18 | 115 | 40 | " | 3 | Beardless. | 6,320 | 26 | 50 |
| 18 | Preston | " 13 | 110 | 46 | " | 3 | " | 5,480 | 26 | 40 |
| 19 | Weldon | " 18 | 115 | 46 | Medium | 3 | " | 5,600 | 26 | 30 |
| 20 | Huron | " 15 | 112 | 44 | Stiff | 3½ | Bearded | 6,080 | 26 | .. |
| 21 | Monarch | " 18 | 115 | 45 | " | 3 | Beardless. | 5,680 | 25 | 50 |
| 22 | Hungarian | " 16 | 113 | 46 | " | 3½ | Bearded | 6,000 | 25 | 40 |
| 23 | Chester | " 18 | 115 | 42 | Medium | 3 | Beardless. | 6,200 | 25 | 20 |
| 24 | Plumper | " 16 | 113 | 42 | Stiff | 3 | Bearded | 6,400 | 24 | 20 |
| 25 | Australian No. 19 | " 15 | 112 | 48 | " | 3½ | Beardless. | 5,680 | 24 | .. |
| 26 | Rio Grande | " 17 | 114 | 44 | Medium | 3½ | " | 6,000 | 23 | 40 |
| 27 | Crawford | " 13 | 110 | 46 | " | 3 | " | 5,600 | 23 | 20 |
| 28 | Colorado | " 13 | 110 | 44 | Stiff | 3½ | Bearded | 6,400 | 23 | .. |
| 29 | Red Fern | " 18 | 115 | 43 | Medium | 3½ | " | 5,810 | 22 | 50 |
| 30 | Pringle's Champlain | " 16 | 113 | 42 | " | 3 | Beardless. | 5,560 | 22 | 40 |
| 31 | Advance | " 15 | 112 | 46 | Strong | 3 | Bearded | 5,520 | 22 | 20 |
| 32 | Herisson Bearded | " 18 | 115 | 40 | Weak | 3 | " | 5,480 | 22 | .. |
| 33 | Dawn | " 15 | 112 | 48 | Stiff | 3½ | Beardless. | 5,000 | 20 | 40 |
| 34 | Hastings | " 15 | 112 | 42 | " | 3½ | " | 5,680 | 18 | 40 |
| 35 | Early Riga | " 11 | 108 | 40 | Weak | 2½ | " | 5,000 | 18 | .. |
| 36 | Fraser | " 13 | 110 | 48 | Stiff | 3 | Bearded | 5,600 | 17 | 20 |

MACARONI WHEAT.

Four varieties of this class of wheat were sown in plots of the same size alongside of the bread wheat plots. The yields are fairly good, but not better than in the regular classes, and as all of them are heavily bearded, they are not better than in become popular. There was no rust or smut in any of these plots.

MACARONI WHEAT—TEST OF VARIETIES.

| Name of Variety. | Date of Ripening. | No. of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Kind of Head. | Weight of Straw. | Yield per Acre. | | Proportion Rusted. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | In. | | In. | | Lbs. | Bush. | Lbs. | |
| Goose | Aug. 15. | 112 | 47 | Stiff and bright.. | 3½ | Bearded | 6,400 | 29 | 20 | No rust or smut. |
| Mahmoudi | " 20. | 114 | 48 | " .. | 3½ | " .. | 5,600 | 28 | .. | " |
| Yellow Gharnovka | " 19. | 116 | 46 | " .. | 3 | " .. | 5,440 | 26 | 40 | |
| Roumanian | " 17. | 114 | 48 | " .. | 3½ | " .. | 5,300 | 26 | .. | |

EMMER AND SPELT.

Four plots of this class were sown alongside of the wheat plots. The yields are very fair and the straw is bright and clean, and is eaten by cattle as a change in their rations, more readily than wheat or oat straw. From reports of samples sent to the dry parts of the interior it has in each case given satisfactory yields, but the bearded sorts are disliked.

EMMER AND SPELT—TEST OF VARIETIES.

| Name of Variety. | Date of Ripening. | No. of Days Maturing. | Length of Straw. | Character of Straw. | Length of Head. | Kind of Head. | Weight of Straw. | Weight of Grain as threshed. |
|---|---|---|---|---|---|---|---|---|
| | | | In. | | In. | | Lbs. | Lbs. |
| Common Emmer | Aug. 20.. | 117 | 36 | Weak | 2 | Bearded.... | 5,360 | 1,920 |
| Red Emmer | " 20.. | 117 | 40 | Strong | 3 | " .... | 5,600 | 1,840 |
| Red Spelt | " 19.. | 116 | 40 | Medium | 3½ | Beardless... | 5,840 | 1,680 |
| South Dakota No. 524 | " 18.. | 115 | 38 | " | 2½ | Bearded.... | 5,680 | 1,660 |
| White Spelt | " 20.. | 117 | 38 | " | 5 | Beardless... | 5,240 | 1,590 |
| South Dakota No. 3 | " 19.. | 116 | 36 | Weak | 2 | Bearded.... | 5,520 | 1,470 |

## PEASE.

Thirty-three varieties of field pease were tested this year. They were sown on sandy loam which had a heavy growth of clover turned under. The land was in apple orchard and although a strip of six feet on each side of the rows of apple trees was left unsown, yet the shade of the trees injured the crop and lessened the yield. The clear dry weather at harvest time allowed the crop to be harvested in good condition.

The following is a statement of the yields computed from plots of one-fortieth of an acre each.

PEASE—TEST OF VARIETIES.

| Number. | Name of Variety. | Date of Ripening. | Number of Days Maturing. | Character of Growth. | Length of Straw. | Weight of Straw. | Length of Pod. | Size of Pea. | Yield per Acre. | | Weight per Bushel. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | In. | Lbs. | In. | | Bush. | Lbs. | Lbs. |
| 1 | Kent | Aug. 15 | 122 | Strong | 52 | 5,600 | 3 | Large | 40 | . | 62½ |
| 2 | Macoun | " 16 | 123 | " | 51 | 5,400 | 2½ | " | 38 | 50 | 62 |
| 3 | Canadian Beauty | " 11 | 118 | " | 56 | 5,200 | 3 | " | 38 | 40 | 61 |
| 4 | Daniel O'Rourke | " 9 | 116 | Medium | 40 | 5,040 | 2½ | Small | 38 | 40 | 61½ |
| 5 | German White | " 9 | 116 | Strong | 56 | 5,400 | 3 | Medium | 38 | 30 | 63 |
| 6 | Duke | " 16 | 123 | " | 58 | 5,680 | 2½ | Large | 37 | 30 | 60½ |
| 7 | White Marrowfat | " 15 | 122 | " | 50 | 5,640 | 3½ | " | 37 | 20 | 60 |
| 8 | Victoria | " 16 | 123 | Medium | 48 | 5,360 | 3 | Medium | 36 | 40 | 61 |
| 9 | Early Britain | " 9 | 116 | " | 50 | 5,400 | 3 | " | 35 | 40 | 62 |
| 10 | English Grey | " 13 | 120 | " | 56 | 5,520 | 3 | " | 35 | 30 | 60 |
| 11 | Prince | " 15 | 122 | Strong | 46 | 5,200 | 3 | Large | 35 | 20 | 60½ |
| 12 | Wisconsin Blue | " 12 | 119 | Medium | 60 | 5,280 | 2½ | Small | 34 | 40 | 61 |
| 13 | Gregory | " 13 | 120 | Strong | 58 | 5,200 | 3 | Medium | 34 | 20 | 60 |
| 14 | Mummy | " 12 | 119 | Medium | 56 | 5,600 | 3 | " | 34 | .. | 61½ |
| 15 | Crown | " 8 | 115 | " | 54 | 5,440 | 3 | Small | 33 | 20 | 61½ |
| 16 | Pride | " 10 | 117 | Strong | 54 | 5,600 | 3 | Large | 33 | .. | 61 |
| 17 | Mackay | " 14 | 121 | " | 56 | 5,600 | 3 | Medium | 32 | 50 | 60½ |
| 18 | Prussian Blue | " 9 | 116 | " | 48 | 5,520 | 3 | " | 32 | 40 | 60 |
| 19 | Paragon | " 16 | 123 | " | 58 | 5,200 | 3 | " | 32 | 30 | 61 |
| 20 | Carleton | " 12 | 119 | " | 60 | 5,680 | 2½ | " | 32 | 20 | 62 |
| 21 | King | " 12 | 119 | " | 54 | 5,440 | 3 | Large | 32 | 10 | 60½ |
| 22 | Black-eyed Marrowfat | " 9 | 116 | " | 50 | 5,720 | 3 | " | 32 | .. | 60 |
| 23 | Nelson | " 12 | 119 | " | 56 | 4,800 | 3 | Medium | 30 | 40 | 61 |
| 24 | White Wonder | " 8 | 115 | Medium | 56 | 5,840 | 2½ | " | 30 | 30 | 61½ |
| 25 | Prince Albert | " 13 | 120 | " | 48 | 5,200 | 2½ | Small | 30 | 20 | 62 |
| 26 | Pearl | " 16 | 123 | Strong | 68 | 5,320 | 3 | Large | 29 | 20 | 61 |
| 27 | Arthur | " 13 | 120 | " | 50 | 5,690 | 3 | " | 28 | 40 | 62½ |
| 28 | Canadian Beauty | " 11 | 118 | " | 56 | 5,200 | 3 | Very large | 28 | 30 | 61¾ |
| 29 | Golden Vine | " 10 | 117 | Medium | 56 | 5,920 | 2½ | Small | 28 | 10 | 61¾ |
| 30 | Picton | " 16 | 123 | Strong | 50 | 5,000 | 3 | Medium | 28 | .. | 60½ |
| 31 | Archer | " 16 | 123 | Medium | 50 | 5,240 | 2½ | " | 27 | 20 | 60 |
| 32 | Agnes | " 13 | 120 | Strong | 55 | 5,360 | 3 | " | 27 | 10 | 62 |
| 33 | Chancellor | " 16 | 123 | " | 54 | 5,280 | 3 | " | 26 | 40 | 62 |

## EXPERIMENTS WITH INDIAN CORN.

Nineteen varieties of corn were tested this year on soil which was quite sandy. This had been in wheat the previous year, and with the wheat about 10 lbs. of red clover seed was sown. The clover made a strong growth after the wheat was harvested, and was ploughed under early the following spring, and harrowed several times before the corn was planted. As in previous years, all the varieties were tested in drills three feet apart in the drill, and the corn thinned to about six inches apart, and in hills three feet apart each way, and about three plants in the hill. In this district where there is as a rule plenty of rain all summer, and a great deal of foliage on the stalks, we have generally found a better development of ears when grown in hills, and where there was corn on the ear it was more matured than that in the rows. Further, the hills give more room for air and sunlight, and a better chance to fight the weeds, as the horse hoe can be used both ways. This probably more than compensates for the larger crops secured from the drills. All the plots were sown May 20, and cut October 8, 10 and 11. Four rows one hundred feet long were planted, and the weight per acre computed from the crop obtained from 66 feet of the two centre rows in each case.

INDIAN CORN—TEST OF VARIETIES.

| Number. | Name of Variety. | When Tasselled. | In Silk. | Early Milk. | Condition when out. | Weight per Acre grown in Rows. | | Weight per Acre grown in Hills. | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Tons. | Lbs. | Tons. | Lbs. |
| 1 | Compton's Early | Aug. 18 | Aug. 24 | Sept. 20 | Roasting ear | 19 | 1,840 | 15 | 360 |
| 2 | Superior Fodder | Sept. 4 | Sept. 20 | | Ears formed | 18 | 88 | 15 | 800 |
| 3 | Salzer's All Gold | " 10 | " 28 | | In silk | 16 | 1,440 | 15 | 1,240 |
| 4 | Mammoth Cuban | " 12 | " 30 | | " | 16 | 560 | 10 | 1,240 |
| 5 | Eureka | Aug. 28 | " 14 | Oct. 6 | Early milk | 14 | 600 | 15 | 800 |
| 6 | Angel of Midnight | " 24 | " 10 | Sept. 30 | " | 14 | 490 | 11 | 1,800 |
| 7 | Giant Prolific Ensilage | Sept. 1 | " 20 | Oct. 6 | " | 13 | 1,500 | 14 | 1,480 |
| 8 | Red Cob Ensilage | Aug. 28 | " 1 | Sept. 20 | Late milk | 13 | 1,500 | 13 | 620 |
| 9 | Early Butler | " 24 | " 5 | " 30 | Early milk | 13 | 400 | 11 | 110 |
| 10 | Cloud's Early Yellow | " 18 | " 7 | " 24 | Late milk | 12 | 240 | 13 | 180 |
| 11 | Champion White Pearl | Sept. 4 | " 20 | Oct. 1 | Early milk | 11 | 1,540 | 13 | 400 |
| 12 | Pride of the North | " 1 | " 14 | " 8 | " | 11 | 1,430 | 12 | 90 |
| 13 | White Cap Yellow Dent | " 1 | " 15 | Sept. 30 | " | 10 | 1,560 | 11 | 1,980 |
| 14 | Longfellow | Aug. 18 | " 3 | " 20 | Late milk | 10 | 1,120 | 9 | 1,800 |
| 15 | King Philip | " 16 | " 14 | Oct. 8 | Early milk | 10 | 20 | 9 | 700 |
| 16 | Selected Leaming | " 28 | " 22 | " 1 | " | 9 | 1,800 | 10 | 240 |
| 17 | Early Mastodon | Sept. 4 | Oct. 1 | | In silk | 9 | 1,690 | 8 | 1,820 |
| 18 | North Dakota White | Aug. 26 | Sept. 12 | Oct. 8 | Early milk | 7 | 300 | 8 | 1,380 |
| 19 | Evergreen Sugar | Sept. 6 | " 20 | " 1 | " | 5 | 670 | 5 | 10 |

## EXPERIMENTS WITH TURNIPS.

Twenty-five varieties of turnips were tested this year. The land was a sandy loam which had given a crop of wheat in 1902, and was seeded with clover with the wheat, top dressed with about 12 tons of barnyard manure per acre in the winter of 1902 and 1903. The clover, which was a fine stand, was mown twice in 1903, and a fine aftermath turned under in November of 1903. It was disked and harrowed, and given another light dressing of stable manure in early spring. This was well worked into the soil with disk and drag, and the land was in good condition when the seed was sown. Two sowings of each sort were made, the first May 13, and the second May 27. Had the season been a normal one there would doubtless have been a heavy yield. All were sown on the flat in drills, four rows of 100 feet length, 30 inches apart, were sown in each test, and the yield per acre computed from 66 feet of the two centre rows. All were harvested October 24.

TURNIPS—TEST OF VARIETIES.

| Number. | Name of Variety. | 1st Plot Sown. | 2nd Plot Sown. | 1st Plot Pulled. | 2nd Plot Pulled. | Yield per Acre. — 1st Plot. | | Yield per Acre. — 1st Plot. | | Yield per Acre. — 2nd Plot | | Yield per Acre. — 2nd Plot | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Tons. | Lbs. | Bush. | Lbs. | Tons. | Lbs. | Bush. | Lbs. |
| 1 | Carter's Elephant ........ | | | | | 40 | 685 | 1,344 | 45 | 31 | 205 | 1,036 | 45 |
| 2 | Halewood's Bronze Top... | | | | | 39 | 870 | 1,314 | 30 | 32 | 1,670 | 1,094 | 30 |
| 3 | Elephant's Master ....... | | | | | 38 | 1,550 | 1,292 | 30 | 34 | 640 | 1,144 | . |
| 4 | Bangholm Selected........ | | | | | 37 | 1,900 | 1,265 | .. | 35 | 600 | 1,176 | 40 |
| 5 | East Lothian............. | | | | | 34 | 1,940 | 1,165 | 40 | 40 | 520 | 1,342 | .. |
| 6 | Prize Purple Top......... | | | | | 34 | 1,305 | 1,155 | 05 | 29 | 1,940 | 1,166 | 40 |
| 7 | Perfection Swede......... | | | | | 34 | 1,140 | 1,152 | 20 | 31 | 1,360 | 1,056 | .. |
| 8 | Skirvings. ............... | | | | | 30 | 390 | 1,006 | 30 | 38 | 1,220 | 1,287 | .. |
| 9 | Magnum Bonum ......... | | | | | 28 | 1,750 | 962 | 30 | 31 | 40 | 1,036 | 45 |
| 10 | Drummond Purple Top... | | | | | 28 | 100 | 935 | .. | 23 | 860 | 781 | . |
| 11 | Kangaroo ......... .. .... | | | | | 26 | 470 | 874 | 30 | 25 | 490 | 841 | 30 |
| 12 | Good Luck. ........... | | | | | 26 | 305 | 871 | 45 | 24 | 1,005 | 816 | 45 |
| 13 | Selected Purple Top...... | May 13 | May 27 | Oct. 24 | Oct. 24 | 25 | 1,480 | 858 | .. | 23 | 1,190 | 786 | 30 |
| 14 | Imperial Swede..... ..... | | | | | 25 | 1,315 | 855 | 15 | 25 | 820 | 847 | .. |
| 15 | Hall's Westbury ......... | | | | | 25 | 820 | 847 | .. | 21 | 900 | 715 | . |
| 16 | Jumbo....... ........... | | | | | 24 | 1,005 | 816 | 45 | 20 | 790 | 679 | 50 |
| 17 | Improved Elephant....... | | | | | 24 | 510 | 808 | 30 | 21 | 900 | 715 | .. |
| 18 | Mammoth Clyde ......... | | | | | 23 | 1,190 | 786 | 30 | 22 | 880 | 748 | .. |
| 19 | Queen.................. | | | | | 23 | 200 | 770 | .. | 21 | 1,890 | 731 | 30 |
| 20 | Emperor Swede .. ...... | | | | | 22 | 1,870 | 764 | 30 | 31 | 1,535 | 1,058 | 45 |
| 21 | Empress ...... ..... .... | | | | | 22 | 1,375 | 756 | 15 | 24 | 1,170 | 819 | 30 |
| 22 | Sutton's Champion ....... | | | | | 22 | 880 | 748 | .. | 31 | 1,360 | 1,056 | .. |
| 23 | Hartley's Bronze .... .... | | | | | 22 | 220 | 737 | .. | 21 | 1,230 | 720 | 30 |
| 24 | Bronze Globe ............ | | | | | 20 | 425 | 673 | 45 | 24 | 1,830 | 830 | 30 |
| 25 | New Century .... .. .... | | | | | 19 | 115 | 635 | 15 | 18 | 1,620 | 627 | .. |

## EXPERIMENTS WITH CARROTS.

Ten varieties of carrots were included in the test this year. As in the other root tests, two separate sowings were made of each variety. The first sowing was made April 25, and the second two weeks later, on May 9. As in previous years, the intermediate or Vosges sorts yield better than the long sorts, and are much easier and consequently cheaper to harvest, and less liable to be broken in handling. Four rows of each sort, each 100 feet long, were sown, and the yield per acre computed from the yield of 66 feet of the two centre rows. These test plots were alongside of the mangels and the soil conditions were the same. The drills were 30 inches apart. All were harvested October 24.

CARROTS—TEST OF VARIETIES

| Number. | Name of Variety. | 1st Plot Sown. | 2nd Plot Sown. | 1st Plot Pulled. | 2nd Plot Pulled. | Yield per Acre. 1st Plot. | | Yield per Acre. 1st Plot. | | Yield per Acre. 2nd Plot. | | Yield per Acre. 2nd Plot | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Tons. | Lbs. | Bush. | Lbs. | Tons. | Lbs. | Bush. | Lbs. |
| 1 | Giant White Vosges .... | April 25 | May 9 | Oct. 24 | Oct. 24 | 21 | 1,232 | 720 | 32 | 19 | 610 | 643 | 30 |
| 2 | Carter's Orange Giant... | " 25 | " 9 | " 24 | " 24 | 17 | 650 | 577 | 30 | 9 | 975 | 316 | 15 |
| 3 | Mammoth White Intermediate ............ | " 25 | " 9 | " 24 | " 24 | 13 | 520 | 442 | .. | 13 | 400 | 440 | .. |
| 4 | Ontario Champion ...... | " 25 | " 9 | " 24 | " 24 | 13 | 355 | 439 | 15 | 11 | 1,760 | 396 | .. |
| 5 | Early Gem ............ | " 25 | " 9 | " 24 | " 24 | 13 | 460 | 440 | .. | 12 | 585 | 409 | 45 |
| 6 | Long Yellow Stump Rooted............ | " 25 | " 9 | " 24 | " 24 | 12 | 1,080 | 418 | .. | 11 | 440 | 374 | .. |
| 7 | White Belgian.......... | " 25 | " 9 | " 24 | " 24 | 11 | 1,760 | 396 | .. | 10 | 1,780 | 363 | .. |
| 8 | New White Intermediate | " 25 | " 9 | " 24 | " 24 | 11 | 770 | 379 | 30 | 10 | 955 | 349 | 15 |
| 9 | Improved Short White... | " 25 | " 9 | " 24 | " 24 | 9 | 1,460 | 324 | 20 | 11 | 605 | 376 | 45 |
| 10 | Half Long Chantenay... | " 25 | " 9 | " 24 | " 24 | 8 | 1,820 | 297 | .. | 8 | 5 | 266 | 45 |

## EXPERIMENTS WITH MANGELS.

Eighteen varieties of mangels were tested this season. Two sowings of each sort were made, the first sown April 25, and the second May 9. Four rows of 100 feet long, 30 inches apart were sown at each sowing of each variety, and the weight of the yield computed from 66 feet of the two centre rows in each case. The land was prepared as in the turnip test, and was of the same character. The seed did not germinate evenly and the stand was very irregular, making a light yield per acre. The stand was lighter in the early sown plants than in the second series, but the roots were larger and better grown. All were pulled October 22.

MANGELS—TEST OF VARIETIES.

| Number. | Name of Variety. | 1st Plot Sown. | 2nd Plot Sown. | 1st Plot Pulled. | 2nd Plot Pulled. | Yield per Acre. 1st Plot. | | Yield per Acre. 1st Plot. | | Yield per Acre. 2nd Plot. | | Yield per Acre. 2nd Plot | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Tons. | Lbs. | Bush. | Lbs. | Tons. | Lbs. | Bush. | Lbs. |
| 1 | Giant Yellow Globe..... | April 25 | May 9 | Oct. 22 | Oct. 22 | 30 | 984 | 1,016 | 24 | 16 | 473 | 541 | 12 |
| 2 | Yellow Intermediate.... | " 25 | " 9 | " 22 | " 22 | 27 | 912 | 915 | 12 | 9 | 480 | 308 | .. |
| 3 | Mammoth Long Red.... | " 25 | " 9 | " 22 | " 22 | 27 | 648 | 910 | 48 | 16 | 1,264 | 554 | 24 |
| 4 | Triumph Yellow Globe.. | " 25 | " 9 | " 22 | " 22 | 24 | 1,104 | 818 | 24 | 10 | 1,658 | 360 | 58 |
| 5 | Giant Sugar Mangel .... | " 25 | " 9 | " 22 | " 22 | 21 | 240 | 704 | .. | 13 | 1,192 | 453 | 12 |
| 6 | Perfection .............. | " 25 | " 9 | " 22 | " 22 | 19 | 148 | 635 | 48 | 13 | 1,984 | 466 | 34 |
| 7 | Half Long Sugar White.. | " 25 | " 9 | " 22 | " 22 | 19 | 16 | 633 | 36 | 13 | 1,060 | 451 | .. |
| 8 | Prize Winner Yellow Globe............... | " 25 | " 9 | " 22 | " 22 | 18 | 1,356 | 622 | 36 | 19 | 1,204 | 653 | 24 |
| 9 | Selected Yellow Globe... | " 25 | " 9 | " 22 | " 22 | 18 | 696 | 611 | 36 | 13 | 4 | 433 | 24 |
| 10 | Mammoth Yellow Intermediate.......... | " 25 | " 9 | " 22 | " 22 | 17 | 1,904 | 598 | 24 | 13 | 928 | 448 | 48 |
| 11 | Lion Yellow Intermediate................ | " 25 | " 9 | " 22 | " 22 | 16 | 826 | 547 | 16 | 13 | 1,984 | 466 | 24 |
| 12 | Prize Mammoth Long Red................. | " 25 | " 9 | " 22 | " 22 | 15 | 96 | 501 | 36 | 14 | 248 | 471 | 48 |
| 13 | Gate Post.. ........... | " 25 | " 9 | " 22 | " 22 | 14 | 248 | 470 | 48 | 7 | 784 | 246 | 24 |
| 14 | Leviathan Long Red.... | " 25 | " 9 | " 22 | " 22 | 13 | 1,984 | 466 | 24 | 12 | 1,872 | 431 | 12 |
| 15 | Giant Yellow Intermediate................ | " 25 | " 9 | " 22 | " 22 | 13 | 268 | 437 | 48 | 11 | 1,760 | 396 | .. |
| 16 | Selected Mammoth Long Red................. | " 25 | " 9 | " 22 | " 22 | 12 | 1,344 | 422 | 24 | 7 | 1,576 | 259 | 36 |
| 17 | Golden Giant........... | " 25 | " 9 | " 22 | " 22 | 12 | 288 | 404 | 48 | 13 | 796 | 446 | 36 |
| 18 | Half Long Sugar Rosy... | " 25 | " 9 | " 22 | " 22 | 10 | 1,272 | 354 | 32 | 8 | 1,160 | 286 | .. |

## EXPERIMENTS WITH SUGAR BEETS.

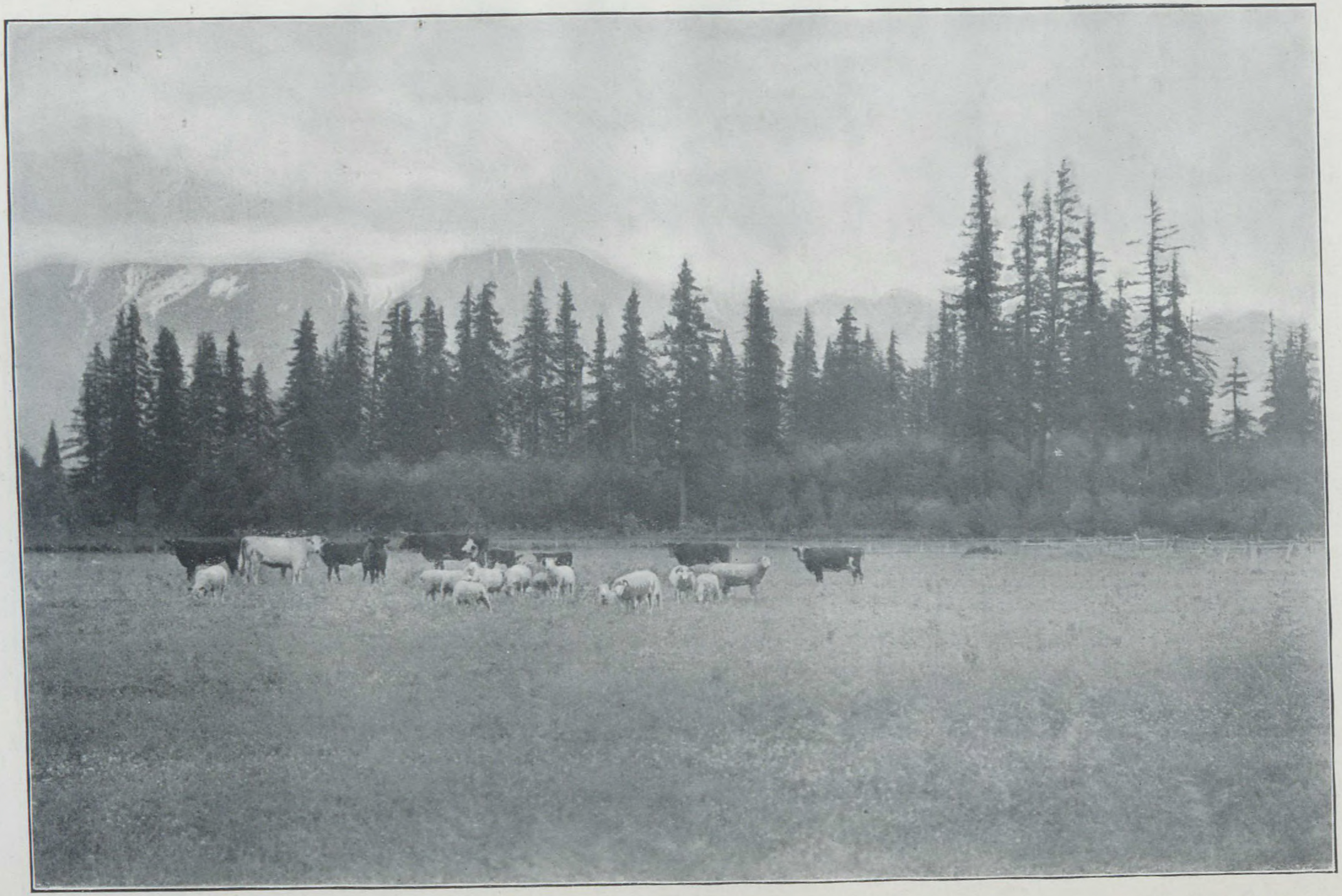
Eight varieties of sugar beet seed were sown alongside the mangels. The soil was of the same nature and the preparation was the same. Two sowings of each sort were made, but the seed did not germinate sufficiently in any of the plots to admit of any estimate as to their relative productiveness.

## POTATOES.

Forty-six varieties of potatoes were tested this year. The land was sandy loam which had been heavily dressed with barn-yard manure in the spring of 1903 and sown to pease. It was fall-ploughed last fall and harrowed every few days from early in the spring until May 12, when the potatoes were planted. They were planted in drills thirty inches apart and the sets one foot apart in the drill. They were harrowed three times before they were well up, which with the harrowing given the ground before planting, left the land pretty clean and cultivation with the horse hoe and two sprayings with Bordeaux mixture, one on July 8, the other three weeks later, was all the treatment given until they were dug. The yields in most cases are very fair and the quality is excellent. There was no rot in any of the varieties. Four rows of one hundred feet each were planted, and the yield calculated from the weight obtained from sixty-six feet of the two centre rows. The seed used was in each case medium sized, smooth potatoes cut in two strong eyes in each set. All were dug September 20 and 21.

POTATOES—TEST OF VARIETIES.

| Number. | Name of Variety. | Total Yield per Acre. | | Yield per Acre of Marketable. | | Yield per Acre of Unmarketable. | | Form and Colour. |
|---|---|---|---|---|---|---|---|---|
| | | Bush. | Lbs. | Bush. | Lbs. | Bush. | Lbs. | |
| 1 | Enormous | 572 | .. | 486 | 12 | 85 | 48 | Long, white. |
| 2 | Uncle Sam | 528 | .. | 475 | 20 | 52 | 40 | Round, white. |
| 3 | Daniel's Sensation | 519 | 12 | 441 | 20 | 77 | 52 | Oval, white. |
| 4 | Rose No. 9 | 492 | 48 | 443 | .. | 49 | 48 | Long, rose. |
| 5 | Rawdon Rose | 479 | 36 | 408 | .. | 71 | 36 | " |
| 6 | Sabean's Elephant | 471 | 08 | 376 | 08 | 95 | .. | Long, flat, white. |
| 7 | Holborn Abundance | 457 | 36 | 411 | 57 | 45 | 45 | Round, white. |
| 8 | Country Gentleman | 456 | 30 | 366 | 30 | 90 | .. | Long, pink and white. |
| 9 | I.X.L | 453 | 12 | 371 | 42 | 81 | 30 | Long, flat, pink. |
| 10 | Seedling No. 7 | 448 | 48 | 399 | 18 | 49 | 30 | Long, red. |
| 11 | Empire State | 440 | .. | 352 | .. | 88 | .. | Long, pink and white. |
| 12 | Rochester Rose | 435 | 36 | 348 | .. | 87 | 36 | Long, rose. |
| 13 | Cambridge Russet | 435 | 36 | 345 | .. | 90 | 36 | Oblong, russet. |
| 14 | Prolific Rose | 431 | 12 | 323 | 12 | 108 | .. | Oblong, rose. |
| 15 | Clay Rose | 426 | 48 | 341 | 18 | 85 | 30 | " |
| 16 | General Gordon | 422 | 24 | 336 | 54 | 84 | 30 | Oval, pink. |
| 17 | Reeves' Rose | 422 | 24 | 340 | 48 | 81 | 36 | Long, rose. |
| 18 | Early St. George | 419 | 40 | 358 | 04 | 61 | 36 | Long, white. |
| 19 | Pearce | 415 | 16 | 334 | 16 | 81 | .. | Long, pink and white. |
| 20 | Swiss Snowflake | 409 | 12 | 328 | .. | 81 | 12 | Long, white. |
| 21 | Vick's Extra Early | 404 | 48 | 325 | 18 | 79 | 30 | Round, pale rose. |
| 22 | State of Maine | 402 | 36 | 301 | 36 | 101 | .. | Long, pink. |
| 23 | American Wonder | 396 | 20 | 317 | .. | 79 | 20 | Long, flat, white. |
| 24 | Late Puritan | 393 | 48 | 324 | .. | 78 | 48 | Long, white. |
| 25 | Early Rose | 391 | 36 | 274 | 08 | 117 | 28 | Oblong, rose. |
| 26 | Sutton's Invincible | 390 | 30 | 292 | 54 | 97 | 36 | Long, white. |
| 27 | New California | 389 | .. | 311 | .. | 78 | . | Round, white. |
| 28 | Dreer's Standard | 378 | 24 | 255 | 54 | 113 | 30 | Oval, white. |
| 29 | Penn Manor | 376 | 12 | 319 | 42 | 56 | 30 | Long, red. |
| 30 | Blue Beauty | 366 | 36 | 275 | .. | 91 | 36 | Oval, blue |
| 31 | Everett | 361 | 8 | 316 | .. | 45 | 08 | Oblong, red. |
| 32 | Carman No. 1 | 356 | 44 | 285 | 20 | 71 | 24 | Round, white. |
| 33 | Sutton's Supreme | 334 | 24 | 267 | 24 | 67 | .. | Long, white. |
| 34 | Delaware | 325 | 36 | 244 | 06 | 81 | 30 | Round, white. |
| 35 | Burnaby Seedling | 320 | 52 | 272 | 52 | 48 | .. | Long, rose. |
| 36 | American Giant | 312 | 24 | 250 | .. | 62 | 24 | Long, white. |
| 37 | Canadian Beauty | 308 | 00 | 246 | .. | 62 | .. | Long, flat, pink. |
| 38 | Bovee | 305 | 48 | 244 | 18 | 61 | 30 | Long, rose. |
| 39 | Early Andes | 290 | 24 | 217 | 54 | 72 | 30 | Round, rose. |
| 40 | Carman No. 3 | 288 | 12 | 201 | 42 | 86 | 30 | Oblong, white. |
| 41 | Irish Cobbler | 270 | 36 | 216 | 36 | 54 | .. | Round, white. |
| 42 | Maule's Thoroughbred | 237 | 36 | 142 | 36 | 95 | .. | Long, rose. |
| 43 | Early Envoy | 226 | 36 | 156 | 56 | 69 | 40 | Long, pink and white. |
| 44 | Moneymaker | 215 | 36 | 167 | 36 | 48 | 36 | Long, white. |
| 45 | Early White Prize | 206 | 48 | 155 | 18 | 51 | 30 | Oblong, white. |
| 46 | Pingree | 176 | .. | 106 | .. | 70 | .. | " |



CATTLE IN PASTURE, EXPERIMENTAL FARM, AGASSIZ, B.C. [By Frank T. Shutt.]

### CUT VERSUS WHOLE SEED POTATOES.

A test was made as to the relative merit and cost of large and medium small cut seed and medium sized whole sets. The plots were arranged as in the uniform test plots, drills thirty inches apart and in the case of the cut sets one foot apart in the drills, and in the whole sets they were eighteen inches apart in the drill.

Two plantings were made in each case, the first April 12, and the second April 25.

Plots 1 and 2A.—The seed was cut from large potatoes and the sets were fairly large and each had not less than three eyes, and weighed on an average about 1 ounce each.

Plots 1 and 2B.—The seed was cut from smooth even average sized potatoes and the sets were cut to two eyes each, and would average about ¾ oz. each.

Plots 1 and 2C.—The sets were whole, smooth, even-sized potatoes, averaging from 2½ to 3½ oz. each.

All were dug September 21, at which time the tops were ripened and dead.

| Name of Variety. | Planted. | Total Yield per Acre. | | Yield per Acre of Marketable. | | Yield per Acre of Unmarketable. | | Weight of Seed per Acre. |
|---|---|---|---|---|---|---|---|---|
| | | Bush. | Lbs. | Bush. | Lbs. | Bush. | Lbs. | Lbs. |
| Rose No. 9, plot 1 A; cut seed, large sets .. | April 18.. | 620 | 18 | 474 | .. | 146 | 18 | 1,090 |
| " " 2 A " " .. | " 25.. | 572 | .. | 436 | .. | 136 | .. | 1,040 |
| " " 1 B; cut seed, 2 eyes to sets | " 18.. | 591 | 16 | 510 | 16 | 81 | .. | 780 |
| " " 2 B " " .. | " 25.. | 545 | 36 | 451 | 36 | 94 | .. | 760 |
| " " 1 C; large, whole sets..... | " 18.. | 786 | 24 | 600 | .. | 186 | 24 | 2,100 |
| " " 2 C " " .... | " 25.. | 673 | .. | 519 | .. | 154 | .. | 2,048 |

### SUMMARY OF CROPS.

| | Tons. | Lbs. |
|---|---|---|
| Hay .................................... | 114 | 1,900 |
| Corn for ensilage and fed green .................. | 67 | .. |
| Clover in silo ................................ | 56 | .. |
| Turnips ..................................... | 17 | 600 |
| Mangels ..................................... | 8 | 1,000 |
| Carrots ..................................... | 2 | .. |
| Oats ........................................ | 7 | 1,000 |
| Pease ....................................... | 3 | 800 |
| Wheat ....................................... | 1 | 500 |
| Barley ...................................... | 2 | 1,000 |
| Potatoes .................................... | 4 | .. |

### FODDER PLANTS.

The following millets and other fodder plants were tested on plots of one-fortieth of an acre each.

The millets were sown April 22, but as only about ten per cent of the seed germinated, the plots were ploughed and sown with rape :—

Plot 1.—Italian Millet.
Plot 2.—Pearl Millet.
Plot 3.—Hungarian Millet.
Plot 4.—Green California.
Plot 5.—White Round.
Plot 6.—Penicillaria.

HORSE BEANS.

Three plots of horse beans were sown April 25.

Plot 7, sown in drills 21 inches apart; seed did not germinate evenly. Growth poor, stalks about 20 inches long, not well podded. Weight when cut 2 tons 840 lbs.

Plot 8, 28 inches apart in the drill; stalks 24 to 30 inches long; not many pods; weight when cut 2 tons 1,620 lbs.

Plot 9, 35 inches apart in the drill; pods 2 to 2½ inches long; not well filled; weight when cut 2 tons 1,080 lbs.

These plots were badly infested with aphis early in August, which doubtless reduced the yield; cut October 10 to October 31.

Soja Beans.—These make a better growth on our warm sandy soil than the horse bean, and as they branch freely, and have a great deal of foliage, as well as many pods, the cattle, horses, pigs and sheep are very fond of them, and on rich land fairly heavy crops can be raised, but clover can be grown so much more cheaply and more feed per acre can be got from clover, that it does not pay except under exceptional conditions to raise Soja beans, especially as the seed seldom ripens sufficiently to be of use.

Three plots were sown April 25 and harvested October 10, at which time a fair percentage of the pods contained seeds in a nearly matured state.

Plot 10, sown at 21 inches apart in the drill; a fair even stand; well podded and very leafy; pods 1 to 1¼ inches long, containing from 1 to 3 seeds each; stalks 24 to 30 inches, and well branched; weight when cut 4 tons 400 lbs.

Plot 11, sown at 28 inches apart in the drill; well podded; very leafy and well branched; pods more matured than where closer together in the drills; weight when cut 4 tons 1,160 lbs.

Plot 12, sown at 35 inches apart in the drills; a fine stand; stalks 30 to 40 inches long; well branched and very leafy; well podded and the pods and seeds more mature than those on the plots where the drills were closer together; weight when cut 4 tons 1,040 lbs. per acre.

CLOVER VERSUS CORN FOR ENSILAGE.

As the weather in June is so often showery, that hay is very difficult to harvest and as clover makes good ensilage, it was thought desirable to compare the crop of an acre of average clover, with an acre of corn. Clover had been seeded in the spring of 1903, and immediately after the wheat crop with which it was grown had been harvested a dressing of about ten tons per acre of barn-yard manure was applied, direct from the stable as fast as it was made, and in spring was harrowed to break up the manure.

The first cutting was made June 20, a bright clear day, and the crop was hauled direct to the barn, weighed and put into the silo. The second crop was cut August 3 and put into the silo. The first cutting weighed 13 tons 273 pounds, second cutting, 12 tons 1,450 pounds, making a yield of 25 tons 1,723 pounds per acre.

One acre of Compton's Early corn, which is one of the best for this locality, planted May 20 and cut October 8, when in roasting ear weighed 19 tons 1,840 pounds, making a difference of nearly six tons per acre in favour of clover. There is a difference in favour of the clover in the cost of production and also in the condition in which the land is left for further cropping.

## GARDEN VEGETABLES.

RADISHES.—Sown April 11.

Early Scarlet Turnip. Fit for use, May 8. Crisp, sweet.
Olive-shaped Scarlet. Fit for use, May 12. Crisp.
French Breakfast. Fit for use, May 20. Very good.

LETTUCE.—Sown April 12.

Big Boston. Fit for use, May 18. Crisp, tender.
Nonpareil Cabbage. Fit for use, May 20. Fine heads, sweet and crisp.
Deacon. Fit for use, May 24. Solid, crisp, sweet.
All the Year Round. Fit for use, May 28. Solid, fine quality.

CARROTS.—Sown April 12.

French Horn. Fit for table, June 9. Very sweet and crisp.
Half Long Scarlet Nantes. Fit for table, June 20. Fine flavoured.
Luc Half Long. Fit for table, July 8. Very sweet, crisp.
Long Scarlet Altringham. Fit for table, July 20. Crisp; sweet; good.

TABLE TURNIPS.—Sown April 10.

Early White Milan. Fit for table, June 10. Very sweet and fine.
Early Snowball. Fit for table, June 14. Rapid grower, good quality.
Red Top Strapleaf. Fit for table, June 14. Rapid grower, very mild.
Hazard's Swede. Fit for table, July 28. Very sweet and fine flavoured.

ONIONS.—Sown April 4.

Extra Early Flat Red. Uniform size; mild, firm, sweet, very good.
Large Red Wethersfield. A fine cropper, solid, smooth, mild, good.
Yellow Globe Danvers. Medium size, solid, mild, good.

CABBAGE.—Sown in beds in open ground April 10, and transplanted May 19.

Eureka. Fit for table, July 11. Heads small; solid, crisp, fine flavour. A good header.

Express. Fit for table, July 14. Heads small; medium solid; fine, crisp, sweet.

Extra Early Midsummer Savoy. Fit for table, July 20. Heads soft and open.

New Early Flat Head. Fit for table, July 30. Heads medium size, firm, solid, white, fine flavour.

Charleston Wakefield. Fit for table, July 30. Heads fine size, very solid, white, crisp, good.

Early Winningstadt. Fit for table, August 16. Heads rather open and soft, but quality good.

Green Globe Savoy. Fit for table, September 10. Heads solid, medium size, very sweet, good.

Fielderkraut. Fit for table, September 24. Heads medium size; not solid, but white; crisp, sweet, fine flavour.

Fottler's Drumhead. Fit for table, October. A fine uniform header; solid, crisp, and an excellent winter cabbage.

Quintal Drumhead. Fit for table, October. Heads large, but not firm and solid.

Fottler's Improved Brunswick. Fit for table, October. A regular header. Heads flat, solid, crisp, good, and an excellent keeper.

Danish Ball Head. Fit for table, October. Heads round, solid, medium size; a good keeper and of superior quality.

Marblehead Mammoth. Fit for table, October. Not a sure header; a coarse, strong grower, but not of fine quality for table.

Mammoth Red Rock. Fit for table, October. Heads solid and very dark red, fine, crisp, sweet, very good.

Large German Savoy Drumhead. Fit for table, October. A uniform header; very solid, crisp, sweet, delicate flavour, and a good keeper.

CAULIFLOWERS.—Sown April 12; transplanted May 19.

Extra Early Selected. Fit for table, July 20. Heads extra fine, large, solid, very white, sweet.

Half Early Paris. Fit for table, July 26. Heads small, compact, crisp, and very good.

Early Snowball. Fit for table, July 30. A uniform header; heads large, firm, very fine, crisp, delicate.

BROCOLI.—Sown April 12 and transplanted May 19.

Extra Early White. Fit for table, August 24. A uniform header; heads large, firm, white, flavour delicate, and good.

BRUSSELS SPROUTS.—Sown April 12 and transplanted May 19.

Dwarf Improved. A fine grower, and well furnished with solid, crisp sprouts.

BEETS.—Sown April 28.

Crimson Globe. Fit for table, July 13. A fair size, crisp, sweet, and very dark red.

Egyptian. Fit for table, July 20. An even, rapid grower of very fine flavour.

Early Blood Turnip. Fit for table, July 20. A crisp, sweet, fine flavoured dark red beet.

Long Smooth Blood Red. Fit for table, September. Very fine quality; sweet, crisp and good; a good keeper.

BEANS.—Planted May 1.

Dwarf Golden Skinless. Ripe, July 13. A dwarf grower; very productive; pods 2½ to 4 inches long; crisp; stringless, and of good quality.

Extra Early Edible Podded. Ripe, July 15. A dwarf grower; productive; pods 4 to 5 inches long; quality good.

Royal Dwarf Kidney. Ripe, July 16. A bushy grower; fairly productive; tender and of pleasant flavour.

Crystal White Wax. Ripe, July 19. A bushy grower; fairly productive; pods 4 to 5 inches long; plump, crisp, and of good flavour.

Fame of Vitry. Ripe, July 20. A strong grower; productive; pods 4 to 6 inches long; crisp, tender, of pleasant flavour, good.

Dwarf Emperor of Russia. Ripe, July 20. A bushy, strong grower; very productive; pods 4 to 5 inches long; crisp, and of very fine flavour.

Dwarf Inexhaustible. Ripe, July 22. Very dwarf; bushy; productive; pods 3 to 5 inches long; crisp, of very pleasant flavour, good.

Dwarf Black Speckled. Ripe, July 24. Dwarf; bushy; productive; pods 4 to 6 inches long; fleshy, crisp, juicy, and of very pleasant flavour.

GARDEN PEASE.—Sown April 4.

Sutton's May Queen. Fit for table, June 18. Pods 2 to 3 inches long; well filled; pease of medium size; good quality; productive.

Alaska. Fit for table, June 18. Vines well podded; pods well filled with pease of fine flavour and quality.

American Wonder. Fit for table, June 20. Vines short, and well furnished with long, well filled pods of sweet, fine-flavoured pease.

Nott's Excelsior. Fit for table, June 22. A fine cropper, and fine-flavoured pease.

Premium Gem. Fit for table, June 24. Vines 2 feet long, and productive; pods long, and well filled.

McLean's Advancer. Fit for table, June 30. Vines 24 to 30 inches long; well podded; pease of medium size, and very fine quality.

Gradus. Fit for table, July 2. Vines 30 to 36 inches long, and well furnished with long, well filled pods; pease large, sweet and good.

Heroine. Fit for table, July 4. Vines 20 to 24 inches long; a fine producer; pods long, well filled; pease large, and very superior in quality.

Sutton's Conqueror. Fit for table, July 7. Productive; pods long, well filled with large pease of very fine quality.

Duke of Albany. Fit for table, July 10. Fairly productive; pods long, and well filled with medium large pease of very fine flavour.

Admiral. Fit for table, July 11. Vines long and productive; pease large, tender, and of fine quality.

Rent Payer. Fit for table, July 11. Vines of medium length; pods long, and well filled with large pease of superior flavour.

New Dwarf Telephone. Fit for table, July 15. Vines short, but very productive; pease large, sweet, and of fine flavour.

Stratagem. Fit for table, July 15. Vines short; productive; pods long, and well filled; pease large, very sweet, and of fine quality.

Sutton's Perfection. Fit for table, July 18. Vines 12 to 18 inches long, stout and productive; pease large and fine flavoured.

Sutton's Late Queen. Fit for table, July 20. Vines productive; pods containing 5 to 10 large, sweet peas.

### Squash.—Planted May 7.

Crookneck. Ripe, August 10. Poor growth, but productive.

Faxon. Ripe, August 10. Growth uneven; productive; squash flat, 6 to 10 inches in diameter; flesh solid, and of good quality.

Boston Marrow. Ripe, August 15. Growth feeble; productive; squash 10 to 15 inches long, 4 to 7 inches in diameter; flesh yellow, rich and sweet.

Hardshell Marrow. Ripe, August 15. Growth medium; productive; squash from 9 to 15 inches in length, 5 to 7 inches in diameter; flesh orange; thick, good; very fine quality.

Chicago Orange Marrow. Ripe, September 4. Growth vigorous; productive; squash oval, 10 inches by 8; flesh thick, rich, sweet, good.

Fordhook. Ripe, September 8. Growth feeble; productive; squash 6 to 10 inches in length, 7 to 9 inches in thickest part; flesh orange; very fine quality.

Essex Hybrid. Ripe, September 10. Growth medium; not productive.

Delicata. Ripe, September 10. Growth vigorous; very productive; squash 10 to 12 inches long and 4 to 5 inches in diameter; skin thin, yellow, streaked with dark green; flesh light yellow, firm, thick, of very good quality; a good keeper.

English Vegetable Marrow. Ripe, September 10. Growth medium; productive; squash 10 to 12 inches long, 4 to 6 inches in diameter; flesh pale yellow; quality fair.

Michigan. Ripe, September 15. Growth feeble; productive; squash 6 to 12 inches long, 3 to 4 inches in diameter; colour dark green; flesh solid, of very good quality; similar in size, shape and style of growth to Delicata.

Golden Hubbard. Ripe, September 15. Growth feeble; productive; squash of fair size, and of good quality.

Delicious. Ripe, September 20. Growth fair; productive; squash 5 to 8 inches from stem to blossom, and 4 to 8 inches in diameter; skin dark green; flesh orange thick, solid, of very good quality; a winter squash.

### Sweet Corn.—Planted April 20.

Prémo. Fit for table, August 2. Ears 4 to 6 inches long; kernels deep, sweet, and of fine flavour.

First of All. Fit for table, August 4. Ears 4 to 6 inches long, well filled to tip; corn sweet and finely flavoured.

Cory Sugar. Fit for table, August 4. Productive; ears well filled with deep, large kernels of sweet, rich, full flavoured corn.

## SAMPLES DISTRIBUTED.

A large number of sample packages of grain, potatoes, nuts and other tree seeds and scions were distributed to farmers by mail in response to applications received from them. From the reports received it is evident that this work is productive of much good.

| | |
|---|---|
| Packages of scions and cuttings | 238 |
| 3 lb. samples of potatoes | 164 |
| 3 " oats | 153 |
| 3 " pease | 120 |
| 3 " spring wheat | 86 |
| 3 " barley | 74 |
| Nut and tree seeds, bulbs, &c. | 599 |
| | 1,444 |

## CORRESPONDENCE.

Letters received, 2,942; letters despatched, 2,772.

## APPLES.

The spring was not a good one for fruit, as the weather during the blossoming time was showery and cold, and a light frost during this period caused much of the fruit to fall, but owing to fine, bright weather during the late summer and autumn, the fruit developed well and coloured finely, and the quality has been very good, and the crop of most varieties a medium one. No new sorts have been planted this year, but a good many varieties have fruited for the first time. Only those which were sufficiently matured to describe their quality as well as the outside appearance have been described.

The following is a list of the summer and fall apples fruiting for the first time. While many of these will doubtless prove of little value here, yet there are some that on further test, may prove to be of merit in their season.

1. *Earliest of All.*—Tree a spreading, straggling grower, and not productive. Fruit small, oblate, roundish. Stem short. Calyx small, closed. Basin shallow. Skin greenish yellow. Flesh whitish, juicy, firm, sprightly acid, of poor quality. Nothing to recommend it. Ripe last of July.

2. *Thomas Rivers.*—Tree a vigorous grower. Fruit of medium size, conical. Stem medium length, cavity deep, and narrow. Calyx small, closed. Basin narrow and deep. Skin clear, bright yellow. Flesh white, coarse, not very juicy, pleasant, mild, sub-acid or nearly sweet. Season August.

3. *September Beauty.*—Tree a poor grower. Fruit of medium size, conical. Stem short, cavity narrow and deep. Calyx small and closed. Basin shallow and narrow. Skin greenish yellow, with a bright red cheek and many whitish dots. Flesh yellowish, crisp, not very juicy, a sprightly pleasant acid. Season early August.

4. *Lord Sudely.*—Tree a moderate grower. Fruit medium to large, oblate conical. Stem short, cavity narrow and deep. Calyx small, closed. Basin narrow, deep and

furrowed. Skin clear yellow, nearly overspread with bright red, and sprinkled with many gray dots. Flesh yellowish, a little coarse grained, crisp, juicy, mild pleasant sub-acid, slightly vinous, good. Season August.

5. *Domino.*—Tree a strong grower, and an early bearer. Fruit large, conical. Stem of medium length. Cavity narrow and deep. Calyx large, closed. Basin deep, narrow and furrowed. Skin pale whitish yellow, with a bright red blush and a few brown dots. Flesh white, crisp, a little coarse grained, juicy, mild, pleasant flavour, sub-acid. Season August.

6. *White Pineating.*—Tree a slow grower. Fruit small, round, flattened; stalk long and slender; cavity narrow and deep, calyx small, closed; basin narrow and deep; skin yellow, with a faint blush on sunny side. Flesh crisp, not juicy, mild and of pleasant flavour; not valuable; season August.

7. *Yellow Calville.*—Tree a strong grower. Fruit of medium size, globular; stem short and stout. Cavity moderately deep and wide. Calyx small, closed. Basin shallow and narrow. Skin a clear, glossy, yellow with a little pale red on the sunny side. Flesh white, a little coarse, crisp, juicy, of a mild, pleasant flavour, sub-acid. Season August.

8. *Belle du Havre.*—Tree a thrifty grower and an early producer. Fruit above medium size, roundish, conical. Stem long. Cavity wide and deep. Calyx large, closed, Basin wide, deep and corrugated. Skin pale yellow with a bright red cheek and sprinkled with brown dots. Flesh white, crisp, fine-grained, juicy with a pleasant flavour, good. Season August.

9. *Greenup's Pippin.*—Tree a vigorous grower. Fruit of medium size, globular, with uneven sides. Stem medium in length, slender. Cavity deep and narrow. Calyx small, closed, set in a narrow deep basin. Skin clear yellowish green, with a dull red cheek. Flesh white, juicy, sprightly, tender, nearly sweet, with a pleasant flavour. Season August.

10. *Early Rivers.*—Tree a strong grower. Fruit medium to large, conical. Stem long. Cavity shallow and narrow. Calyx small, closed. Basin, small, shallow and corrugated. Skin greenish yellow. Flesh whitish, a little coarse, granular, juicy, a mild, pleasant flavour, acid, a fine cooking apple. Season August.

11. *Tyra Mostbirne.*—Tree a vigorous grower. Fruit of medium size, globular, Stem short. Cavity deep and narrow. Calyx large, closed. Basin wide and deep, corrugated. Skin greenish yellow, with streaks and splashes of deep red on the sunny side, Flesh whitish, crisp, juicy, a little coarse and a little granular, a mild pleasant acid. Season August.

12. *Dutch Codlin.*—Tree a strong grower. Fruit large, roundish, ribbed from stem to calyx. Stem long. Calyx large. Basin shallow. Flesh white, coarse, mildly acid. Moderately juicy. A good cooking apple. Season, August.

13. *Barchard's Seedling.* Tree a vigorous grower and productive. Fruit of medium size, oblate, conical. Stalk short. Cavity small. Calyx small, open. Basin narrow and deep. Skin greenish yellow, with stripes and patches of bright red over nearly the whole surface. Flesh white, fine grained, juicy of a mild, pleasant flavour, sub-acid, good. Season, late August.

14. *C. H. R. Starr.*—Tree a moderate grower. Fruit small roundish, oblate. Stalk long. Cavity narrow and shallow. Calyx small, closed. Basin narrow and shallow. Skin yellow, with a bright red cheek. Flesh whitish, juicy, sub-acid, a little coarse, of a mild pleasant flavour. Season, September.

15. *Lady Derby.*—Tree a strong grower. Fruit medium to small, oblate. Stem short. Cavity deep and wide. Calyx small, closed. Basin wide and deep. Skin clear, bright yellow with stripes and splashes of bright red on the sunny side. Flesh yellowish, fine grained, crisp, juicy, acid, and of a pleasant flavour. Season, September.

16. *Bijou.*—Tree a vigorous grower. Fruit of medium size, roundish oblate. Stem long. Cavity narrow and shallow. Calyx large, closed. Basin wide and shallow. Skin yellow, nearly overspread with dull red. Flesh yellowish, crisp, moderately juicy, mild, pleasantly acid, with a fine rich flavour. Season, September and October.

17. *Sugar Loaf Pippin.*—Tree a slow grower. Fruit below medium size, oblong, conical. Stalk short, often with a fleshy knob at the side. Calyx small, closed. Basin narrow and deep. Skin clear bright yellow. Flesh yellowish, crisp, juicy, mild, sub-acid or nearly sweet, with a pleasant flavour. Season, September.

18. *Grand Sultan.*—Tree a strong, upright, spreading grower. Fruit large, oblong, conical. Stem short. Cavity narrow and deep. Calyx small, closed. Basin deep, moderately wide and deeply corrugated. Skin yellow, nearly covered with dull red. Flesh white, a little coarse, fairly juicy and mildly sub-acid. Season, September.

19. *De Moisson.*—Tree a vigorous grower and an early bearer. Fruit of medium size, conical. Stem short. Cavity narrow and deep. Calyx small, closed. Basin deep and narrow. Skin greenish yellow, with a dull red cheek. Flesh white, crisp, juicy and pleasantly sub-acid. Season, September.

20. *De Lait.*—Tree a poor grower. Fruit above medium size, oblong, conical. Stem short. Cavity narrow and deep. Calyx large, closed. Basin wide and deep. Skin pale yellow, with a few stripes and patches of bright red. Flesh white, crisp, juicy, sprightly acid, with a pleasant flavour, good. Season, September.

21. *Oswin.*—Tree a strong grower. Fruit medium to large, oblong, oval, stem short, cavity narrow and deep, calyx, large, closed. Basin narrow and deep. Skin greenish yellow, with sometimes a faint blush and a few whitish dots. Flesh whitish, crisp, moderately juicy, briskly sub-acid, with a pleasant flavour. Season, September.

22. *Anis Rise (Niemetz).*—Tree a strong grower and a free producer. Fruit above medium size, globular, somewhat conical. Stem of medium length. Cavity shallow and wide. Calyx small, closed. Basin deep and narrow. Skin pale yellow, with sometimes a few narrow stripes, on sunny side. Flesh white, juicy, crisp, sprightly, tender pleasantly acid, good. Season September.

23. *Bottle Stopper.*—Tree a medium grower. Fruit below medium size, oblong, tapering to eye. Stalk short. Cavity wide and shallow. Calyx large, closed. Basin narrow, shallow and corrugated. Skin green, with many white dots. Flesh white, juicy, sprightly, rather corky. Season September. Quality poor.

24. *Scinde Centre.*—Tree a strong grower. Fruit above middle size, oblong, conical. Stalk short. Cavity deep and narrow. Calyx large, closed. Basin wide and deep. Skin whitish yellow, with streaks and spots of bright red over nearly the whole surface. Flesh coarse, white, crisp, juicy, sprightly, pleasantly acid. Season September.

25. *Kieve Reinette.*—Tree a vigorous grower. Fruit large, oblate, tapering to the eye. Stem short. Cavity narrow and deep. Calyx small, closed. Basin narrow and deep. Skin yellowish white, finely mottled with streaks and patches of red in two shades. Flesh white, a little coarse, moderately juicy, nearly sweet, pleasant. Season September.

26. *White Plikanoff.*—Tree a strong grower. Fruit of medium size, globular, conical. Stem short and slender. Cavity narrow and shallow. Calyx small, closed. Basin deep and narrow. Skin yellowish white, with a few small patches and stripes of bright red). Flesh white, crisp, a little coarse, juicy, mild and pleasantly acid. Season September.

27. *Duchess of Brabant.*—Tree a vigorous grower. Fruit medium to large, oblong, conical. Stalk medium. Cavity deep and narrow. Calyx small, closed. Basin shallow and narrow. Skin greenish white, with stripes of dark red on the sunny side, and sprinkled with gray dots. Flesh white, tender, juicy, crisp, with a pleasant, sprightly flavour; a very good cooking apple. Season, September and October.

28. *Lady Henniker.*—Tree a strong grower and an early producer. Fruit above medium size, roundish, a little conical, ribbed. Stalk short. Cavity wide and deep. Calyx large, open. Basin deep and deeply ribbed. Skin yellow, with a faint red blush, and a few gray dots. Flesh white, tender, moderately coarse, granular, juicy, mild and pleasantly acid. Season October to December.

29. *Lamb Abbey Pearmain.*—Tree a strong grower. Fruit of medium size, oblate, slightly conical. Stalk short. Cavity narrow and deep. Calyx moderately open. Basin shallow and flat. Skin yellow, nearly covered with red in two shades. Flesh white, juicy, crisp, sprightly, sub-acid. A splendid apple for sauce or baking. Season October and November.

30. *Jefferson.*—Tree a medium grower. Fruit small, round, oblate. Stem short. Cavity narrow and deep. Calyx small, closed. Basin wide and deep. Skin clear yellow, with a bright red cheek. Flesh whitish, not juicy, mildly acid, not valuable. Season October.

31. *Harvey's Wiltshire Defiance.*—Tree a strong grower. Fruit of medium size, oblate tapering to calyx, irregularly ribbed. Stem of medium length. Cavity narrow and deep. Calyx small, closed. Basin shallow and flat. Skin greenish-yellow with a bronze cheek and many russet dots, and a few small patches of russet. Flesh yellowish, firm, crisp, juicy, sweet. Season October and November.

32. *The Vicar.*—Tree a strong grower. Fruit small, roundish oblate. Stem slender, of medium length. Cavity deep and narrow. Calyx large, closed. Basin wide and deep, corrugated. Skin yellow with a bright orange blush. Flesh white, moderately juicy, mild and pleasantly acid. Season September and October.

33. *James Grieve.*—Tree a vigorous grower. Fruit of medium size, roundish, oblate, tapering slightly to the eye. Skin yellowish-white with sometimes a little dull red on sunny side. Flesh white, juicy, tender with a pleasant flavour, nearly sweet. Season October and November.

34. *Prince Lippe.*—Tree a strong grower. Fruit medium to small, oblate, conical. Stalk short. Cavity narrow and deep. Calyx small closed. Basin of medium width and deep. Skin greenish-yellow striped with dull red over nearly the whole surface and sprinkled with small gray dots. Flesh greenish-white, crisp, juicy, fine grained, mild and of pleasant flavour, refreshingly acid, quality good. Season November to January.

35. *Rose.*—Tree a weak grower. Fruit small, flat. Stem slender. Cavity narrow and deep, skin greenish yellow nearly overspread with dull red, with many small whitish dots. Flesh white, not juicy or of fine flavour, nearly sweet. Quality poor. Season, October and November.

36. *Scotch Bridget.*—Tree a vigorous grower. Fruit of medium size, conical, stalk long, cavity wide and deep, calyx small, closed, basin small and corrugated, skin greenish yellow. Flesh white, soft, juicy and pleasantly acid. A good cooking apple. Season, October and November.

37 *Pioneer.*—Tree a feeble grower. Fruit of medium size, globular, a little flattened, stalk short, cavity wide and shallow, calyx small, closed, basin wide and shallow, skin yellow with a few gray dots. Flesh whitish yellow, juicy, tender, crisp with a pleasant aromatic flavour, sub-acid. Season, October and November.

38. *Schoolmaster.*—Tree a very poor grower. Fruit of medium size, roundish oblate. Stalk medium. Cavity narrow and deep. Calyx small, closed. Basin wide and shallow, skin greenish yellow with a red blush on the sunny side, and a few gray dots. Flesh, white, juicy, crisp, sprightly with a pleasant flavour. Season, October and November.

39. *Mrs. Barron.*—Tree a moderate grower. Fruit of medium size, conical. Stalk long. Cavity narrow and deep. Calyx small, closed. Basin shallow and narrow. Skin greenish yellow with a dark red cheek. Flesh white, firm, juicy, crisp and sprightly acid; a good cooking apple. Season, October and November.

40. *Striped Beaufin.*—Tree a vigorous grower. Fruit large, roundish, oblate, heavily ribbed. Stalk short. Cavity narrow and shallow. Calyx large, closed. Basin wide and deep. Skin greenish yellow, with a dull red cheek and many gray dots. Flesh yellowish, firm, juicy, mildly acid. Season, October and November.

41. *Queen Caroline.*—Tree a poor grower. Fruit medium to large, oblate, roundish. Stalk short. Cavity narrow and deep. Calyx small, closed. Basin deep and wide. Skin greenish yellow, with a slight blush and many gray dots. Flesh crisp, juicy, a little coarse, mildly acid. Season, October and November.

42. *Court of Wick.*—Tree a strong grower. Fruit small, conical. Stalk slender. Cavity narrow and deep. Calyx large, open. Basin shallow. Skin greenish orange, with many gray dots and a little reddish blush in the sun. Flesh yellow, crisp, juicy, with a rich aromatic flavour, mildly acid. Quality good. Season, October and November.

43. *G. H. Wright.*—Tree a vigorous grower. Fruit of medium size, oblate. Stalk short. Cavity narrow and deep. Calyx small, closed. Basin of medium width and depth. Skin yellow, with a few russet dots and russet about calyx. Flesh white, tender, granular, not juicy, mildly sub-acid. Season, October and November.

44. *Smith's Seedling.*—Tree a strong grower. Fruit small, oblate. Stalk short. Cavity narrow and shallow. Calyx small. Basin shallow. Skin greenish yellow with a few whitish dots. Flesh white, firm, moderately juicy, a mildly pleasant acid. Season October and November.

45. *Arthur.*—Tree a vigorous grower. Fruit medium to small, oblong, globular. Stalk short. Cavity deep and narrow. Calyx small, closed. Basin narrow. Skin golden yellow, with sometimes a bright red blush. Flesh yellowish, granular, juicy, mildly acid, with a pleasant flavour. Season, November.

46. *Duncan.*—Tree a slow grower. Fruit of medium size, oblate conical. Stalk long. Cavity deep and narrow. Calyx large, open. Basin wide and shallow. Skin greenish yellow with a small dull red blush in the sun. Flesh greenish, white, tender, crisp, juicy, mild and pleasantly sub-acid. Season, November and December.

47. *Seaton House.*—Tree a very moderate grower. Fruit large, flat. Stalk short. Cavity deep and wide. Calyx large, closed. Basin wide and shallow. Skin greenish yellow splashed with clear bright red. Flesh white, crisp, moderately juicy, mildly acid. Season, November.

48. *Gibbin's Russet.*—Tree a strong grower. Fruit small, flat. Stem short. Cavity narrow and deep. Calyx small. Basin deep and narrow. Skin russet yellow. Flesh juicy, fine grained, mildly acid with a pleasant flavour. Season, November and December.

49. *Peter.*—Tree a strong grower. Fruit of medium size, globular, tapering slightly to eye. Stalk long, slender. Cavity narrow and of medium depth. Calyx small, closed. Basin moderately wide and deep. Skin yellow, nearly entirely overspread with dark and light red. Flesh crisp, juicy, a mild pleasant acid. Season, November and December.

50. *Landsburg Reinette.*—Tree a vigorous grower. Fruit medium to large, oblate. Stalk medium. Cavity deep and wide. Calyx small, closed. Basin narrow and deep. Skin orange yellow, with a faint red blush. Flesh yellowish, moderately juicy, tender with a pleasant flavour nearly sweet. Season, November and December.

51. *Walton Abbey Seedling.*—Tree a slow grower. Fruit large, roundish, slightly conical. Stem short. Cavity medium in depth. Calyx small, closed. Basin narrow and deep. Skin yellow, with a dull red blush and a few russet dots and russet about the stalk. Flesh white, fairly juicy, fine grained, tender, mildly sub-acid. Quality good. Season, November and December.

52. *Evagil.*—Tree a strong grower. Fruit of medium size, roundish globular. Stalk long. Cavity wide and deep. Calyx large, closed. Basin wide and deep. Skin

greenish yellow, with many gray dots. Flesh yellowish, crisp, juicy, mild and pleasantly acid. Season, November and December.

53. *Coos River Beauty.*—Tree a strong grower. Fruit large, oblate, conical, somewhat ribbed. Stalk short. Cavity wide and of medium depth. Calyx medium, open. Basin narrow, deep and corrugated. Skin bright yellow. Flesh white, coarse, not very juicy, mild and pleasantly acid. Season, November and December.

54. *Kingston Black.*—Tree a vigorous grower. Fruit of medium size, conical. Stalk short. Cavity narrow and shallow. Calyx small, closed. Basin deep and wide. Skin yellow, nearly overspread with deep red and freely sprinkled with small whitish dots. Flesh white, firm, not juicy, mildly acid. Season, November and December.

55. *Siegfried.*—Tree a vigorous grower. Fruit medium to large, oblate, roundish. Stem short. Cavity narrow, funnel-shaped. Calyx large, closed. Basin wide and deep. Skin yellow with a dull red cheek. Flesh greenish white, tender, juicy, sprightly with a pleasant flavour. Season, November to January.

56. *Forge.*—Tree a strong grower. Fruit of medium size, oblong, oval. Stalk short. Cavity, narrow and deep. Calyx small, closed. Basin deep and corrugated. Skin pale yellow, splashed and mottled with two shades of red. Flesh yellowish white, tender, juicy, pleasantly sub-acid. Season, November and December..

57. *Kronish Rosy.*—Tree a vigorous grower. Fruit small, conical. Stalk medium. Cavity narrow and shallow. Calyx small, closed. Basin narrow and shallow. Skin greenish yellow with a little dull red on sunny side. Flesh yellowish, crisp, juicy, mildly acid, nearly sweet, with a pleasant flavour. Season, November to January.

58. *Hormead's Pearmain.*—Tree a vigorous grower. Fruit of medium size, oblong conical. Stalk short. Cavity deep and narrow. Calyx large. Basin wide and shallow. Skin yellow, with a faint blush on sunny side. Flesh white, tender, crisp, juicy, sub-acid, with a good and pleasant flavour. Season, November.

59. *Bramtot.*—Tree a strong grower. Fruit small, conical. Stem short. Cavity wide and shallow. Calyx large. Basin shallow and flat. Skin yellow, with a bright red cheek. Flesh white, coarse, not juicy, a bitter sweet, suitable for cider. Season, November.

60. *Williams' Russet.*—Tree a strong grower. Fruit medium or below medium in size; oblong, globular, tapering a little to the eye. Stalk short. Cavity wide and deep. Calyx large, closed. Basin wide and deep. Skin russet yellow with a pink red cheek. Flesh whitish, tender, juicy, mildly acid, with a pleasant aromatic flavour. Season, November to January.

61. *Betty Geeson.*—Tree a medium grower. Fruit large, oblate, ribbed, angular. Stalk short. Cavity wide and deep. Calyx large, open. Basin wide and deep and heavily ribbed. Skin yellow with a small red blush. Flesh whitish, crisp, firm, moderately juicy, of a mild, pleasant acid character. A good cooking apple. Season, November and December.

62. *Siegende Reinette.*—Tree a medium grower. Fruit large, roundish, globular. Stalk short. Cavity shallow and wide. Calyx small, closed. Basin of medium width and deep. Skin greenish russet with a dull red cheek and many whitish dots. Flesh whitish, fine, tender, moderately juicy, with a pleasant aromatic flavour, sub-acid. Season, November and December.

63. *Royal Russet.*—Tree a strong grower. Fruit above medium size, oblate conical. Stalk short. Cavity deep and narrow. Calyx large, closed. Basin small. Skin greenish yellow, nearly overspread with a fine russet. Flesh white, crisp, tender, fine grained, with a rich, high flavour, nearly sweet. Season, November to January.

64. *Reinette de Canada.*—Tree a strong grower and an early bearer. Fruit above medium size, conical. Stalk long. Cavity medium deep and wide. Calyx large, closed. Basin wide and moderately deep. Skin greenish yellow, with a red cheek and

a few yellowish dots. Flesh white, fine grained, juicy, of a brisk, pleasant, acid character. Quality good. Season, November and December.

65. *Pigeon Gris.*—Tree a vigorous grower. Fruit of medium size, conical. Stalk short. Cavity narrow and shallow. Calyx small, closed, narrow and shallow. Skin greenish yellow with a fine russet over the surface. Flesh white, fine grained, moderately juicy, with a rich, pleasant flavour; nearly sweet. Season, November to January.

66. *Tom Putt.*—Tree a strong grower. Fruit medium to large, globular, conical. Stem medium, and cavity medium in width and depth. Calyx large, open. Basin deep, narrow and corrugated. Skin pale yellow with a small blush in the sun. Flesh white, a little coarse and rather dry; not of fine quality. Season, November and December.

67. *Colville Blanche d'Hiver.*—Tree a strong grower. Fruit of medium size, roundish, conical. Stem short. Cavity deep and wide. Calyx large, closed. Basin wide, deep and deeply ribbed. Skin yellow with a faint blush in the sun. Flesh yellowish white, fairly juicy, not of high quality. Season, November to January.

68. *Yellow Arkad.*—Tree a strong grower. Fruit medium to large, oblate, conical, heavily ribbed. Stalk short. Cavity narrow and shallow. Calyx large, open. Basin deep and wide and heavily ribbed. Skin yellow with a mottled red blush and many white dots. Flesh whitish, coarse, juicy, pleasantly sub-acid. Season, November and December.

69. *Swinsovka.*—Tree a vigorous grower. Fruit medium to large, conical. Stem short. Cavity narrow and deep. Calyx small, closed. Basin shallow and narrow. Skin greenish yellow, with a bright handsome red cheek, and sprinkled with many white dots. Flesh white, a little coarse, juicy, mildly sub-acid, with a pleasant flavour. A fine cooking apple. Season, November and December.

70. *Aunt Ginnie.*—Tree a strong grower. Fruit of medium size, conical, irregular, ribbed. Stalk short. Cavity deep and narrow. Calyx moderately open. Basin deep and narrow. Skin yellow, nearly covered with stripes and patches of light and dark red, with a little russet about the stalk. Flesh greenish white, tender, crisp, fairly juicy, mildly sub-acid, with a pleasant flavour. Season, November and December.

71. *Ringer.*—Tree a vigorous grower. Fruit above medium size, roundish, flattened. Stalk short. Cavity moderately deep and wide. Calyx small, closed. Basin narrow and shallow. Skin greenish yellow, with sometimes a faint blush, and many gray dots. Flesh yellowish, crisp, firm, juicy, pleasantly acid. A very fine cooking apple. Season, November and winter.

72. *Gospatrick.*—Tree a medium grower. Fruit below medium size, oblong conical. Stalk short. Cavity narrow and deep. Calyx large, closed. Basin narrow and deep. Skin yellow, with a red cheek in the sun. Flesh white, crisp, of fine texture, juicy, mildly sub-acid, with a very pleasant flavour. Season, November and December.

73. *Small's Admirable.*—Tree a vigorous grower. Fruit of medium size, oblate conical. Stalk long, slender. Cavity narrow and shallow. Calyx small, closed. Basin narrow and of medium depth. Skin greenish yellow, with russet about the cavity, and sprinkled with russet dots about the eye. Flesh white, juicy, mild, crisp, fine grained, nearly sweet, and of a delicate flavour. Season, November and December.

74. *Gray French Reinette.*—Tree a strong grower. Fruit small, roundish conical. Stem short. Cavity deep and narrow. Calyx large, closed. Basin wide and corrugated. Skin greenish russet. Flesh whitish, juicy, with a rich pleasant flavour; sub-acid. Season, November and December.

75. *Jacques Lebel.*—Tree a strong grower. Fruit above medium size, roundish oblate. Stalk short. Cavity small. Calyx small, closed. Basin narrow and shallow. Skin rich yellow, with a dull red cheek, and many gray dots. Flesh white, fine grained, tender, of a mild, pleasant acid character. Season, November and December.

76. *Cooper's Seedling.*—Tree a feeble grower. Fruit small, roundish globular. Stalk long. Cavity wide and shallow. Calyx large, closed. Basin wide and shallow. Skin greenish yellow, with a purple red cheek and a few gray dots. Flesh white, crisp, moderately juicy, mildly sub-acid, with a pleasant flavour. Season, November and December.

77. *Ornament de Table.*—Tree a poor grower. Fruit below medium size, oblate. Stalk short. Cavity narrow and deep. Calyx large, partly open. Basin wide and flat. Skin yellow, with sometimes a red cheek. Flesh yellowish, juicy, tender, mildly sub-acid, with a pleasant flavour. Seascn, December.

78. *Lord Hindlip.*—Tree a vigorous grower. Fruit small, globular. Stalk medium. Cavity wide and shallow. Calyx small, closed. Basin wide and deep. Skin pale yellow, nearly covered with russet and sprinkled with gray dots. Flesh yellowish, tender, juicy, nearly sweet, with a fine aromatic flavour. Season, November to January.

79. *Muscat Reinette.*—Tree a poor grower. Fruit small, roundish conical. Stalk short. Cavity narrow and shallow. Calyx small, closed. Basin small. Skin yellow, striped with red. Flesh yellowish, fine-grained, juicy, rich and aromatic, mildly sub-acid. Season, November and December.

80. *Calville Grand Duke Frederic de Bade.*—Tree a strong grower. Fruit large, roundish globular, somewhat ribbed. Stalk short. Cavity narrow and deep. Calyx large, closed. Basin wide and deep. Skin greenish yellow, with stripes of pale red on sunny side. Flesh yellowish, coarse, tender, of pleasant flavour; of a mild, sprightly, acid character. Season, November, December and January.

81. *Reinette de Dippedalle.*—Tree a medium grower. Fruit of medium size, oblong, globular, slightly tapering to the eye. Stalk short. Cavity deep and narrow. Calyx large, open. Basin wide, deep and deeply ribbed. Skin golden yellow, with a small blush in the sun and many gray dots. Flesh white, firm, not very juicy, slightly aromatic, nearly sweet. Season, November and December.

82. *Carter.*—Tree a moderate grower. Fruit small, roundish, oblate. Stalk short. Cavity wide and shallow. Calyx large, closed. Basin wide and flat. Skin yellow, with a few small stripes of dull red. Flesh tender, juicy, sub-acid, with a pleasant flavour. Season, November to January.

83. *Nonsuch.*—Tree a strong, spreading grower. Fruit medium to large, roundish. Stem short. Cavity deep and narrow. Calyx large, open. Basin wide and deep. Skin greenish yellow with a dull red cheek. Flesh white, soft, moderately juicy and pleasantly acid. Season, November and December.

84. *Fiessers Erstling.*—Tree a moderate grower. Fruit of medium size, conical, Stalk short. Cavity deep and narrow. Calyx large, closed. Basin narrow, deep and corrugated. Skin yellow with a deep red cheek. Flesh white, juicy, vinous, sub-acid. Season, November and December.

85. *Reinette de Middlebourg.*—Tree a strong, upright grower. Fruit of medium size, oblong, tapering a little to the eye. Stalk short. Cavity narrow and deep. Calyx small, closed. Basin wide and shallow. Skin greenish yellow, with many gray dots, and a small blush on sunny side. Flesh white, fine-grained, tender, crisp, juicy, of a mild, pleasant acid character. Season, December to January.

86. *Hoover.*—Tree a moderate grower. Fruit of medium size, roundish. Stalk long, cavity deep. Calyx large, open. Basin furrowed. Skin yellow, striped with light and dark red, with a little russet about stem. Flesh yellowish, firm, fine-grained, juicy, sub-acid, with a fine flavour. Season, November and December.

87. *Green Crimean.*—Tree a vigorous, spreading grower. Fruit above medium size, conical. Stalk short. Cavity wide and shallow. Calyx large, open. Basin narrow and shallow. Skin yellow, mottled with stripes and patches of dull red, with russet about the stalk. Flesh yellowish, a little coarse, juicy, sprightly and mildly acid. A good cooking apple. Season, November and December.

88. *Scarlet Nonpareil.*—Tree a slow grower. Fruit small, oblate, flattened. Stalk medium. Cavity deep and wide. Calyx large, closed. Basin wide, shallow. Skin yellow, with a red cheek, and a few whitish dots. Flesh yellowish white, firm, juicy, mildly sub-acid. Season, November and December.

89. *Egremont Russet.*—Tree a vigorous grower. Fruit of medium size, roundish oblate. Stem short. Cavity narrow and shallow. Calyx large, closed. Basin narrow and shallow. Skin clear golden yellow, with a little russet in basin. Flesh white, firm, juicy, fine grained, rich, sugary, with a pleasant vinous flavour. Season, December.

90. *Rymer.*—Tree a moderate grower. Fruit of medium size, roundish oblate. Stalk short. Cavity small. Calyx large, closed. Basin wide and shallow. Skin glossy yellow, with a bright blush. Flesh yellowish, juicy, firm, crisp, sub-acid, with a pleasant flavour. Season, December.

Many of the apples above described as in season during November and December, while fit for the table at that time, are evidently good keepers, and some will no doubt prove valuable as late varieties on further test.

Many of the trees planted in the older orchards having fruited for a number of years, and their relative value pretty well tested, have been removed. In some cases the varieties were poor in quality, in others the trees were unthrifty or unproductive, but as the main object in planting trees on the Experimental Farm is to test their suitability and value for our climate and conditions, a few years' trial after a tree begins fruiting determines its quality and relative usefulness, when, if it is found inferior or lacking in any of the qualities which characterize a first-class fruit, it is removed to make way for other more desirable or untried sorts. A partial list of those which have been removed is appended.

American Pippin.
American Summer Pearmain.
Anis.
Anisovka.
Antonovka.
Aport Grell.
Aport (252).
Aport (23).
Arabka (257).
Arabka.
Arabka Winter.
Arabskoe.
Arkad Solovieff.
Arkansas Beauty.
Autumn Strawberry.
Avenarius.
Bailey Sweet.
Baraboo.
Basil the Great.
Baxter.
Ben Davis.
Bismarck.
Bombshell.
Bottle Greening.
Bradfords Best.
Cabashea.
Canada Baldwin.
Carolina Red June.
Carthouse.
Chenango Strawberry.
Colvert.
Danvers Winter Sweet.
Dickinson.
Dutch Mignonne.
Dwyer.
Early Harvest.
Early May.
Early Ripe.
Excelsior.
Fairmount.
Fallawater.
Fall Jenetting.
Fall Orange.
Fall Wine.
Fameuse.
Fraser River Beauty.
Gideon.
Gideons (No. 20).
Gipsy Girl.
Gracie.
Grandmother.
Green Stripe.
Green Harvest.
Haas.
Hastings.
Hawley.
Hominy.
Isham Sweet.
Jacob Sweet.
Kantil Sinap.
Kara Sinap.
Keswick Codlin.
Lanes Sweet.
Large Anis.
Long Arcade.
Lowell.
Magog Red Streak.
Manks Codlin.
Margil.
Mayne Island.
McMahon White.
Melonen.

Milden.
Naliv Ansjutin.
Newton.
No. 181 Budd.
Onondaigua.
Orel No. 1.
Orel No. 5.
Orel No. 6.
Ostrakoff (472) Beadle.
Paperovka.
Parson Sweet.
Persian Bogdanoff.
Pewaukee.
Plodovitka Koslov.
Plums Cider.
Pointed Pipka.
Queen Olga.
Red Astrachan.
Red Bietigheimer.
Red Juneating.
Red Queen.
Red Streak.
Rolfe.
Romenskoe.
Rosy Repka.
Rosy Voronesh.
Royal Table.
Russian Preserve.
Russet Henrys.
Russet Pewaukee.
Russian Tyrol.
St. Lawrence.
Scott's Winter.
Shannon.
Silken Leaf.
Simbirsk No. 4.
Simbirsk No. 5.
Skirsch.
Smokehouse.
Sommitelnoe.
Striped Anis.
Summer Queen.
Summer Red Streak.
Sweet Bough.
Taffets Winter.
Talman Sweet.
Tetofsky.
Titovko Solovieff.
Trenton.
Twenty Ounce.
Ukraine.
Utter's Large Red.
Volga Anis.
Walbridge.
Warner's King.
Washington.
Waxen.
Waxy, Juicy.
Wellington.
Western Beauty.
White Cardinal.
Winter St. Lawrence.
Yellow Ingestre.
York Imperial.

## PEARS.

The trees are vigorous and healthy, but they have borne very little fruit at Agassiz. They were full of bloom in spring and looked very promising for a crop, but the April frost caught them just when the fruit was setting, and very few varieties bore any fruit. The following sorts; which have been reported on in previous reports, gave a small crop again this year; Beurre Bosc, Bartlett, Emile d'Heyst, La France, Dr. Jules Guyot and the Keiffer. These were the only old trees which bore fruit. The following sorts fruited for the first time this year :—

1. *Elliott's Early.*—Tree a strong grower. Fruit below medium size, obtuse, pyriform. Stalk ¾-inch long. Cavity shallow. Calyx small, open. Basin shallow. Skin yellow, with a clear red cheek and many gray dots and a little russet about stalk. Flesh, juicy, sweet, tender, somewhat granular; not high flavoured. Season, last of July.

2. *Saint Michael Archangel.*—Tree a medium grower. Fruit above medium size, oblong, pyriform. Stalk stout. Cavity small. Calyx medium, open. Basin shallow and corrugated. Skin pale yellow, splashed with russet and sprinkled with greenish dots. Flesh white, juicy, sweet, tender, aromatic. Season, October and November.

3. *Beurre Spae.*—Tree a strong grower. Fruit large, roundish, pyriform. Stalk of medium length and fleshy at junction. Calyx small and open. Skin yellow, with a little russet, and sprinkled with gray dots. Flesh yellowish, melting, very juicy, sweet, perfumed. Season, October and November.

4. *Daimyo.*—Tree a strong grower. Fruit small, ovate, pyriform. Stalk long, slender and fleshy at junction. Calyx small, open. Basin narrow, deep. Skin yellowish green, with a little russet, and a few russet dots. Flesh coarse, juicy, firm. A cooking pear. Season, November.

5. *Goat-herd.*—Tree a strong grower. Fruit small, acute pyriform. Stem one inch long, no cavity. Calyx large, open. Basin narrow and shallow. Skin greenish russet with a dull red cheek and many gray dots. Flesh white, juicy, buttery, sweet. Season, September.

6. *Charneau.*—Tree a slow grower. Fruit small, long, acute pyriform. Stalk one inch long, curved. Calyx small, open. Basin shallow and narrow. Skin russet with a bronze reddish cheek. Flesh yellowish, juicy, melting, sweet. Season, September and October.

7. *Marum Flask.*—Tree a poor grower. Fruit large, oblong, pyriform. Stalk $\frac{3}{4}$-inch long, set inclined and with a fleshy knob. Calyx large, open, no basin. Skin yellow. Flesh white, sweet, pleasant, moderately juicy. Season, October.

8. *Lincoln of Illinois.*—Tree a moderate grower. Fruit above medium size, oblong, pyriform. Stalk long. Calyx open. Skin yellowish green. Flesh yellowish, juicy, almost sweet. Season, October.

9. *Prince Imperial.*—Tree a moderate grower. Fruit of medium size, obtuse pyriform. Stalk short, stout. Calyx small, open. Basin wide and deep. Skin clear yellow with small patches of russet and many gray dots. Flesh yellowish, juicy, buttery, sweet, very good. Season, October.

## PLUMS.

The plums, like the pears, suffered from the cold rains in April and from the frost. Very few of the older trees bore fruit this year. Many of the trees of the orchard planted in the spring of 1890 have been removed. Some of them were unproductive, some very subject to rot, and others too small or poor in quality.

The following varieties are new to this country, and have fruited for the first time:—

1. *Bonne de Bry.*—Tree a strong grower. Fruit below medium size, globular, with a shallow suture, terminating in a slight depression. Skin dark purple, with a heavy whitish blue bloom. Flesh greenish, juicy, sweet, tender. Stone very small and free. Very fine for canning. Season, last of July.

2. *St. Etienne.*—Tree a strong grower. Fruit below medium size, globular. Stalk $\frac{3}{4}$-inch long. Suture well defined, ending in a small basin, one side enlarged. Skin bright orange, with a whitish bloom and a crimson blush. Flesh yellow, firm, juicy, sweet, with a fine flavour. Stone small, free. Season, last of July.

3. *Reine Claude d'Althan.*—Tree a strong grower. Fruit very small, round. Stem, $\frac{1}{2}$-inch long, set in a small depression. Skin bright clear red, with a whitish bloom. Flesh yellowish, fine grained, not juicy. Stone small, cling. Not valuable. Season, early August.

4. *Climax.*—Tree a strong grower. Fruit large, obtuse, heart-shaped. Stalk short. Cavity small. Calyx well marked. Skin deep red, sprinkled with small golden dots. Flesh yellowish, sweet, juicy, fine grained, with a pleasant flavour. Season, first of August.

5. *Yellow Imperatrice.*—Tree a strong grower. Fruit above medium size, roundish oval, with a distinct suture. Skin clear golden yellow, with a little red in streaks about stalks. Flesh yellowish, juicy, sweet, tender, with a very fine flavour. Cling stone. Season, early August.

6. *Reine Claude Davion.*—Tree a strong grower. Fruit small to medium, roundish oval. Stalk short. Suture well marked. Skin dull greenish yellow, with a few reddish dots, and spots on sunny side. Flesh yellowish, fine grained, juicy, sweet, with a fine rich flavour. Stone small, cling. Season, August.

7. *Prince of Wales.*—Tree a strong upright grower. Fruit large medium, oval shape. Stalk $\frac{3}{4}$-inch long, and set in a slight depression, with a well defined suture.

Skin bright reddish purple, with many yellow dots. Flesh yellowish, juicy, firm, sprightly. Cling stone. Season, August.

8. *Mirabelle Grosse.*—Tree a strong grower. Fruit below medium size. Round, smooth, yellow, with a few crimson dots. Flesh yellow, juicy, sugary, with a very fine flavour. Stone small, free. Season, August.

9. *Early Red.*—Tree a slow grower. Fruit below medium to small, oval. Stalk short set in a small cavity, and a well defined suture ending in a slight depression. Skin dull red with a thin whitish bloom, and sprinkled with golden dots. Flesh yellowish, juicy, a little coarse, with a pleasant flavour. Season, September.

10. *Autumn Compote.*—Tree a vigorous grower. Fruit medium to large oblong oval, with one side enlarged. Stalk long, and set in a small cavity. Skin pale dull yellow, with a thin whitish bloom. Flesh yellowish, a little coarse, juicy, sprightly, with a pleasant flavour. Season, September.

11. *Giant.*—Tree a strong grower. Fruit of medium size, oblong, with a neck. Stalk short. Suture distinct, and one side enlarged. Skin red, with a whitish bloom. Flesh yellowish, juicy, fine-grained, tender, sweet. Stone small, nearly free. Season September.

12. *White Bullace.*—Tree a strong grower. Fruit small, round. Stem short. Skin yellowish white, mottled with red in the sun. Flesh firm, juicy and sweet. A cling stone. Season last of September.

13. *Cheshire Damson.*—Tree a vigorous grower. Fruit small, round. Stalk short. Skin dark purple, covered with a thick bluish bloom. Flesh greenish, firm, juicy, sprightly and pleasant. Season last of September.

## CHERRIES.

The cherry trees were full of bloom early in April and some of the sweet cherries set a fair crop, but the continued showery weather in May and June prevented effective spraying, and the rot was severe, and the showers and sunshine during the time of ripening caused much of the sound fruit to split. So severe was this cause of loss that on two trees which were fairly well loaded with ripening fruit, not more than five per cent were sound, this by count of the fruit on several well loaded branches.

The following sorts fruited for the first time this year:—

1. *Kentish.*—Tree a slow grower. Fruit large, flattened at top and bottom. Stalk short. Skin clear deep shiny red. Flesh yellowish white, juicy, sub-acid, and when allowed to hang on the tree until very ripe has a rich pleasant flavour mildly acid. Season last of June.

2. *Grosse Griotte du Vin.*—Tree a healthy grower. Fruit of medium size, roundish, much flattened. Stalk long. Skin very dark glossy red. Flesh and juice dark red, juicy, mild, sprightly acid, with a pleasant flavour. Season July.

3. *Bohemian Black Bigarreau.*—Tree a strong grower. Fruit large, roundish, heart shaped. Stalk short and stout. Skin glossy black. Flesh black, with dark red juice; firm, juicy, rich, sweet, with a very fine flavour. Season July.

4. *Wragg.*—Tree a strong grower. Fruit of medium size, oval. Stalk long, set in a narrow cavity. Skin dark glossy red. Flesh red, with dark red juice; rich, with a pleasant flavour, mildly acid. Stone small. Season July.

5. *Cluster Black Heart.*—Tree a strong grower. Fruit medium to small, heart-shaped. Stalk long. Skin glossy black. Flesh and juice very dark red. Flesh tender, juicy, mild and pleasantly acid. Season July.

6. *Early Juicy.*—Tree a strong grower, but late and unproductive. Fruit of medium size, roundish. Stalk long, slender and set in a slight depression. Skin clear glossy red. Flesh yellowish, tender, juicy, nearly sweet. Season July.

7. *Griotte Acher.*—Tree a medium grower. Fruit of medium size, heart-shaped. Stalk long, set in a narrow basin. Skin dark glossy red. Flesh and juice red. Flesh tender, juicy, nearly sweet, with a pleasant flavour. Season late July.

8. *Guigne Choque.*—Tree a medium grower. Fruit above medium size, oblong oval. Skin yellowish-red. Flesh juicy, sweet with a pleasant flavour. Stone large. Season July.

9. *Bigarreau Mongin.*—Tree a medium grower. Fruit of medium size, heart-shaped. Skin clear glossy yellow with a bright red cheek. Stalk long, set in a deep basin. Flesh yellowish-white, tender, juicy, sweet with a pleasant flavour. Season July.

10. *Chatenay*—Tree a weak and slow grower. Fruit small, heart-shaped. Stalk very long set in a narrow basin. Skin yellowish-red with dark red dots. Flesh whitish, juicy, sprightly, not valuable. Season early August.

## PEACHES AND APRICOTS.

There are only a few trees of these fruits left on the Experimental Farm and these bore no fruit. The peach trees now growing here are perhaps too young to bear much, and the apricots bloom too early and have never borne much fruit.

## QUINCES.

The only one of these fruits to bear is the Portuguese, which fruited again this year. Three other varieties blossomed but did not bear fruit.

## MEDLARS.

All of the medlar trees fruited this year. There is practically no difference in productiveness or quality of the fruit of the different named sorts, and all make a fine rich jelly.

## MULBERRIES.

As in former years the mulberry trees were loaded with fruit.

## MOUNTAIN ORCHARDS.

The mountain orchards have made a strong healthy growth and have borne some fruit, plums, apples, pears and medlars, but, as in former years, birds and wild animals eat or destroy much of the fruit.

## NUT ORCHARDS.

The Japanese walnut as usual bore a heavy crop of nuts, the Japanese and Spanish chestnuts a fair crop, and the English walnut and the American black walnut a few nuts per tree. A great many applications for nuts to plant are being received and many reports of success with nuts from samples of nuts distributed in previous years are received.

## SMALL FRUITS.

The crop of small fruits has been fairly good this year, and a few days earlier than last year. The fruit was not quite so large as usual, which was caused by the dry weather. We have now under test seventy-three varieties of Red and Yellow raspberries. These have all been described in previous reports.

After several years' trial under similar conditions, the following varieties have proved to be the best.

In quality, Sarah is superior to all the others and equal to any in productiveness, but it is not so firm, or so large as the Cuthbert.

RED AND YELLOW RASPBERRIES.

| Name. | Date of Ripening. | Growth of Plant. | Size of Fruit. | Quality. | Productiveness. |
|---|---|---|---|---|---|
| Phœnix | June 26. | Vigorous | Large | Firm, good quality | Productive. |
| Pauline | July 1. | " | " | " " continued long in bearing. | " |
| New Fastolf | " 2. | " | " | Firm, good quality | " |
| Northumberland Fill Basket. | " 2. | " | Very large | " " continued long in bearing. | " |
| Duke of Brabant | " 3. | " | Large | Firm, good quality | " |
| All Summer | " 4. | " | Large medium | " " continued long in bearing. | " |
| Sarah | " 5. | " | " | Very good quality | " |
| Lord Beaconsfield | " 7. | " | " | Firm, good quality | " |
| London | " 7. | " | " | " " | " |
| Cuthbert | " 8. | " | Large | " " | " |
| R. B. Whyte | " 8. | " | Large medium | " " | " |
| French Vice-President | " 8. | " | Very large | " " | " |
| Golden Queen | " 4. | " | Large | " " | " |
| Large Yellow | " 6. | " | " | " " | " |

BLACK CAP RASPBERRIES.

Nineteen varieties of Black Cap Raspberries are under test. Black Caps require very rich ground. They also require moisture as well as sunshine when the berries are growing and ripening, to ensure a good crop.

The following are the best of those tested here:—

| Name. | Date of Ripening. | Growth of Plant. | Size of Fruit. | Quality. | Productiveness. |
|---|---|---|---|---|---|
| Nemaha | July 8. | Vigorous | Large | Good quality | Productive. |
| Palmer | " 8. | " | Large medium | " | " |
| Older | " 10. | " | " | " | " |
| Kansas | " 10. | " | " | " | " |
| Mammoth Cluster | " 10. | " | Large | " | " |
| Gregg | " 12. | " | " | " | " |
| Progress | " 12. | " | Medium | " | " |
| Ida | " 12. | " | " | " | " |

BLACKBERRIES.

The blackberries gave a fairly good crop this year, there are twenty-nine varieties under test; the following are the best:—

| Name. | Date of Ripening. | Growth of Plant. | Size of Fruit. | Quality. | Productiveness. |
|---|---|---|---|---|---|
| Early King | July 16. | Vigorous | Large | Good quality | Productive. |
| Snyder | " 22. | " | Large medium | " | " |
| Hansel | " 22. | " | Medium | " | " |
| Stone's Hardy | " 22. | " | Large | Very good quality | " |
| Eldorado | " 22. | " | " | The very best quality | " |
| Erie | " 24. | " | " | Good quality | " |
| Agawam | " 25. | " | Large medium | " | " |
| Taylor | " 25 | " | " | " | " |
| Taylor's Prolific | Aug. 1. | " | " | " | " |
| Minnewaska | " 2. | " | " | " | " |

RED AND WHITE CURRANTS.

Of the forty-two varieties under test, the following are the best:—

| Name. | Date of Ripening. | Growth of Plant. | Size of Fruit. | Quality. | Productiveness. |
|---|---|---|---|---|---|
| La Fertile | July 3. | Vigorous | Large medium | Good quality | Productive. |
| Pomona | " 3. | " | " | " | " |
| Raby Castle | " 3. | " | " | " | " |
| London | " 3. | " | " | " | " |
| Red Cherry | " 3. | " | Large | " | " |
| La Conde | " 4. | " | " | " | " |
| Prince Albert | " 4. | " | Large medium | " | " |
| White Cherry | " 7. | " | Large | " | " |
| LargeWhiteBrandenburg | " 7. | " | " | " | " |
| White Pearl | " 8. | " | Medium | " | " |
| Victoria | " 8. | " | Large medium | " | " |

BLACK CURRANTS.

Fifty-one varieties of black currants are under test, of these the following are the best:—

| Name. | Date of Ripening. | Growth of Plant. | Size of Fruit. | Quality. | Productiveness. |
|---|---|---|---|---|---|
| Dominion | July 10. | Vigorous | Large medium | Good quality | Productive. |
| Middlesex | " 10. | " | " | " | " |
| Merveille de la Gironde | " 10. | " | " | " | " |
| Boskoop Giant | " 10. | " | Very large | Very good quality | " |
| Baldwin | " 10. | " | Large medium | Good quality | " |
| Prince of Wales | " 10. | " | Large | " | " |
| London | " 12. | " | Large medium | " | " |
| Black Naples | " 12. | " | Large | " | " |
| Lee's Prolific | " 12. | " | Large medium | " | " |
| Pearce | " 12. | " | " | " | " |
| Pomona | " 12. | " | Large | " | " |
| Victoria | " 12. | " | Large medium | " | " |
| Climax | " 12. | " | " | " | " |

## GRAPES.

The weather during summer and autumn being dry and warm, the following varieties of grapes ripened, in the order named:—

Jessica.
Delaware.
Saunders' Seedling No. 2.
Saunders' Seedling No. 4.
Moore's Early.
Moyer.
Wyoming Red.
Poughkeepsie Red.
Worden.
Emerald.
Martha.
Brighton.
Wilder.
Pocklington.
Brilliant.
Canada.
Lady.
Champion.
Clinton.
Niagara.

## METEOROLOGICAL RECORD.

| Date of Highest Temperature. | Temperature. | Date of Lowest Temperature. | Temperature. | Rainfall. | Snowfall. | Sunshine. | |
|---|---|---|---|---|---|---|---|
| | ° | | ° | Inches. | Inches. | Hours. | Minutes. |
| 1903. | | | | | | | |
| December 3......... | 52 | December 11 & 27 | 31 | 3·31 | 11 | 35 | 18 |
| 1904. | | | | | | | |
| January 3 ......... | 46 | January 18 and 19 | 15 | 6·30 | 4 | 30 | 24 |
| February 24........ | 48 | February 8 and 9. | 17 | 2·86 | 32 | 23 | .. |
| March 25.. ........ | 63 | March 21 and 22.. | 30 | 5·32 | 3 | 73 | 36 |
| April 14........... | 80 | April 29 ......... | 30 | 3·46 | .......... | 139 | 24 |
| May 22............. | 82 | May 1 and 31 .... | 35 | 2·34 | .......... | 176 | 30 |
| June 20............ | 88 | June 9........... | 37 | 3·42 | .......... | 181 | 30 |
| July 22............ | 93 | July 28.......... | 43 | 3·45 | .......... | 225 | 36 |
| August 4.......... | 90 | August 23........ | 41 | 2·30 | .......... | 176 | 12 |
| September 16....... | 81 | September 29..... | 36 | 2·37 | .......... | 172 | 36 |
| October 17......... | 78 | October 25........ | 36 | 3·20 | .......... | 68 | 18 |
| November 3........ | 67 | Nov. 1, 2, 6 & 28.. | 35 | 6·43 | .......... | 31 | 30 |
| | | Totals..... ... | .......... | 44·76 | 50 | 1,333 | 54 |

I have the honour to be, sir,

Your obedient servant,

THOS. A. SHARPE.

# STATEMENT OF EXPENDITURE ON THE DOMINION EXPERIMENTAL FARMS, FOR THE YEAR ENDING JUNE 30, 1904.

## CENTRAL EXPERIMENTAL FARM.

| | | | |
|---|---|---|---|
| Live stock | | | $ 306 11 |
| Feed for stock | | $ 680 55 | |
| Supplies from experimental plots | | 547 11 | |
| Grain screenings from grain distribution | | 116 12 | |
| | | $ 1,343 78 | |
| LESS—Supplies to poultry department | | 253 80 | |
| | | | 1,089 98 |
| Veterinary services and drugs | | | 205 14 |
| Seeds, grain, trees, &c | | $ 1,655 72 | |
| LESS—Value of seeds for grain distribution | $ 281 52 | | |
| " trees " tree " | 93 37 | | |
| " " Arboretum | 106 15 | | |
| | | 481 04 | |
| | | | 1,174 68 |
| Implements, tools, hardware and supplies | | | 1,049 56 |
| Drainage and drain tiles | | | 151 55 |
| Manure and fertilizers for experimental plots and horticultural department | | | 448 17 |
| Travelling expenses | | | 1,738 81 |
| Exhibition expenses | | | 655 95 |
| Blacksmithing, harness supplies and repairs | | | 736 57 |
| Bee department | | | 153 27 |
| Wages: farm work, including salaries of officers in charge | | | 4,708 79 |
| Wages: care of stock, including salary of herdsman | | | 3,377 40 |
| Horticultural division, including salaries of officers in charge, also forestry $11.59 | | | 4,971 25 |
| Poultry division, also salaries of officers in charge | | $ 2,775 25 | |
| Value of grain, &c., supplied by farm | | 253 80 | |
| | | | 3,029 05 |
| Experimental division, including salaries of officers in charge | | $ 3,872 78 | |
| LESS—Value of material supplied for feed | | 547 11 | |
| " potatoes supplied for seed distribution | | 151 00 | |
| | | 698 11 | |
| | | | 3,174 67 |
| Care of hedges, avenues, ornamental trees and grounds | | | 1,316 06 |
| Office assistance, including English and French correspondence and messenger service | | | 4,505 11 |
| Printing of office supplies and stationery | | | 1,302 77 |
| Arboretum | | $ 1,193 79 | |
| Value of trees from Seeds, grain, trees, &c | | 106 15 | |
| | | | 1,299 94 |
| Distribution of trees and tree seeds | | $ 177 51 | |
| Value of trees from Seeds, grain, trees, &c | | 93 37 | |
| | | | 270 88 |
| Seed testing and care of green-houses | | | 1,157 97 |
| Dairy branch, including salary of dairyman | | | 849 64 |
| Contingencies | | | 134 83 |
| Telegrams and telephones | | | 244 22 |
| Steers, purchased for feeding experiments | | | 1,792 06 |
| Museum | | | 56 83 |
| Books and newspapers | | | 193 33 |
| | | | $ 40,094 59 |
| LESS—Proceeds of sale of steers, purchased for feeding experiments | | | 2,875 26 |
| | | | $ 37,219 33 |

## EXPERIMENTAL FARM, NAPPAN, N.S.—EXPENDITURE, 1903-4.

| | | |
|---|---|---|
| Live stock | $ | 209 12 |
| Feed for stock | | 2,422 03 |
| Veterinary services and drugs | | 65 72 |
| Seed grain, seeds, trees, &c. | | 444 11 |
| Implements, tools, hardware and supplies | | 387 98 |
| Manure and fertilizers | | 411 86 |
| Travelling expenses | | 316 83 |
| Exhibition expenses | | 279 21 |
| Blacksmithing, harness supplies and repairs | | 417 03 |
| Salary of Superintendent | | 1,500 00 |
| Wages, farm work, including experimental work with farm crops | | 2,628 47 |
| Wages, care of stock | | 1,733 75 |
| Poultry branch | | 99 20 |
| Horticultural division, including experimental work with vegetables, fruits, forest and ornamental trees and flowers; also care of grounds and salary of officer in charge | | 1,601 13 |
| Distribution of seed grain, potatoes, &c. | | 173 19 |
| Contingencies, including postage, $149; mail delivery, $97.50 | | 333 85 |
| Printing and stationery | | 56 11 |
| Books and newspapers | | 23 92 |
| Telegrams and telephones | | 54 47 |
| Steers purchased for feeding experiments | | 927 50 |
| | $ | 14,085 48 |
| LESS—Proceeds of sale of steers purchased for feeding experiments | | 2,000 16 |
| | $ | 12,085 32 |

## EXPERIMENTAL FARM, BRANDON, MAN.—EXPENDITURE, 1903-4.

| | | |
|---|---|---|
| Live stock | | $ 26 00 |
| Feed for stock | | 18 50 |
| Veterinary services and drugs | | 94 10 |
| Seed grain, trees, seeds, &c. | | 40 95 |
| Implements, tools, hardware and supplies | | 1,268 67 |
| Travelling expenses | | 110 49 |
| Exhibition expenses | | 235 45 |
| Blacksmithing, harness supplies and repairs | | 507 10 |
| Bee department | | 71 18 |
| Salary of Superintendent | | 1,500 00 |
| Wages, farm work, including experimental work, with farm crops, &c. | | 3,334 28 |
| Wages, care of stock | | 1,013 75 |
| Horticultural branch, including experiments with vegetables, fruits and flowers; also care of Arboretum and grounds | | 710 90 |
| Forestry branch, including care of hedges | | 644 25 |
| Poultry branch | | 95 65 |
| Office help, including delivery of mail, $148 | | 813 20 |
| Distribution of seed grain, potatoes, &c. | | 640 66 |
| Distribution of trees and tree seeds | | 226 97 |
| Contingencies, including postage, $263.15; renewal of bridge across small lake on farm, $350.93; sinking well, $51 | | 683 56 |
| Printing and stationery | | 165 14 |
| Books and newspapers | | 19 25 |
| Telegrams and telephones | | 87 67 |
| Drainage and drain tiles | | 40 50 |
| Manure and fertilizers | | 115 00 |
| Steers purchased for feeding experiments | | 398 30 |
| | | $ 12,861 52 |
| LESS—Proceeds of sale of steers purchased for feeding experiments | $ 580 42 | |
| Value of grain supplied for seed distribution at Ottawa | 362 02 | |
| | | 942 44 |
| | | $ 11,919 08 |

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.—EXPENDITURE, 1903-4.

| | | |
|---|---|---|
| Live stock | | $ 242 00 |
| Feed for stock | | 58 55 |
| Veterinary services and drugs | | 103 95 |
| Seed grain, seeds, trees, &c | | 90 46 |
| Implements, tools, hardware and supplies | | 1,398 17 |
| Travelling expenses | | 112 66 |
| Exhibition expenses | | 105 75 |
| Blacksmithing, harness supplies and repairs | | 199 80 |
| Salary of Superintendent | | 1,500 00 |
| Wages, farm work, including experimental work with farm crops | | 3,724 70 |
| Wages, care of stock | | 775 02 |
| Horticultural branch | | 420 65 |
| Poultry branch | | 115 54 |
| Forestry branch, including hedges | | 287 65 |
| Office help, including delivery of mail | | 750 00 |
| Distribution of seed grain, potatoes, &c | | 271 08 |
| Distribution of trees and tree seed | | 120 78 |
| Contingencies, including postage, $669.39 | | 715 04 |
| Printing and stationery | | 65 91 |
| Telegrams and telephones | | 42 15 |
| Manure and fertilizers | | 14 27 |
| Books and newspapers | | 3 50 |
| Steers purchased for feeding experiments | | 470 00 |
| | | $ 11,587 63 |
| LESS—Proceeds of sale of steers purchased for feeding experiments | $ 785 00 | |
| Value of grain supplied for grain distribution at Ottawa | 1,127 35 | |
| | | 1,912 35 |
| | | $ 9,675 28 |

EXPERIMENTAL FARM, AGASSIZ, B.C.—EXPENDITURE, 1903-4.

| | |
|---|---|
| Live stock | 67 13 |
| Feed for stock | 47 58 |
| Veterinary services and drugs | 4 40 |
| Seed grain, seeds, trees, &c | 99 03 |
| Implements, tools, hardware and supplies | 177 99 |
| Manure and fertilizers | 137 37 |
| Travelling expenses | 181 94 |
| Exhibition expenses | 254 54 |
| Blacksmithing, harness supplies and repairs | 151 75 |
| Salary of Superintendent | 1,500 00 |
| Wages, farm work, including experimental work with farm crops, vegetables, fruit trees, vines, &c | 3,018 57 |
| Wages, care of stock | 549 00 |
| Poultry branch | 65 95 |
| Forestry branch, including care of hedges | 216 00 |
| Office help | 130 00 |
| Distribution of seed grain, potatoes, &c | 112 80 |
| Distribution of trees and tree seeds | 5 13 |
| Clearing land | 544 80 |
| Contingencies, including postage, $155.19 | 213 69 |
| Printing and stationery | 18 24 |
| Books and newspapers | 20 50 |
| Drainage and drain tiles | 15 20 |
| Bee supplies | 1 00 |
| Telegrams and telephones | 1 50 |
| | 7,534 11 |

## SUMMARY OF EXPENDITURE, 1903-04.

| | |
|---|---|
| Central Experimental Farm | $ 37,219 33 |
| Nappan " | 12,085 32 |
| Brandon " | 11,919 08 |
| Indian Head " | 9,675 28 |
| Agassiz " | 7,534 11 |

*General Expenditure.**

| | | | |
|---|---|---|---|
| Distribution of seed grain, potatoes, &c., from Central Experimental Farm | | $ 4,804 42 | |
| Value of seeds from, seeds, grain, trees, &c | | 281 52 | |
| " grain from Brandon | $ 362 02 | | |
| " " Indian Head | 1,127 35 | | |
| " potatoes from Experimental Division C.E.F. | 151 00 | | |
| | $1,640 37 | | |
| Less—Value of screenings charged feed for stock C.E.F | 116 12 | | |
| | | 1,525 24 | |
| | | | 6,610 19 |
| Entomological and Botanical Division, including salaries of officers in charge | | | 4,098 81 |
| Chemical Division, including salaries of officers in charge | | | 4,720 22 |
| Salaries general, including— | | | |
| Director, accountant, director's secretary and assistant accountant | | | 6,137 51 |
| | | | 99,999 85 |
| Printing bulletins and distribution of bulletins and reports | | 7,000 00 | |
| Less—Special sum in estimates for this item | | 7,000 00 | |
| | | | 99,999 85 |

*These items are put under "General Expenditure" for the reason that they are incurred for general purposes.

## SUMMARY OF STOCK, MACHINERY, IMPLEMENTS, &c., ON HAND DECEMBER 1, 1904.

### CENTRAL EXPERIMENTAL FARM, OTTAWA, ONT.

| | |
|---|---|
| 17 Horses | $ 3,415 00 |
| 18 Ayrshire cattle | 2,035 00 |
| 13 Guernsey cattle | 1,565 00 |
| 14 Durham cattle (Shorthorns) | 3,175 00 |
| 8 Canadian cattle | 950 00 |
| 16 Grade cattle | 605 00 |
| 27 Yorkshire swine | 728 00 |
| 9 Berkshire swine | 340 00 |
| 7 Tamworth swine | 200 00 |
| 70 Grade swine | 382 00 |
| 28 Shropshire sheep | 503 00 |
| 12 Leicester sheep | 230 00 |
| 3 Grade sheep | 12 00 |
| Farm machinery and implements | 3,071 75 |
| Vehicles, including farm wagons and sleighs | 1,079 00 |
| Hand tools, hardware and sundries | 1,152 15 |
| Harness | 588 45 |
| Dairy department, machinery, &c | 488 50 |
| Horticultural and forestry departments, implements, tools, &c | 658 50 |
| Botanical department, implements, tools, &c | 5 00 |
| Poultry department, 222 fowls | 353 00 |
| Poultry department, implements, furnishings, &c | 146 35 |
| Bees and apiarian supplies | 430 02 |
| Chemical department, apparatus and chemicals | 1,875 00 |
| Books in several departments | 572 86 |
| Greenhouse plants, supplies, &c | 2,229 50 |
| Furniture at Director's house | 1,100 00 |
| Office furniture and stationery | 1,676 25 |
| Experimental flour mill and electric motor | 4[illegible]5 00 |
| | 30,037 33 |

## EXPERIMENTAL FARM, NAPPAN, N.S.

| | |
|---|---|
| 8 Horses | $ 1,085 00 |
| 4 Guernsey cattle | 635 00 |
| 7 Holstein cattle | 370 00 |
| 14 Ayrshire cattle | 855 00 |
| 60 Grade cattle | 1,960 00 |
| 4 Yorkshire swine | 95 00 |
| 2 Berkshire swine | 45 00 |
| 64 Grade swine | 300 00 |
| 20 Sheep | 240 00 |
| 77 Fowls | 50 50 |
| Bees and apiarian supplies | 10 30 |
| Vehicles, including farm wagons and sleighs | 416 50 |
| Farm machinery | 547 50 |
| Farm implements | 207 00 |
| Hand tools, hardware and sundries | 363 50 |
| Harness | 213 50 |
| Furniture for reception room and bedroom for visiting officials | 129 00 |
| Furniture supplies and books for office | 85 00 |
| | $ 7,607 80 |

## EXPERIMENTAL FARM, BRANDON, MAN.

| | |
|---|---|
| 13 Horses | $ 1,400 00 |
| 3 Ayrshire cattle | 175 00 |
| 7 Durham cattle | 550 00 |
| 3 Guernsey cattle | 175 00 |
| 9 Grade cattle | 285 00 |
| 1 Tamworth pig | 15 00 |
| 1 Berkshire pig | 15 00 |
| 13 Yorkshire swine | 90 00 |
| 8 Grade swine | 30 00 |
| 100 Fowls | 100 00 |
| Bees and apiarian supplies | 131 45 |
| Vehicles, including farm wagons and sleighs | 415 00 |
| Farm machinery | 2,136 33 |
| Farm implements | 728 00 |
| Hand tools, hardware and sundries | 654 05 |
| Harness | 219 25 |
| Furniture for reception room and bedroom for visiting officials | 161 55 |
| Furniture supplies and books for office | 287 30 |
| | $ 7,567 93 |

## EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.

| | |
|---|---|
| 12 Horses | $ 1,570 00 |
| 35 Durham cattle | 1,960 00 |
| 23 Grade cattle | 830 00 |
| 18 Berkshire swine | 155 00 |
| 19 Tamworth swine | 151 00 |
| 2 Yorkshire White swine | 40 00 |
| 66 Fowls | 66 00 |
| Bees and apiarian supplies | 25 75 |
| Vehicles, including farm wagons and sleighs | 551 00 |
| Farm machinery | 2,255 33 |
| Farm implements | 763 00 |
| Hand tools, hardware and sundries | 399 75 |
| Harness | 182 75 |
| Furniture for reception room and bedroom for visiting officials | 217 00 |
| Furniture supplies and books for office | 367 50 |
| | $ 9,534 08 |

## EXPERIMENTAL FARM, AGASSIZ, B.C.

| | | |
|---|---|---|
| 6 Horses | $ | 650 00 |
| 12 Durham cattle | | 1,600 00 |
| 17 Dorset horned sheep | | 191 00 |
| 14 Berkshire swine | | 129 00 |
| 11 Yorkshire White swine | | 145 00 |
| 74 Fowls | | 68 00 |
| Bees and apiarian supplies | | 54 75 |
| Vehicles, including farm wagons | | 193 50 |
| Farm machinery | | 643 00 |
| Farm implements | | 104 50 |
| Hand tools, hardware and sundries | | 137 70 |
| Harness | | 116 00 |
| Furniture for reception room and bedroom for visiting officials | | 151 15 |
| Furniture supplies and books for office | | 124 00 |
| | $ | 4,307 60 |

THOS. M. CRAMP, *Accountant.*

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