9-10 EDWARD VII. SESSIONAL PAPER No. 16 A. 1910

APPENDIX TO THE REPORT OF THE MINISTER OF AGRICULTURE

EXPERIMENTAL FARMS

REPORTS

OF THE

DIRECTOR		WM. SAUNDERS, C.M.G., LL.D.
ENTOMOLOGICAL AND BOTANICAL DIVISION		" " "
AGRICULTURIST		J. H. GRISDALE, B. AGR.
HORTICULTURIST		W. T. MACOUN
CHEMIST		F. T. SHUTT, M.A.
CEREALIST		C. E. SAUNDERS, PH.D.
POULTRY MANAGER		A. G. GILBERT
SUPT. EXPERIMENTAL FARM,	NAPPAN, N.S.	R. ROBERTSON
" " "	BRANDON, MAN.	JAMES MURRAY, B.S.A.
" " "	INDIAN HEAD, SASK.	ANGUS MACKAY
" " "	LETHBRIDGE, ALTA.	W. H. FAIRFIELD, M.S.
" " "	LACOMBE, ALTA.	G. H. HUTTON, B.S.A.
" " "	AGASSIZ, B.C.	THOS. A. SHARPE

FOR THE

YEAR ENDING MARCH 31

1909

PRINTED BY ORDER OF PARLIAMENT

OTTAWA
PRINTED BY C. H. PARMELEE, PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1909

[No. 16—1909.]

APPENDIX

TO THE

REPORT OF THE MINISTER OF AGRICULTURE

ON

EXPERIMENTAL FARMS

OTTAWA, March 31, 1909.

SIR,—I beg to submit for your approval the twenty-second annual report of the work done, and in progress, at the several Experimental Farms.

Following the report of the Director will be found a report on the work done by the Division of Entomology and Botany, with special references to the work of the late chief officer of this Division, Dr. James Fletcher.

You will find also 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 Cerealist, 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 of the Experimental Farm for the Maritime Provinces, at Nappan, Nova Scotia; from Mr. James Murray, Superintendent of the Experimental Farm for Manitoba at Brandon; from Mr. Angus Mackay, Superintendent of the Experimental Farm for Saskatchewan at Indian Head; from Mr. W. H. Fairfield, Superintendent of the Experimental Farm for Southern Alberta at Lethbridge; from Mr. G. H. Hutton, Superintendent of the Experimental Farm for Central Alberta at Lacombe, 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, orchards and plantations at the several Experimental Farms; of scientific research in connection with the breeding of cereals and in determining their relative value; 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 work of the Entomological and Botanical Division 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 and other farm crops, furnish gratifying evidence of the desire for information 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

For the year ending March 31, 1909

REPORT OF THE DIRECTOR

WM. SAUNDERS, C.M.G., LL.D., F.R.S.C., F.L.S.

The season of 1908, although not everywhere favourable to the farmer, was, in most parts of Canada, fairly satisfactory. The field crops of the Dominion are said to have covered a total area of 27,505,663 acres, and to have yielded crops which, estimated at average local market prices, would reach the value of $432,534,000.

In Ontario the season was not very favourable. The spring was exceedingly wet, and the early sowing of grain was therefore impossible. When at length the seed was all in, the weather changed, and unusual heat and rather severe drought prevailed through the greater part of the summer and autumn. These adverse conditions reduced the crops to considerably below the average except where the soil was unusually rich and retentive of moisture. The results of this season have emphasized the necessity for early sowing, and in those localities where early seeding was possible the resulting crops were more satisfactory. The crop of winter wheat was 15,798,000 bushels, the average yield being 23·60 bushels per acre. Spring wheat gave an average of only 15·80 bushels per acre and the crop was 2,259,000 bushels. The total crop of oats was 103,821,000 bushels, with an average yield of 33·40 bushels per acre. The barley, the total crop of which was 21,124,000 bushels, gave an average of 28·40 bushels per acre. The hay and clover, which occupies a larger acreage than any other crop in Ontario, gave 5,187,000 tons, which brought an average return of $11.02 per ton, or a total of $57,160,000.

In Quebec, where the acreage under crop is very much smaller than in Ontario, winter wheat is not grown. Spring wheat gave an average of 13·50 bushels per acre, oats, 23 bushels, and barley, 19·80 bushels per acre. These three cereals returned to the farmers nearly twenty-two million dollars in all. Hay and clover, on account of drought, gave a yield somewhat less than in Ontario, the total crop being 3,473,000 tons, valued at $38,198,000. The summer weather in this province was unusually dry.

In the Maritime Provinces, the winter was mild, the spring dry and the land ready for seeding early. The season was favourable for growth, and the yield of most crops has been up to or above the average. Spring wheat has yielded better crops than in Ontario. In Nova Scotia the average has been 17·40 bushels per acre, in New Brunswick 17·30, and in Prince Edward Island 14·25 bushels per acre, but oats, which occupied a much larger area, have not averaged quite so well as in Ontario. Dairying has been prosperous, cheese and butter bringing unusual prices. Apples have been fairly plentiful and have been of better quality than usual bringing higher prices. The exports of apples from Nova Scotia during 1908 are said to have been the largest on record, amounting to nearly 600,000 barrels. Hay was a heavy crop with lower prices. The yield of potatoes has been excellent.

In Manitoba the spring weather was suitable for early sowing, and all crops were got in in good time and under favourable conditions. Good weather continued until about the middle of July, when very hot weather set in, which lasted for two weeks.

This ripened the grain too rapidly, and the yields of some crops were considerably reduced, especially oats and wheat. There were several degrees of frost on August 22, which injured some of the later fruits. In the Brandon district, the season was a favourable one and a good average crop was secured, in good condition. The total wheat crop in Manitoba was 50,269,000 bushels, with an average yield of 17 bushels per acre. This brought nearly forty-two million dollars into the pockets of the Manitoba farmers. Oats yielded over fourteen millions and barley more than six and one-half million dollars.

In Saskatchewan, the spring of 1908 was probably the finest season for seeding which this province has had for many years. The weather was favourable at the outset and seeding was nearly three weeks earlier than that of 1907. The ground was kept in a good condition of moisture by timely showers and growth was very rapid, while, later in the season, hot weather prevailed, which caused the grain to ripen rapidly. On July 25 the temperature rose to 94·5° F. This had an injurious effect on some of the grain, causing it to shrivel. Subsequently, the weather was very favourable for harvesting and threshing. At the Experimental Farm at Indian Head, the trial plots of grain gave more than twice the crop of 1907, the varieties averaging 39 bushels 21 lbs. per acre. The total yield of wheat in this province was 34,742,000 bushels. The yield per acre was rather low, 14·50 bushels, but the total crop realized nearly twenty-six million dollars.

In Southern Alberta, the crop of winter wheat was very good. The total yield for the province was 3,000,000 bushels, and the yield per acre averaged 29·70 bushels. The yield of spring wheat, of which there was harvested a crop of 3,842,000 bushels, was larger than in any of the other provinces of the Dominion, averaging 22·60 bushels per acre. The ten varieties of winter wheat grown at Lethbridge under 'dry farming' methods averaged 40 bushels 20 lbs. per acre. A field of Kharkov wheat also grown at Lethbridge of 23¼ acres, sown at the rate of 30 lbs. of seed per acre during the first few days of September and cut the last week in July following, yielded at the rate of 54 bushels 11 lbs. per acre. The spring wheat on non-irrigated land gave an average of 29 bushels 32 lbs. per acre, while on the irrigated land the yield was 37 bushels 20 lbs. per acre.

At Lacombe, in Central Alberta, the season of 1908 was much more favourable for wheat-growing than that of 1907. The crop was larger and most of the grain was plump. Seeding was about three weeks earlier than last year, and the growth was rapid until August, when cool weather and some frost delayed the maturing of the grain. In 1907, the trial plots of spring wheat gave an average of 21 bushels 51 lbs. per acre, whereas in 1908, the average yield was 33 bushels 34 lbs. per acre. Oats gave a larger average yield per acre in Alberta than in any other of the western provinces.

In British Columbia the season of 1908 opened earlier, and grain was sown about ten days sooner than in 1907. The weather later in the season also was favourable to the ripening of the grain, and it matured well and early. Oats, barley, peas, turnips and mangels all gave heavier crops in 1908 than in 1907.

EXPERIMENTS IN AGRICULTURE, HORTICULTURE AND ARBORICULTURE AT FORT VERMILION, ON THE PEACE RIVER.

In the annual report of the Experimental Farms for the year ending March 31, 1908, reference is made on page 6 to some experiments in agriculture, horticulture, &c., at Fort Vermilion, on the Peace River. These experiments have been continued by Mr. Robert Jones, a practical farmer, who has had many years' experience in the Peace River country. As already stated, Fort Vermilion is about 350 miles in a direct line north of Edmonton, or about 700 miles by the mail route.

Under date of December 19, 1908, Mr. Jones reports on the results of the experiments conducted, also on the condition of the crops in the Fort Vermilion district. He says: 'The past season was, on the whole, very favourable for crops of all sorts in this locality. The spring opened up about the middle of April and seeding was under full headway by the 1st of May. Wheat was fully ripe by the 17th of August, and the harvest was general by the 20th of that month. None of the wheat grown in this district was frosted.'

Owing to delay in the mails, the seed of early-ripening wheat and other early cereals, also seeds of many sorts of vegetables and fodder plants, sent to Mr. Jones from the Central Experimental Farm at Ottawa for sowing, did not reach Fort Vermilion until June, hence they were held over to be sown in the spring of 1909. Mr. Jones has given much of his time this season to the examination of crops grown by farmers in the district, and has obtained samples from them which he has forwarded to the Central Experimental Farm. He says that he thinks he is quite safe in estimating the wheat crop for the Fort Vermilion district for this year at 35,000 bushels, with an average yield of 24 bushels per acre. The quantity of barley produced he estimates at 5,000 bushels, with an average of about 60 bushels to the acre, and oats about 4,000 bushels, making a total of about 44,000 bushels of grain for that district.

Experimental plots of turnips sown by Mr. Jones have given crops of over 16 tons to the acre, mangels 15 tons and white carrots 12½ tons, to the acre.

The hardy cross-bred apples produced at the Experimental Farm at Ottawa, also some hardy Russian sorts, which were sent to Fort Vermilion in the spring of 1907 survived the winter of 1907-8, and have made good growth during the past season, some of them as much as two feet. The plums which were sent at the same time have made a still stronger growth. Mr. Jones says, when writing on October 15, 1908: 'Although most of our native trees have been stripped of their foliage by frost, the leaves on the apple and plum trees are quite green yet.'

About twenty-five varieties of black, red and white currants were also sent to Fort Vermilion for test, with three varieties of raspberries and two of strawberries, and all of these are doing well and making good growth. Many varieties of trees and shrubs of the hardiest sorts suitable for shelter and ornament in northern districts were also supplied. Those which survived the hardships connected with transportation and the cold weather of the winter of 1907—more than fifty varieties in all—are reported as doing well.

Writing on August 29, 1908, Mr. Jones says: 'My garden vegetables are promising large yields. Some of my carrots measure now three inches in diameter, and I have cauliflowers at present which weigh 10 pounds each, also tomatoes of good size which are almost ripe now. The yield of potatoes will be large; the earliest ones were ready for the table on July 13.'

The samples of wheat sent by Mr. Jones from Fort Vermilion were very fine, well matured and very heavy. There were five samples in all and their dates of sowing and harvesting were as follows:—

Name of Variety.	Date of Sowing.	When Ripe.	When Cut.	Weight per Bushel.	Percentage of Germination.
				Lbs.	
Preston	May 6	August 19	August 22	64½	100
Ladoga	April 31	....	September 5	64	92
Ladoga	May 4	August 17	August 21	64	99
Early Riga	April 21	....	" 21	63	96
Riga	May 9	....	" 29	64½	100

No samples of Red Fife could be obtained. All the varieties in the above list are earlier than Red Fife, and hence suit this district better. They have all been grown from samples sent to settlers during the past few years for trial, from the Central Experimental Farm at Ottawa.

Two samples of oats were received from Mr. Robert Jones, one of Banner, which weighed 41½ lbs. per bushel, and one unnamed sort which weighed 42 lbs. per bushel. The Banner was sown May 16 and was ripe August 24. One sample of barley was sent in, unnamed, which was sown May 16 and was cut August 12. This weighed 49½ lbs. per bushel. There was also one sample of peas which was sown May 23 and cut on August 12, weighing 64 lbs. per bushel. Besides these there were two samples of beans which were plump and well-ripened.

From the dates of sowing and ripening, the absence of injury from frost and the weights of the samples of the grain received, it is evident that the season of 1908 was quite as favourable for crop growing in the Peace River District as it was in many parts of Alberta and Saskatchewan further south. Writing on December 19, Mr. Jones says: 'The farmers in this neighbourhood are busy at present hauling their wheat to market, all of which is of the very best quality.'

Writing again on February 14, Mr. Jones says: 'The winter has been very severe up to date, as the meteorological records will show. The snow is very deep, which puts the idea of the wintering of stock outside out of the question. The live stock at Fort Vermilion are in good condition, the feed supply being plentiful. The lowest temperature was on February 7, when the thermometer dropped to 59·5° below zero. 59° below zero was recorded on January 13, and 58° below zero on January 6 and 14.'

TABLE of meteorological observations taken at Fort Vermilion, Peace River District, Alberta, from July 1, 1908, to March 31, 1909, showing maximum, minimum and mean temperature, also highest and lowest, for each month, with date of occurrence; also rainfall, snowfall and total precipitation.

Month.	Maximum.	Minimum.	Mean.	Highest.	Date.	Lowest.	Date.	Rainfall.	Snowfall.	Total Precipitation.	Number of days Precipitation.	Heaviest in 24 hours.	Date.
	°	°	°	°		°							
*July	74·72	46·65	60·68	92·0	23rd	38·0	4th	2·30	.....	2 30	10	1·00	25th
August	71·19	43·35	57 26	85·0	5th	33·0	17th	2·05	......	2·05	11	0·73	15th
September	56·97	33·68	45·32	73·9	12th	20·0	25th & 26th	0·69	......	0·69	10	0·14	2nd
October	42·03	20·48	31·25	59·0	11th	-15·0	30th	0·33	2·00	0·55	7	0·15	4th
November	18·25	-1·10	8·45	41·0	6th	-43·5	30th	......	8·50	0·85	6	0·40	28th
December	1·75	-17·75	-7·90	43·0	11th	-51·0	29th	....	2·50	0 25	4	0·15	13th
January	-13·50	-36·67	-25·08	14·4	1st	-59·0	13th	......	5·75	0·57	7	0·20	22nd
February	-4·10	-26·50	-15·32	18·2	19th	-59·5	7th	......	1·50	0·15	5	0·05	2nd
March	25·17	4·07	14·47	43·4	25th	-26 0	8th	......	4·25	0·42	6	0·20	5th
								5·37	24·50	7·83	66		

* No records of temperature or precipitation have been supplied for April, May and June, 1908.

SOME weather observations taken at Central Experimental Farm, Ottawa, as compared with those taken at Fort Vermilion, Peace River District, Alberta.

—	Mean Temp.	Highest Temp.	Lowest Temp.	Total Precipitation.	Heaviest in 24 hours.	Total Hours Sunshine.	Average Sunshine per day.
July.							
	°	°	°				
Ottawa	71·44	96·0	49·0	2·77	0·97	284·0	9·16
Fort Vermilion	60·68	92·0	38·0	2·30	1·00	301·0	9·70
August.							
Ottawa	66·42	90·0	42·6	1·72	0·65	263·4	8·49
Fort Vermilion	57·26	85·0	33·0	2·05	0·73	238·2	7·68
September.							
Ottawa	63·58	95·8	34·0	1·00	0·26	163·4	5·44
Fort Vermilion	45·32	73·9	20·0	0·69	0·14	160·6	5·35
October.							
Ottawa	49·21	80·6	27·0	2·28	1·05	131·4	4·23
Fort Vermilion	31·25	59·0	−15·0	0·55	0·15	127·6	4·11
November.							
Ottawa	33·27	57·5	12·8	2·47	0·50	51·6	1·72
Fort Vermilion	8·45	41·0	−43·5	0·85	0·40	61·5	2·05
December.							
Ottawa	14·35	53·0	−16·0	4·38	0·70	74·7	2·40
Fort Vermilion	7·90	43·0	−57·0	0·25	0·15	68·5	2·20
January.							
Ottawa	13·23	40·5	−18·0	3·66	1·04	66·2	2·13
Fort Vermilion	−25·08	14·4	−59·0	0·57	0·20	86·7	2·79
February.							
Ottawa	15·55	42·4	−16·4	2·34	0·41	112·4	4·01
Fort Vermilion	−15·32	18·2	−59·5	0·15	0·05	115·2	4·11
March.							
Ottawa	24·10	45·4	− 3·0	3·78	1·42	156·8	5·05
Fort Vermilion	14·47	43·4	−26·0	0·42	0·20	163·0	5·25

RECORD of Sunshine at Fort Vermilion, Peace River District, Alberta, from May 1, 1908, to March 31, 1909.

Month.	Number of days with Sunshine.	Number of days without Sunshine.	Total hours Sunshine.	Average sunshine per day.
*May	18	1	164·6	8·66
June	28	2	209·2	6·97
July	30	1	301·0	9·70
August	29	2	238·1	7·68
September	26	4	160 6	5·35
October	22	9	127·6	4·11
November	18	12	61·5	2·05
December	20	11	68·5	2·20
January	22	9	86·7	2·79
February	28	0	115·2	4·11
March	27	4	163·0	5·25

* No returns for April, 1908, and during May a record of the first nineteen days only was kept, owing to supply of cards for sunshine-recorder having run out.

(Signed) WILLIAM T. ELLIS.

CO-OPERATIVE EXPERIMENTS BY FARMERS THROUGHOUT CANADA.

Another distribution was made this year from the Experimental Farms to Canadian farmers of samples of seed of high quality for the improvement of crops. The object in view in this distribution was to ascertain by test the relative merits of the different sorts under trial, as to quality, productiveness and earliness in ripening. In conducting these trial plots, farmers everywhere have readily undertaken to co-operate with the Experimental Farms and to report the results of their experiments. These joint efforts have been productive of much good, and a great deal of information has thus been gathered as to the suitability of these different varieties to the climatic conditions prevailing in different parts of Canada.

During the season of 1908 the number of Canadian farmers who have united in these experiments was 38,748. The value of this work in all parts of the Dominion has been abundantly demonstrated.

The samples sent from the Central Farm have weighed as follows: Wheat and barley, five pounds each, and oats, four pounds, sufficient in each case to sow one-twentieth of an acre. The samples of Indian corn, peas and potatoes have weighed three pounds each.

DISTRIBUTION OF SAMPLES BY PROVINCES.

Name of Grain.	Prince Edward Island.	Nova Scotia.	New Brunswick.	Quebec.	Ontario.	Manitoba.	Saskatchewan.	Alberta.	British Columbia.
Oats	563	644	1,595	5,925	2,009	393	1,289	536	45
Barley	106	272	188	1,481	593	165	466	184	14
Wheat	188	335	704	2,546	449	491	2,485	600	28
Peas	8	46	32	238	40	17	38	15	8
Indian Corn	16	58	251	409	356	56	68	16	18
Potatoes	94	442	861	2,842	2,159	738	1,340	554	321
Total	975	1,797	3,631	13,441	5,606	1,860	5,686	1,905	434

Total number of samples distributed, 35,335.

Total number of packages of each sort distributed:—

Oats	12,999
Barley	3,469
Wheat	7,826
Peas	442
Indian corn	1,248
Potatoes	9,351
Total	35,335

The following list shows the number of packages of the different varieties which have been sent from the Central Experimental Farm:—

Name of Variety.	Number of Packages.	Name of Variety.	Number of Packages.
OATS.		PEAS.	
Banner	6,339	Golden Vine	292
Wide Awake	2,056	Arthur	150
Thousand Dollar	1,490		
Improved Ligowo	1,241	Total	442
Danish Island	750		
White Giant	608		
Tartar King	313		
Black Beauty	202	INDIAN CORN.	
Total	12,999		
		Longfellow	357
BARLEY (SIX-ROWED.)		Angel of Midnight	322
		Selected Leaming	284
Mensury	2,087	Compton's Early	249
Mansfield	718	Champion White Pearl	36
(TWO-ROWED.)		Total	1,248
Invincible	540		
Standwell	124		
Total	3,469	POTATOES.	
SPRING WHEAT.			
		Rochester Rose	2,734
Red Fife	3,454	Carman No. 1	2,259
Preston	2,221	Gold Coin	1,624
Pringle's Champlain	952	Early White Prize	1,198
Stanley	421	Everett	614
Percy	404	Money Maker	579
Huron	374	Late Puritan	343
Total	7,826	Total	9,351

DISTRIBUTION OF SAMPLES FROM THE BRANCH EXPERIMENTAL FARMS.

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

Experimental Farm, Nappan, N.S.—

Spring wheat	80
Oats	240
Barley	54
Potatoes	329
Buckwheat	40
	743

Experimental Farm, Brandon, Man.—

Wheat	55
Oats	53
Barley	24
Peas	17
Potatoes	134
	283

Total number of packages of each sort distributed:—

Oats	12,999
Barley	3,469
Wheat	7,826
Peas	442
Indian corn	1,248
Potatoes	9,351
Total	35,335

The following list shows the number of packages of the different varieties which have been sent from the Central Experimental Farm:—

Name of Variety.	Number of Packages.
Oats.	
Banner	6,339
Wide Awake	2,056
Thousand Dollar	1,490
Improved Ligowo	1,241
Danish Island	750
White Giant	608
Tartar King	313
Black Beauty	202
Total	12,999
Barley (Six-Rowed.)	
Mensury	2,087
Mansfield	718
(Two-Rowed.)	
Invincible	540
Standwell	124
Total	3,469
Spring Wheat.	
Red Fife	3,454
Preston	2,221
Pringle's Champlain	952
Stanley	421
Percy	404
Huron	374
Total	7,826
Peas.	
Golden Vine	292
Arthur	150
Total	442
Indian Corn.	
Longfellow	357
Angel of Midnight	322
Selected Leaming	284
Compton's Early	249
Champion White Pearl	36
Total	1,248
Potatoes.	
Rochester Rose	2,734
Carman No. 1	2,259
Gold Coin	1,624
Early White Prize	1,198
Everett	614
Money Maker	579
Late Puritan	343
Total	9,351

DISTRIBUTION OF SAMPLES FROM THE BRANCH EXPERIMENTAL FARMS.

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

Experimental Farm, Nappan, N.S.—	
Spring wheat	80
Oats	240
Barley	54
Potatoes	329
Buckwheat	40
	743

Experimental Farm, Brandon, Man.—	
Wheat	55
Oats	53
Barley	24
Peas	17
Potatoes	134
	283

Experimental Farm, Indian Head, Sask.—	
Wheat	204
Oats	226
Barley	132
Peas	60
Sundries (flax, rye, spelt)	23
Potatoes	630
	1,275

Experimental Farm, Lethbridge, Alberta—	
Wheat, oats and barley	104
Potatoes	28
	132

Experimental Farm Agassiz, B.C.—	
Wheat and Rye	43
Oats	223
Barley	80
Peas	107
Potatoes	271
Indian corn	61
	785

Experimental Farm, Lacombe, Alberta—	
Wheat	120
Oats	55
Barley	20
	195

By adding the number of farmers supplied by the branch Farms to those supplied by the Central Farm, we have a total of 38,748. The average number of samples sent out each year for the past eleven years has been over 38,000.

It is remarkable how rapidly a supply of grain may be built up from a single four or five-pound sample. Take for instance, a sample of oats. The four pounds received will, if well cared for, usually produce from three to four bushels. This, sown on two acres of land, will, at a very moderate estimate, give one hundred bushels, and sometimes much more, but taking the lower figure as the basis for this calculation, the crop at the end of the second year would be sufficient to sow fifty acres, which, at the same moderate computation, would furnish 2,500 bushels available for seed or sale at the end of the third year.

The critical point of these tests is the threshing of the grain at the end of the first season, and it is here that some farmers fail to get the full advantage of the experiment. The product of the one-twentieth acre plot is sometimes threshed in a large machine, which it is difficult to thoroughly clean, and in this way the grain becomes mixed with other varieties and with weed seeds and is practically ruined. At the Central Experimental Farm we thresh the produce of many of the small plots of grain by cutting off the heads, placing them in sacks and beating them with a stick, then winnowing until most of the chaff is got rid of, and the grain made clean enough for sowing.

Where the farmer is to use this seed for his own sowing it is not necessary that the sample be entirely free from chaff. It is, however, most essential if he is to get the full benefit of his experiment, that the grain be quite free from all admixture with other sorts of grain or with weeds. Farmers are expected to harvest the product of their experimental plot separately, and store it away carefully, threshing it by hand either with a flail or in such other manner as they may prefer The results to be gained will abundantly repay the cost of careful handling of the grain.

Every season after the regular free distribution of the samples has been provided for, the surplus grain grown on the Experimental Farms not required for sowing is sold to farmers in quantities of from 2 to 6 bushels or more each. In this way, a considerable number of farmers are supplied every year with seed grain in these larger quantities, especially from the branch Farms at Brandon, Manitoba; Indian Head, Saskatchewan; and at Lethbridge, Alberta.

TESTS OF THE VITALITY OF SEED GRAIN AND OTHER SEEDS.

The following report includes tests of grain and other seeds grown on the several Experimental Farms, as well as those bought with the object of growing them on the Farms. The list also includes tests of the vitality of a number of specimens of grain grown in the several provinces of the Dominion from the samples distributed from the Central Experimental Farm. These tests have been made with the object of ascertaining what climatic conditions are most favourable for producing seed of high vitality, and how far this desirable quality is likely to be influenced by variations in character of season. Formerly these tests included a number of doubtful samples which were believed, by the parties sending them, to have been injured in their vitality by exposure to unfavourable conditions. All such samples are now referred to the Seed Commissioner for report. The results reported on here are the average proportions of vitality shown by samples of grain grown in different parts of the several provinces of Canada, under healthy and normal circumstances. In the following table, showing the results by provinces, the total percentage of vitality is given, also the percentage of strong and weak growth.

RESULTS of Tests of Seeds for Vitality, 1907-8.

Kind of Seed.	Number of Tests.	Highest Per-centage.	Lowest Per-centage.	Per-centage of Strong Growth.	Per-centage of Weak Growth.	Average Vitality.
Wheat	521	100·0	3·0	75·7	5·4	81·2
Barley	343	100·0	7·0	80·7	8·1	88·8
Oats	498	100·0	1·0	73·0	6·4	79·4
Rye	11	97·0	73·0	81·0	5·4	86·4
Peas	97	100·0	38·0	....	....	84·5
Corn	17	100·0	40·0	....	....	82·7
Flax	9	98·0	76·0	....	....	92·2
Clover	10	88·0	45·0	....	....	74·3
Beans	4	100·0	92·0	....	....	97·0
Grass	2	86·0	76·0	....	....	81·0
Turnips	1	98·0	98·0	....	....	98·0
Total number of samples tested, highest and lowest percentage	1,513	100·0	1·0	....	....	....

TABLE showing Results of Grain Tests for each Province for 1907-8.

Kind of Seed.	Number of Tests.	Highest Per-centage.	Lowest Per-centage.	Per-centage of Strong Growth.	Per-centage of Weak Growth.	Average Vitality.
ONTARIO.						
Wheat	131	100·0	22·0	77·4	5·9	83·4
Barley	86	100·0	30·0	80·2	10·4	90·7
Oats	104	100·0	18·0	86·4	5·7	92·1
QUEBEC.						
Wheat	33	99·0	22·0	79·5	4·1	83·6
Barley	20	100·0	87·0	87·7	7·3	95·0
Oats	21	100·0	37·0	84·1	6·4	90·6
MANITOBA.						
Wheat	63	100·0	72·0	88·2	4·6	92·8
Barley	43	100·0	57·0	82·5	6·4	88·9
Oats	69	100·0	16·0	81·0	3·4	84·4

TABLE showing Results of Grain Tests for each Province for 1907-8—*Continued.*

SASKATCHEWAN.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
Wheat	121	100·0	12·0	67·4	6·5	73·9
Barley	58	100·0	7·0	79·6	4·0	83·6
Oats	103	100·0	1·0	58·0	9·0	67·0

ALBERTA.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
Wheat	54	99·0	3·0	62·5	6·5	69·0
Barley	37	97·0	21·0	69·5	12·8	82·3
Oats	76	97·0	1·0	40·1	10·5	50·7

NOVA SCOTIA.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
Wheat	54	99·0	8·0	74·7	4·5	79·2
Barley	50	99·0	59·0	79·4	8·7	88·2
Oats	51	100·0	57·0	83·8	4·6	88·5

NEW BRUNSWICK.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
Wheat	30	99·0	53·0	83·2	4·5	87·7
Barley	7	97·0	84·0	86·4	6·1	92·5
Oats	21	100·0	79·0	88·1	3·0	91·2

PRINCE EDWARD ISLAND.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
Wheat	25	100·0	61·0	85·7	4·2	89·9
Barley	12	100·0	86·0	88·7	5·8	94·5
Oats	20	100·0	84·0	92·0	3·4	95·4

BRITISH COLUMBIA.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
Wheat	10	100·0	90·0	94·9	2·6	97·5
Barley	30	100·0	77·0	88·0	9·1	95·2
Oats	33	100·0	79·0	91·5	3·3	94·9

RESULTS of Tests of Seeds for Vitality, 1908-9.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
Wheat	440	100·0	24·0	88·8	2·5	91·4
Barley	337	100·0	11·0	88·9	4·0	93·0
Oats	450	100·0	37·0	86·1	4·3	90·5
Rye	12	97·0	57·0	79·3	3·0	82·3
Peas	153	100·0	6·0	....	....	74·4
Corn	17	100·0	58·0	....	....	81·6
Flax	9	95·0	52·0	....	....	80·4
Beans	6	100·0	30·0	....	....	78·0
Clover	3	87·0	79·0	....	....	83·3
Tares	1	98·0	98·0	....	....	98·0
Total number of samples tested, highest and lowest percentage	1,428	100·0	6·0	....	....	....

TABLE showing Results of Grain Tests for each Province for 1908-9.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
Ontario.						
Wheat	112	100·0	66·0	89·7	2·7	92·4
Barley	86	100·0	61·0	85·8	7·2	93·1
Oats	99	100·0	65·0	91·4	3·3	94·7
Quebec.						
Wheat	36	100·0	72·0	91·7	1·9	93·6
Barley	35	100·0	69·0	91·6	2·6	94·3
Oats	35	100·0	69·0	85·2	4·1	89·3
Manitoba.						
Wheat	46	100·0	83·0	91·8	1·8	93·6
Barley	31	100·0	87·0	94·9	1·6	96·6
Oats	43	100·0	78·0	91·4	3·6	95·1
Saskatchewan.						
Wheat	86	100·0	62·0	92·4	2·0	94·4
Barley	51	100·0	11·0	89·1	3·1	92·3
Oats	71	100·0	37·0	88·4	3·9	92·4
Alberta.						
Wheat	72	100·0	56·0	84·0	3·8	87·8
Barley	76	100·0	67·0	89·2	3·7	92·9
Oats	84	97·0	46·0	75·8	6·6	82·4
Nova Scotia.						
Wheat	23	93·0	24·0	72·0	3·4	75·4
Barley	24	99·0	60·0	82·8	3·6	86·4
Oats	24	97·0	73·0	82·0	5·0	87·0
New Brunswick.						
Wheat	25	100·0	68·0	91·2	1·2	92·5
Barley	6	98·0	77·0	89·6	1·8	91·5
Oats	37	100·0	64·0	87·7	3·3	91·0
Prince Edward Island.						
Wheat	14	99·0	77·0	92·2	2·1	94·3
Barley	4	100·0	98·0	97·0	2·2	99·2
Oats	32	100·0	83·0	91·7	2·7	94·4
British Columbia.						
Wheat	26	100·0	46·0	88·8	2·7	91·6
Barley	24	100·0	73·0	91·4	2·8	94·2
Oats	25	95·0	71·0	80·4	6·7	87·1

(Signed) WILLIAM T. ELLIS.

METEOROLOGICAL OBSERVATIONS.

Table of meteorological observations taken at the Central Experimental Farm, Ottawa, from April 1, 1908, to March 31, 1909, giving 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.
	°	°	°	°	°		°							
April....	45·59	27·88	17·70	36·73	66·5	26th	5·5	4th	1·34	4·00	1·74	17	0·33	27th
May.....	68·44	47·73	20·70	58·08	86·8	26th	30·8	2nd	5·46	......	5·46	17	1·43	1st
June....	79·64	52·88	26·76	66·26	92·0	8th	40·2	3rd	1·31	.. ..	1·31	8	0 54	15th
July....	83·27	59·61	23 66	71·44	96·0	30th	49·0	17th	2·77	......	2·77	14	0·97	17th
Aug	79 12	53 72	25·40	66·42	90·0	31st	42·6	25th	1·72	......	1·72	13	0·65	5th
Sept.....	77·19	49·97	27·22	63·58	95·8	1st	34·0	30th	1·00	......	1·00	6	0 26	2nd
Oct......	60·00	38·43	21·57	49·21	80.6	17th	27·0	10th	2·28	......	2·28	6	1·05	26th
Nov.....	38 86	27·68	11·18	33·27	57·5	26th	12·8	21st	1·48	9·90	2·47	17	0·50	15th
Dec.....	23·49	5·23	18·25	14·35	53·0	1st	—16·0	6th & 25th	0·21	41·75	4·38	21	0·70	18th
Jan.....	22·10	4·36	17·74	13·23	40·5	5th	—18·0	13th	2·46	12·00	3 66	20	1·04	23rd
Feb.....	25·16	5·94	19 22	15·55	42·4	6th	—16·4	1st	0·72	16·25	2·34	19	0·41	24th
Mar.....	32·90	15·30	17·60	24·10	45·4	31st	—3·0	1st	1.38	24·00	3·78	16	1·42	25th
									22·13	107·90	32 91	174		

Rain or snow fell on 174 days during the 12 months.
Heaviest rainfall in 24 hours, 1·43 inches on May 1st.
Heaviest snowfall in 24 hours, 7·00 inches on December 11th and 18th.
The highest temperature during the 12 months was 96·0° on July 30th.
The lowest temperature during the 12 months was—18·0° on January 13th.
During the growing season, rain fell on 17 days in April, 17 days in May, 8 days in June, 14 days in July, 13 days in August, and 6 days in September.
September and October show the lowest number of days with precipitation, viz.: 6 in each month.
Total precipitation during the 12 months 32·91 inches, as compared with 38·18 inches during 1907-08.

Rainfall, Snowfall, and Total Precipitation, from 1890 to 1909; also the average annual amount that has fallen.

Year.	Rainfall.	Snowfall.	Total Precipitation.
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	40·72
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
1905..	23·71	87·25	32·42
*1906, January 1 to March 31..................	1·90	24·50	4·34
1906-07..	21·73	72 50	28·94
1907-08..	24·70	134·75	38.18
1908-09..	22·13	107·90	32.91
Total for 19 years and 3 months..................	496·05	1780.75	674.45
Average for 19 years..............................	26·00	92·43	35.26

*The 3 months from January 1 to March 31, 1906 are omitted in calculating the yearly average.

Record of Sunshine at the Central Experimental Farm, Ottawa, from April 1, 1908, to March 31, 1909.

Months.	Number of days with Sunshine.	Number of days without Sunshine.	Total hours Sunshine.	Average Sunshine per day.
April	27	3	194·6	6·48
May	25	6	206·6	6.64
June	29	1	296.5	9.88
July	29	2	284·0	9·16
August	31	0	263·4	8·49
September	26	4	163·4	5·44
October	25	6	131·4	4·23
November	14	16	51·6	1·72
December	19	12	74·7	2·40
January	15	16	66·2	2·13
February	22	6	112·4	4·01
March	24	7	156·8	5·05

(Signed.) WILLIAM T. ELLIS,
Observer.

CORRESPONDENCE.

The correspondence carried on during 1908-9 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 April 1, 1908, to March 31, 1909:—

	Letters received.	Letters sent.
Director	63,981	22,763
Agriculturist	2,789	3,524
Horticulturist	2,240	1,905
Chemist	1,899	1,861
Entomologist and Botanist	2,804	2,713
Cerealist	496	351
Poultry manager	3,489	4,042
Accountant	1,384	2,541
Total	79,082	39,700

Many of the letters received by the Director are applications for samples of grain, or for the publications issued by the Experimental Farms; many of these are answered by mailing the material asked for, accompanied in most instances by circular letters. This will explain why the number of letters received by that officer so much exceeds the number sent out.

DISTRIBUTION OF REPORTS, BULLETINS AND CIRCULAR LETTERS.

Reports and bulletins mailed	282,026
Circular letters relating to samples of seed grain	50,717
Total	332,743

Branch Experimental Farms.

The correspondence conducted by the superintendents of the Branch Experimental Farms is also large, as is shown by the following figures:—

		Letters received.	Letters sent.
Experimental Farm,	Nappan, N.S....	2,965	2,700
"	Brandon, Man..	3,067	3,044
"	Indian Head, Sask. ...	8,114	7,951
"	Agassiz, B.C....	4,881	4,727
"	Lethbridge, S. Alberta.	1,250	1,239
"	Lacombe, C. Alberta..	1,647	1,551
		21,924	21,212

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, the total number of letters received is found to be 101,006, while those sent out number 60,912.

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, on plots of one-tenth acre each, 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.

These experiments have been continued, and a summary of the results obtained has been given each year, by taking the average yield of crops from the beginning of the test, 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 1887-8 and its subsequent treatment, the reader is referred to the earlier issues of this report.

VALUABLE INFORMATION GAINED.

From this long-continued series of tests some useful information has been gained.

These trials have shown that barnyard 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 barnyard 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. Many years' experience has shown that mineral phosphate, untreated, is practically of no value as a fertilizer.

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

Common salt, which has long had a reputation for its value as a fertilizer for barley, with many farmers, while others disbelieved in its efficacy, has been shown to be a 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 proved 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 these plots to which no barnyard manure had been applied, was much depleted of humus, 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. No barnyard manure was applied on plots 1 and 2 in each series from 1898 to 1905.

In 1900 all the fertilizers on all the plots were discontinued, and from then to 1905 the same crops were grown on all these plots from year to year without fertilizers, sowing clover with the grain each season. In this way some additional 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 had been used on these plots since the experiments were begun. In 1905-6-7-8 all the fertilizers were again used as in 1898.

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 places, 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 also crops of Indian corn and roots were grown on these plots. In 1903 the land was again devoted to clover and was in Indian corn and roots again in 1904 and each year since.

WHEAT PLOTS.

The seed sown on each of these plots from the beginning has been in the proportion of about $1\frac{1}{2}$ 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, Rio Grande was used, and from 1895 to 1908, inclusive, Red Fife. In 1908, the Red Fife was sown May 16, and was ripe August 18.

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

Number of Plot.	Fertilizers applied each year from 1888 to 1898 or 1899. No fertilizers used from that time to 1905. Clover sown in 1899 and each year after to 1905 with the grain and ploughed under in the autumn. In 1905-6-7-8 fertilizers again applied as in 1898. Clover discontinued.	Average Yield for Twenty Years. Yield of Grain. Per acre.		Average Yield for Twenty Years. Yield of Straw. Per acre.	21st Season, 1908. Variety, Red Fife. Yield of Grain. Per acre.		21st Season, 1908. Variety, Red Fife. Yield of Straw. Per acre.	Average Yield for Twenty-one Years. Yield of Grain. Per acre.		Average Yield for Twenty-one Years. Yield of Straw. 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 used from 1899 to 1905. In 1905-6-7-8, 15 tons per acre again used	22	$20\frac{4}{20}$	3800	13	20	1260	21	$54\frac{10}{21}$	3679
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 used from 1899 to 1905. In 1905-6-7-8, 15 tons per acre again used	22	$29\frac{18}{20}$	3827	13	00	1320	22	$2\frac{4}{21}$	3708
3	Unmanured from the beginning	11	$39\frac{10}{20}$	1862	3	40	680	11	$16\frac{14}{21}$	1806
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 fertilizer used from 1900 to 1905. In 1905-6-7-8 Thomas' phosphate again used as in 1899	12	$36\frac{15}{20}$	2001	5	00	700	12	15	1939
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 were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as in 1899	13	$32\frac{15}{20}$	2589	6	40	820	13	$13\frac{3}{21}$	2505
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 were used in place of the mineral phosphate. No fertilizers used from 1899 to 1905. In 1905-6-7-8 fertilizers again used as in 1898	19	$31\frac{18}{20}$	3216	13	00	1220	19	$13\frac{5}{21}$	3121
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 were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as in 1899	14	$6\frac{11}{20}$	2594	8	40	1080	13	51	2522

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 from that time to 1905. Clover sown in 1899 and each year after to 1905 with the grain and ploughed under in the autumn. In 1905-6-7-8 fertilizers again applied as in 1898. Clover discontinued.	Average Yield for Twenty Years. Yield of Grain. Per acre.		Average Yield for Twenty Years. Yield of Straw. Per acre.	21st Season, 1908 Variety, Red Fife. Yield of Grain. Per acre.		21st Season, 1908 Variety, Red Fife. Yield of Straw. Per acre.	Average Yield for Twenty-one Years. Yield of Grain. Per acre.		Average Yield for Twenty-one Years. Yield of Straw. 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 were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as in 1899.	12	2	2179	5	40	660	11	43 17/21	2107
9	Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as in 1899..........	12	39 2/20	1958	5	20	600	12	18 5/21	1893
10	Mineral superphosphate, No. 1, 350 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as in 1899.	13	34 18/20	2802	7	20	1080	13	16 20/21	2720
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 use from 1900 to 1905. In 1905-6-7-8 fertilizers again used as in 1899........	14	29 16/20	2806	8	—	1100	14	11 5/21	2725
12	Unmanured from the beginning.........	10	33 10/20	1829	2	40	460	10	10 20/21	1764
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 bone again used as at first....	12	42 8/20	2053	7	40	740	12	27 16/21	1991
14	Bone, finely ground, 500 lbs., wood ashes unleached, 1,500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as at first.	15	27 10/20	2591	11	—	780	15	14 4/21	2506
15	Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as at first.	14	9 17/20	2415	9	—	1060	13	55 2/21	2351
16	Muriate of potash, 150 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as at first.	15	20 3/20	2246	8	40	780	15	1 2/21	2176
17	Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as at first.....	13	0 7/20	2403	6	20	800	12	41 6/21	2327
18	Sulphate of iron, 60 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as at first.....	12	39 18/20	1989	7	—	720	12	23 16/21	1928
19	Common salt (Sodium chloride), 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as at first..........	13	38 18/20	1663	6	40	760	13	19	1620
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as at first............	12	50 3/20	1926	7	40	820	12	35 5/21	1873
21	Mineral superphosphate, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as at first...	13	19 5/20	1915	5	20	700	12	56 9/21	1857

BARLEY PLOTS.

The quantity of seed sown per acre on the barley plots was about 2 bushels from 1889 to 1891, 1½ bushels in 1892 and 1893, and 2 bushels from 1894 to 1908, 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, Duckbill; and in 1894 to 1901, Canadian Thorpe, a selected form of the Duckbill. Since 1902, Mensury has been sown. In 1908 it was sown May 16, and was harvested on August 10.

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 from that time to 1905. Clover sown in 1899 and each year after to 1905 with the grain and ploughed under in the autumn. In 1905-6-7-8 fertilizers again applied as in 1898. Clover discontinued.	Average Yield for Nineteen Years.			20th Season, 1908, Variety, Mensury.			Average Yield for Twenty 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 used from 1899 to 1905. In 1905-6-7-8, 15 tons per acre again used........	37	29$\frac{17}{19}$	3007	18	36	1200	36	32$\frac{12}{20}$	2917
2	Barn-yard manure, fresh, 15 tons per acre each year to 1898, inclusive. No manure used from 1899 to 1905. In 1905-6-7-8, 15 tons per acre again used..............	38	$\frac{8}{19}$	3138	22	4	1240	37	10	2981
3	Unmanured from the beginning...........	15	26$\frac{17}{19}$	1479	8	16	440	14	45$\frac{11}{20}$	1427
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 fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as in 1899........................	17	10$\frac{18}{19}$	1557	5	—	520	16	29$\frac{18}{20}$	1505
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 were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as in 1899.........	23	25$\frac{11}{19}$	2220	9	28	820	22	40$\frac{3}{20}$	2150
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 were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as in 1898.	31	18$\frac{11}{19}$	2448	12	44	960	30	22$\frac{5}{20}$	2373
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 used from 1900 to 1905. In 1905-6-7-8 fertilizers used as in 1899.......	29	30$\frac{6}{19}$	2453	12	24	860	28	37$\frac{4}{20}$	2373

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 from that time to 1905. Clover sown in 1899 and each year after to 1905 with the grain and ploughed under in the autumn. In 1895-6-7-8 fertilizers again applied as in 1898. Clover discontinued.	Average Yield for Nineteen Years. Yield of Grain. Per acre.		Average Yield for Nineteen Years. Yield of Straw. Per acre	20th Season, 1908. Variety, Mensury. Yield of Grain. Per acre.		20th Season, 1908. Variety, Mensury. Yield of Straw. Per acre	Average Yield for Twenty Years. Yield of Grain. Per acre.		Average Yield for Twenty Years. Yield of Straw. 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 were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as in 1899.	24	$24\frac{15}{19}$	1900	7	44	480	23	$32\frac{19}{20}$	1829
9	Mineral superphosphate No. 1, 500 lbs. per acre used each year from 1888 to 1899, inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as in 1899.	23	$7\frac{13}{19}$	1761	7	24	400	22	$18\frac{1}{20}$	1693
10	Mineral superphosphate, No. 1, 350 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers used from 1900 to 1905, In 1905-6-7-8 fertilizers again used as in 1899.	29	$30\frac{3}{19}$	2357	11	32	920	28	35	2285
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 used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as in 1899.	29	$28\frac{10}{19}$	2496	8	16	800	28	$25\frac{18}{20}$	2371
12	Unmanured from the beginning	15	$12\frac{15}{19}$	1236	3	16	420	14	$32\frac{3}{20}$	1195
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 bone again used as at first....	17	$8\frac{11}{19}$	1375	4	8	540	16	$23\frac{7}{20}$	1327
14	Bone, finely ground, 500 lbs., wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as at first.	25	$30\frac{8}{19}$	2109	10	20	640	24	$41\frac{16}{20}$	2036
15	Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as at first.	22	$32\frac{3}{19}$	2143	10	—	520	22	$1\frac{18}{20}$	2062
16	Muriate of potash, 150 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as at first.	23	$35\frac{16}{19}$	1770	9	8	560	23	$0\frac{17}{20}$	1714
17	Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1889, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as at first.	20	$5\frac{13}{19}$	1822	8	16	580	19	$5\frac{7}{20}$	1760
18	Sulphate of iron, 60 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as at first.	20	$15\frac{5}{19}$	1559	4	28	480	19	$25\frac{7}{20}$	1505
19	Common salt (Sodium chloride) 300 lbs. per acre used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as at first	28	$33\frac{2}{19}$	1867	10	20	720	27	$37\frac{5}{20}$	1810
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as at first	21	$39\frac{5}{19}$	1521	5	20	540	20	$47\frac{18}{20}$	1467
21	Mineral superphosphate, 500 lbs. per acre, used each year from 1889 to 1899, inclusive. No fertilizer used from 1909 to 1905. In 1905-6-7-8 fertilizer again used as at first.	22	$11\frac{13}{19}$	1678	7	4	400	21	$23\frac{11}{20}$	1614

OAT PLOTS.

The quantity of seed sown per acre on the oat plots was about 2 bushels in 1889 and 1890; $1\frac{1}{2}$ bushels from 1891 to 1893, and 2 bushels from 1894 to 1908, inclusive. The varieties used were as follows: In 1889, Early English; in 1890 to 1893, Prize Cluster; and from 1894 to 1908, inclusive, the Banner. In 1908, Banner was sown May 16 and the plots were harvested August 12.

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 from that time to 1905. Clover sown in 1899 and each year after to 1905 with the grain and ploughed under in the autumn. In 1905 6-7-8 fertilizers again applied as in 1898. Clover discontinued.	Average Yield for Nineteen Years.			20th Season, 1908. Variety, Banner.			Average Yield for Twenty Years.		
		Yield of Grain. Per acre.		Yield of Straw. Per acre	Yield of Grain. Per acre.		Yield of Straw. Per acre	Yield of Grain. Per acre.		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 used from 1899 to 1905. In 1905-6-7-8, 15 tons per acre were again used...	52	$32\frac{5}{19}$	3160	31	26	1300	51	$30\frac{5}{20}$	3067
2	Barn-yard manure, fresh, 15 tons per acre each year to 1898, inclusive. No manure used from 1899 to 1905. In 1905-6-7-8, 15 tons per acre were again used...........	55	$25\frac{9}{19}$	3336	35	10	1400	54	$24\frac{14}{20}$	3240
3	Unmanured from the beginning.........	34	$32\frac{13}{19}$	1702	15	30	580	34	$0\frac{5}{20}$	1646
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 fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as in 1899...	36	$29\frac{9}{19}$	1923	22	12	940	36	$4\frac{16}{20}$	1874
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 were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as in 1899.........	48	$22\frac{14}{19}$	2719	30	—	1180	47	25	2642
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 were used in place of the mineral phosphate. No fertilizers used from 1899 to 1905. In 1905-6-7-8, fertilizers again used as in 1898.	49	$2\frac{8}{19}$	2766	27	2	1080	47	33	2682
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 were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as in 1899..................	49	1	3111	23	18	940	47	$25\frac{18}{20}$	3002
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 Thomas' phosphate were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as in 1899.........	43	$32\frac{9}{19}$	2514	22	32	960	42	$30\frac{15}{20}$	2437

TABLE III.—EXPERIMENTS WITH FERTILIZERS ON PLOTS OF OATS—*Concluded.*

No. of Plot.	Fertilizers applied each year, from 1889 to 1898 or 1899. No fertilizers used from that time to 1905. Clover sown in 1899 and each year after to 1905 with the grain and ploughed under in the autumn. In 1905-6-7-8 fertilizers again applied as in 1898. Clover discontinued.	Average Yield for Nineteen Years.			20th Season, 1908. Variety, Banner.			Average Yield for Twenty Years.		
		Yield of Grain. Per acre.		Yield of Straw. Per acre	Yield of Grain. Per acre.		Yield of Straw. Per acre	Yield of Grain. Per acre.		Yield of Straw. Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
9	Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as in 1899....	38	$16\frac{15}{19}$	1981	19	14	740	37	$18\frac{7}{20}$	1919
10	Mineral superphosphate, No. 1, 350 lbs. nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as in 1899.	47	$5\frac{13}{19}$	2557	22	12	940	45	$31\frac{10}{20}$	2476
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 used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as in 1899.	38	$23\frac{7}{19}$	2352	14	24	600	37	$16\frac{17}{20}$	2264
12	Unmanured from the beginning	23	$14\frac{11}{19}$	1450	10	..	380	22	$25\frac{15}{20}$	1397
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 bone again used as at first ...	35	$3\frac{8}{19}$	1925	18	8	520	34	$8\frac{15}{20}$	1855
14	Bone, finely ground, 500 lbs., wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7-8 fertilizers used again as at first.	40	$23\frac{9}{19}$	2275	20	..	640	39	$22\frac{8}{20}$	2193
15	Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as at first.	46	$18\frac{10}{19}$	2647	21	6	980	45	$9\frac{8}{20}$	2564
16	Muriate of potash, 150 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as at first.	40	$21\frac{6}{19}$	2159	17	2	700	39	$15\frac{5}{20}$	2086
17	Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as at first.	46	23	2736	28	8	900	45	$25\frac{13}{20}$	2644
18	Sulphate of iron, 60 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as at first.	39	$33\frac{13}{19}$	2029	27	22	860	39	$12\frac{14}{20}$	1970
19	Common salt (Sodium chloride), 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer used again as at first.	40	$6\frac{11}{19}$	2011	26	16	1000	39	$17\frac{5}{20}$	1960
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as at first.	36	$18\frac{2}{19}$	2023	25	10	940	35	33	1969
21	Mineral superphosphate, 500 lbs. per acre, used each year from 1889 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as at first.	37	$15\frac{7}{19}$	1894	23	18	960	36	$20\frac{1}{20}$	1847

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 the land. On this account, no clover was sown on any of the cereal plots in 1904, and one-half of each wheat plot was sown with mangels, one-half of each barley plot with potatoes, and one-half of each oat plot with carrots, computing the yields of grain from a one-twentieth acre plot in each case. Similar hoed crops were sown in 1905, 1906, 1907 and 1908, changing the position of the varieties from year to year.

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 of having the corn so well 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. On the other half of the plot (No. 2) one of the Flint varieties was grown. 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 apart, and the No. 2 in hills 3 feet apart each way, with 4 or 5 kernels in a hill. During the past eleven years, both sorts have been grown in hills.

In 1900 no crop of Indian corn was grown on these plots, but red 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. Corn was planted in 1905, 1906, 1907 and 1908. In 1908 it was planted on June 5, and cut for ensilage September 17.

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 from that time to 1905. 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. In 1905-6-7-8 fertilizers again applied as in 1898. Clover discontinued.	Average Yield for Sixteen Years.				17th Season, 1908.				Average Yield for Seventeen Years.			
		½ Plot No. 1—weight of green fodder. Per acre.		½ Plot No. 2—weight of green fodder. Per acre		½ Plot No. 1—Selected Leaming, weight of green fodder. Per acre.		½ Plot No. 2—Longfellow, weight of green fodder. Per acre		½ Plot No. 1—weight of green fodder. Per acre.		½ Plot No. 2—weight of green fodder. Per acre	
		Tons.	lbs.	Tons	lbs	Tons.	lbs.	Tons	lbs	Tons.	lbs.	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 used from 1899 to 1905. In 1905-6-7-8 manure was again used as at first	16	272	13	46	12	260	8	1640	15	1801	12	1552
2	Barn-yard manure (mixed horse and cow-manure) fresh, 12 tons per acre each year from 1888 to 1898 inclusive. No manure used from 1899 to 1905. In 1905-6-7-8 manure was again used as at first.	15	572	11	1431	10	1100	7	760	15	15	11	921
3	Unmanured from the beginning..........	6	989	5	160	1	1100	1	1200	6	407	4	1751

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF INDIAN CORN.

No. of Plot.	Fertilizers applied each year from 1888 to 1898 or 1899. No fertilizers used from that time to 1905. 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. In 1905-6-7-8 fertilizers again applied as in 1898. Clover discontinued.	Average Yield for Sixteen Years.		17th Season, 1908.		Average Yield for Seventeen Years.	
		Plot No. 1—weight of green fodder.	Plot No. 2—weight of green fodder.	Plot No. 1—Selected Leaming, weight of green fodder.	Plot No. 2—Longfellow, weight of green fodder.	Plot No. 1—weight of green fodder.	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.	Tons. lbs
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 fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as in 1899........................	8 129	5 1312	4 40	3 1200	7 1658	5 1070
5	Mineral phosphate, untreated, finely ground, 800 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1895 and 1899, 800 lbs. of the Thomas' phosphate were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as in 1899.........	11 695	9 348	6 1900	7 140	11 178	9 100
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 were used in place of the mineral phosphate. No fertilizers used from 1899 to 1905. In 1905-6-7-8 fertilizers again used as in 1898....	15 1425	11 1975	9 100	6 740	15 641	11 1314
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 were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as in 1899	14 1305	11 347	8 1720	5 1740	14 682	10 1664
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 were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as in 1899........	12 118	9 1276	6 400	4 660	11 1429	9 652
9	Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as in 1899	11 59	8 111	5 1820	4 340	10 1457	7 1654
10	Mineral superphosphate. No. 1, 350 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as in 1899	12 1448	10 90	6 160	5 1000	12 666	9 1597
11	Mineral superphosphate, No. 1, 350 lbs., nitrate of soda, 200 lbs., wood ashes, unleached, 1,500 lbs. yer acre, used each year from 1888 to 1899 inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as in 1899.	15 1204	12 330	8 1700	7 140	15 410	11 1731

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 from that time to 1905. 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. In 1905-6-7-8 fertilizers again applied as in 1898. Clover discontinued.	Average Yield for Sixteen Years.		17th Season, 1908.		Average Yield for Seventeen Years.	
		½ Plot No. 1—weight of green fodder. Per acre.	½ Plot No. 2—weight of green fodder. Per acre	½ Plot No. 1—Selected Leaming, weight of green fodder. Per acre.	½ Plot No. 2—Longfellow, weight of green fodder. Per acre	½ Plot No. 1—weight of green fodder. Per acre.	½ Plot No. 2—weight of green fodder. Per acre
		Tons. lbs.	Tons lbs	Tons. lbs.	Tons lbs	Tons. lbs.	Tons lbs
12	Unmanured from the beginning.........	10 952	8 1413	4 840	3 700	10 240	8 783
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 bone again used as at first....	11 1372	9 422	5 1960	4 1860	11 701	8 1918
14	Bone, finely ground, 500 lbs., wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as at first.	12 1362	10 58	7 1900	6 420	12 805	9 1609
15	Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as at first.	11 1680	9 573	6 840	5 120	11 042	9 76
16	Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as at first......	12 654	9 1406	5 1900	6 200	11 1904	9 982
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 used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as at first.	13 426	10 156	9 1200	6 940	13 1	9 1732
18	Muriate of potash, 300 lbs. per acre, used each year from 1889 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as at first.	10 258	7 1428	7 340	5 940	9 1910	7 1165
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, 300 lbs., mineral superphosphate, No. 1, 500 lbs. per acre used each year from 1889 to 1899, inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as at first	12 585	9 571	8 1400	7 1660	12 162	9 399
20	Wood ashes unleached, 1,900 lbs. per acre used each year from 1889 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as at first	11 5	8 1336	8 1040	6 1020	10 1713	8 1082
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 used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as at first..................	12 341	8 64	9 1180	2 1600	12 38	7 1448

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 has been 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 barnyard 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.

The variety of mangel principally grown was the Mammoth Long Red, and about four pounds of seed were sown per acre each year.

The variety of turnip chiefly sown was 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. 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 three pounds of seed were sown per acre.

In 1900 and 1903, no crops of mangels or turnips were grown, but clover was sown in their place in May at the rate 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, the year following, by which time it had made a very heavy growth. It was then ploughed under about 6 inches deep and harrowed well, then made 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 were 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.

From 1904 to 1908, inclusive, the roots were grown each year. In 1908 both the mangels and the turnips were sown on May 20, and pulled on October 17. The yield per acre has been calculated in each case from the weight of roots gathered from the whole plot.

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 from that time to 1905. 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. In 1905-6-7-8 fertilizers again applied as in 1899. Clover discontinued.	Average Yield for Sixteen Years. Mangels, Weight of Roots. Per acre. Tons.	lbs.	Average Yield for Sixteen Years. Turnips, Weight of Roots. Per acre. Tons.	lbs.	17th Season, 1908, Varieties. East Half Plot. Turnips: Purple Top Swede. Weight of Roots. Per acre. Tons.	lbs.	17th Season, 1908, Varieties. West Half Plot. Mangels Mammoth Long Red. Weight of Roots. Per acre. Tons.	lbs.	Average Yield for Seventeen Years. Mangels, Weight of Roots. Per acre. Tons.	lbs.	Average Yield for Seventeen 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 used from 1899 to 1905. In 1905-6-7-8 manure was again used as at first.	21	1334	14	1848	4	720	13	1060	21	377	14	605
2	Barn-yard manure (mixed horse and cow-manure) fresh, 20 tons per acre each year from 1889 to 1898 inclusive. No manure used from 1899 to 1905. In 1905-6-7-8 manure was again used as at first..............	20	1765	15	115	4	540	14	580	20	990	14	846
3	Unmanured from the beginning....	8	1224	7	27	2	160	3	1680	8	663	6	1447
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 fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as in 1899.............	8	1143	7	1741	1	1340	4	660	8	644	7	1011

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

No. of Plot.	Fertilizers applied each year from 1889 to 1898 or 1899. No fertilizers used from that time to 1905. 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. In 1905-6-7-8 fertilizers again applied as in 1899. Clover discontinued.	Average Yield for Sixteen Years.				17th Season, 1908, Varieties.				Average Yield for Seventeen Years.			
		Mangels, Weight of Roots.		Turnips, Weight of Roots.		East Half Plot. Turnips: Purple Top Swede, Weight of Roots.		West Half Plot. Mangels: Mammoth Long Red, 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.
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 Thomas' phosphate were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as in 1899	14	1768	9	1484	5	180	8	1160	14	1026	9	937
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 were used in place of the mineral phosphate. No fertilizers used from 1899 to 1905. In 1905-6-7-8 fertilizers again used as in 1898.	17	877	12	315	8	1480	9	80	16	1889	11	1325
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 were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as in 1899.........	12	1212	9	580	2	560	8	1520	12	760	8	1755
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 used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as in 1899......	13	1952	11	647	4	1220	8	660	13	1288	10	1857
9	Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as in 1899	9	1208	9	115	3	1020	5	1700	9	766	8	1462
10	Nitrate of soda, 300 lbs. per acre, used each year from 1889 to 1899, inclusive. No fertilizer used from from 1900 to 1905. In 1905-6-7-8 fertilizer used again as in 1899....	13	1725	9	293	5	540	6	180	13	811	8	1837
11	Sulphate of ammonia, 300 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer used again as in 1899....	11	1916	10	957	2	1760	4	1580	11	1078	10	63

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 from that time to 1905. 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. In 1905-6-7-8 fertilizers again applied as in 1899. Clover discontinued.	Average Yield for Sixteen Years. Mangels, Weight of Roots. Per acre.		Average Yield for Sixteen Years. Turnips, Weight of Roots. Per acre.		17th Season, 1908, Varieties. East Half Plot. Turnips: Purple Top Swede, Weight of Roots. Per acre.		17th Season, 1908, Varieties. West Half Plot. Mangels: Mammoth Long Red, Weight of Roots. Per acre.		Average Yield for Seventeen Years. Mangels, Weight of Roots. Per acre.		Average Yield for Seventeen Years. Turnips, Weight of Roots. Per acre.	
		Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.
12	Unmanured from the beginning....	7	277	6	1973	1	1500	2	460	6	1700	6	1357
13	Bone, finely ground, 500 lbs., wood ashes, unleached, 1,000 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as at first...	12	389	8	1450	2	0	5	260	11	1558	8	659
14	Wood ashes, unleached, 2,000 lbs. per acre, used each year from 1889 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as at first.	11	109	8	155	2	20	6	320	10	1533	7	1441
15	Common salt (Sodium chloride), 400 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as at first.	9	1383	7	901	3	200	6	300	9	966	7	330
16	Mineral superphosphate, No. 1, 500 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as at first...	12	648	9	1507	4	1800	4	1380	11	1745	9	936
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 used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as at first.	12	1802	10	728	5	1740	6	420	12	1015	10	199
18	Mineral superphosphate, No. 1, 500, lbs., muriate of potash, 200 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as at first.	12	1983	10	1524	4	1380	8	1760	12	1499	10	810
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 used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as at first......	14	300	11	1127	3	320	8	680	13	1616	11	138
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 used from 1900 to 1905. In 1905-6-7-8 fertilizers again used as at first...............	14	1992	10	521	2	1300	8	640	14	1207	9	1655
21	Mineral superphosphate, No. 2, 500, lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7-8 fertilizer again used as at first.	14	547	10	1140	2	1500	5	1300	13	1533	10	220

The season of 1908 at Ottawa has been unfavourable for the trial plots of fertilizers. The spring was exceedingly wet, so that it was impossible to sow early. The grain could not be got in until May 16, which is much too late for good crops in this climate. There was again a considerable falling off in yield both in grain and straw; none of the plots of wheat, barley or oats reached the average of past years.

The weight of fodder cut from the plots of Indian corn was much less than formerly, due partly to the late date of seeding, June 5, and partly to the unfavourable season. The field roots also gave very inferior crops.

BULLETINS ISSUED DURING THE YEAR ENDING MARCH 31, 1909.

Three bulletins were issued during the year, and a second edition of several others of which the first edition was exhausted. Among these were Bulletin No. 37 on Apple Culture, and Bulletin No. 35 on The Stave Silo.

The new bulletins were the following:—Bulletin No. 60, The Grades of Wheat in the Manitoba Inspection Division, Crop of 1907. The first part of this bulletin, 'On the Milling and Baking Qualities of the Grades of Wheat,' was prepared by Dr. C. E Saunders, Cerealist of the Experimental Farms. This contains descriptions of the samples and particulars regarding the cleaning and milling of them, also the percentage of straight flour made from each. The results of the baking tests are also given. The second part, 'A Chemical Study of the Grain and Flour of the Grades of Wheat,' was prepared by the Chemist of the Experimental Farms, Mr. F. T. Shutt. In it are presented the details of the analyses of the various grades of wheat, both as received and as cleaned for milling. The analyses of the flours are also submitted, with much useful information regarding their several constituents.

Bulletin No. 61 of the Experimental Farm series was prepared jointly by the Cerealist, Dr. C. E. Saunders, and myself. This treats of the results obtained on all the Dominion Experimental Farms from trial plots of grain, fodder corn, field roots and potatoes in 1908. This is the fourteenth issue of this special publication. There are presented in this bulletin the results of a large number of experiments which have been conducted at all the Dominion Experimental Farms during the season of 1908 with spring and winter wheat, oats, barley, peas, Indian corn, turnips, mangels, carrots, sugar beets and potatoes. The average results are also given for the past five years of the comparative tests of those varieties which have been long under trial, and these records are arranged in the order of their yield.

These trial plots are conducted with the object of gaining information as to the relative productiveness of the different sorts and their earliness in ripening in the different climates of Canada. The returns show much variation in the weight and earliness of the crops grown, and point to the importance of care in the choice of varieties of seed for sowing.

Bulletin No. 5, second series: 'A List of Herbaceous Perennials tested in the Arboretum and Botanic Garden of the Central Experimental Farm, Ottawa,' with descriptions of flowers and other notes, by W. T. Macoun, Horticulturist and Curator of the Arboretum and Botanic Garden.

This bulletin contains a list of the herbaceous perennials which have been tested at Ottawa for the past twenty years. 2,116 species and varieties are recorded. These are arranged alphabetically under their scientific names, and in all cases where common names could be found these have also been given, together with the name of the country from whence the different species and varieties have been obtained.

This list of perennial plants is the result of much labour and painstaking effort on the part of the author. He has given, in addition to the botanical and common names of the species, the year when planted, the height to which the plant grows, the time of blooming and the colour of the flowers; also whether the plant is hardy or tender. In the introduction to this bulletin, some very useful information is given, including brief notes on the planting and care of herbaceous perennial plants.

Bulletins of the second series treat of such subjects as are of interest to a limited class of readers, and are mailed to those only to whom the information is likely to be useful. Copies may, however, be obtained by any one desiring them, as long as the edition lasts, on application to the Director of Experimental Farms, Ottawa, Canada.

Three pamphlets have also been issued during the year, giving useful information, one 'On Preparing Land for Grain Crops in Saskatchewan,' by Angus Mackay, Superintendent of the Experimental Farm at Indian Head, Sask. In this the settler is advised as to the best methods to adopt to ensure success in grain-growing in that province.

The two other pamphlets have been prepared by Mr. W. T. Macoun, Horticulturist. In pamphlet No. 4 the following subjects are treated of: 'How to make and use a hotbed and cold frame.' 'Top-grafting.' 'How to transplant a tree or shrub.' 'Protection of fruit trees from mice and rabbits, and care of injured trees.'

Pamphlet No. 5 gives information on 'Asparagus culture, 'Celery culture,' and on 'Onion culture.' Copies of these pamphlets may be had from the Director of Experimental Farms by any one desiring them.

VISITS TO THE BRANCH EXPERIMENTAL FARMS.

Visits were paid to the branch Experimental Farms in the west during August and September. I left Ottawa for this purpose on August 4.

EXPERIMENTAL FARM, BRANDON, MAN.

I arrived at Brandon on August 7. The spring weather here had been favourable for the early sowing of all crops, and good weather conditions prevailed until the middle of July, when two weeks of very hot weather began, which caused the grain to ripen very rapidly. As a result the kernel became shrivelled and the weight of the crop somewhat reduced. Notwithstanding this drawback, the trial plots of wheat gave an average yield of 39 bushels 45 pounds per acre, and the oats gave an average of 102 bushels 27 pounds per acre. Everything on the farm was in good order, the horses and cattle in good condition and the buildings and implements well cared for. A second visit was made at Brandon on September 22 on the way east, when the grain was all harvested and threshing was proceeding rapidly in the bright autumn weather.

EXPERIMENTAL FARM, INDIAN HEAD, SASK.

The season of 1908 was a fine one at Indian Head also, where I arrived August 8, and remained until the 10th. Seeding had been completed some three weeks earlier than in 1907, and the coming harvest was full of promise. The grain was ripening fast. The weather during June and the first three weeks of July was very favourable, and rapid growth was made. The weather subsequently became very hot, which brought about a sudden ripening of the grain, causing it to shrivel more or less. The weather was exceptionally favourable for harvesting and threshing, and the resulting wheat crops gave nearly twice the number of bushels harvested in 1907. I called at Indian Head again on the way home on September 19 and 20. On both occasions I found the farm in excellent condition. The state of the crops, stock, buildings and implements all gave evidence of careful and constant supervision.

EXPERIMENTAL FARM, LETHBRIDGE, ALBERTA.

A visit was paid to Lethbridge on August 17 and 18. Two sets of trial plots of the most important farm crops were established here: one after the methods practiced in connection with dry-farming (non-irrigated), the other on irrigated land. The soil had been well prepared and the crops gave promise of an abundant harvest. Later the ten varieties of winter wheat grown on non-irrigated land gave an average of 40 bushels 20 pounds per acre, while spring wheat under the same conditions gave 29 bushels 32 pounds per acre.

No winter wheat was grown on irrigated land, but the plots of spring wheat under irrigation gave an average yield of 37 bushels 20 pounds per acre. Nearly all the crops experimented with gave good returns. The alfalfa fields had become well established and presented a promising appearance. All the fields and plots both on non-irrigated and irrigated land had been well prepared, and the results were highly satisfactory.

EXPERIMENTAL FARM, LACOMBE, ALBERTA.

The Experimental Farm at Lacombe was reached on August 22, when the trial plots of grain were looking remarkably fine. The season here also had been much more favourable than that of 1907. Seeding had taken place fully three weeks earlier, and had been followed by favourable conditions and a very rapid growth. Cool weather in August delayed the maturing of the grain, which ripened, however, before frost. The land on this farm also had been well prepared and got into a good condition of tilth. The fertility of the soil was manifested by the strong and rapid growth of the crops. The fourteen varieties of spring wheat under trial gave an average of 33 bushels 34 pounds per acre. Oats ranged from 110 to 51 bushels per acre and barley from 65 to 40 bushels per acre.

The forest, ornamental and fruit trees had all suffered more or less from the severe winter. Many interesting ones, however, had survived and were making promising growth.

EXPERIMENTAL FARM, AGASSIZ, B.C.

Agassiz also was twice visited, first on August 30 and 31, and again on September 7 to 10.

The season of 1908 opened earlier than that of 1907, and grain was sown about ten days earlier than in the latter year. The weather later in the season had also been favourable to the ripening of the grain and it matured early. The average crop of the fourteen varieties of spring wheat grown on the trial plots was 22 bushels 4 pounds per acre, the average of the twenty-four plots of oats was 75 bushels 6 pounds per acre, and the thirteen varieties of barley averaged 41 bushels 30 pounds per acre. The general crop of apples was below medium; the weather in the spring was cold and showery and the fruit did not set freely. Plums gave a better average yield and the fruit which ripened was of fine quality, owing to favourable weather. The commercial orchards recently planted are doing well and many of the trees in the nut orchard had very fair crops. In the various branches of live stock the animals were all found in satisfactory condition.

EXPERIMENTAL FARM, NAPPAN, NOVA SCOTIA.

Owing to a lengthened absence in the Northwest, followed by a journey to Albuquerque in New Mexico, where I went to represent Canada at an important 'Dry Farming' congress, it was near the middle of October before I returned to Ottawa, when it was too late to see any of the crops on the Maritime Province Farm. For these reasons the work at Nappan was not inspected this year. From the reports of the superintendent, I learn that, notwithstanding a cold and wet spring wheat gave a considerably higher average than in 1907, and that barley also gave a slightly higher yield. Indian corn gave excellent crops; with oats also, the average was very good.

IRRIGATION AND 'DRY FARMING' CONVENTIONS.

On August 11 and 12, 1908, I attended the Annual Convention of the Western Canada Irrigation Association, which was held at Vernon, B.C. The meetings of this association were large, and much practical information on irrigation was given. Mr. W. H. Fairfield, Superintendent of the Experimental Farm at Lethbridge, was with me. At the close of the meetings a series of excursions was arranged, which gave the visitors an opportunity of seeing many of the finest orchards in the Okanagan valley. The marvellous extension of the fruit interests in that valley was a great surprise, and several days were spent in looking over some of the most important fruit areas. Some of the earlier-maturing varieties of peaches were ripe at the time of our visit, and abundant opportunities were afforded of testing the quality of these fruits, which was pronounced excellent on every hand. The trees seemed healthy and vigorous and gave good promise for the future.

From September 29 to October 3, I was present at the 'Sixteenth National Irrigation Congress' held in Albuquerque, New Mexico, U.S.A. This congress was largely attended by representatives from all parts of the United States, also from many foreign countries, but the main part of the attendance was from those sections of the country where the rainfall is scanty and where it is necessary to use every possible means to economize the rainfall in order that crops may be grown. Exhibits were made in connection with this meeting of various agricultural and horticultural crops which had been grown under dry-farming conditions. Much useful information was communicated at the meetings and a great deal of enthusiasm manifested. It was a profitable gathering, and many facts learned there will serve a useful purpose in time to come.

ACKNOWLEDGMENTS.

My grateful thanks are due to all the members of the staff for their kind co-operation with me in the various branches of the work conducted both at the Central Experimental Farm and at the branch Farms throughout the Dominion. The present report is largely the result of their earnest efforts to render service to agriculture in their different spheres of labour.

To those members of the staff who have aided me in those branches of the work of which I have personal charge, I also tender sincere thanks; to the farm foreman who has carefully supervised the special tests of fertilizers on field crops and recorded the results; to the foreman of the distribution branch for his watchful care over the distribution of the samples of seed grain sent for trial to farmers in all parts of the Dominion; to the foreman in care of the lawns and ornamental grounds at the Central Farm, for the taste and industry he has displayed, and to the foreman of the greenhouses for his careful management of the plants and shrubs under propagation, also for the useful work he has done in testing the vitality of seeds and in the taking of meteorological records. I desire also to bear testimony to the faithful services of my secretary. The employees also of all the farms have my thanks for the interest they have manifested in their work and the careful manner in which they have discharged their respective duties.

REPORT

OF THE

DIVISION OF ENTOMOLOGY AND BOTANY

BY THE DIRECTOR, DR. WILLIAM SAUNDERS, C.M.G.

It becomes my painful duty to record the death during the year of a beloved member of our staff, a most highly esteemed fellow worker, one whose urbanity and kindly spirit endeared him to all. I refer to the late Dr. James Fletcher, Entomologist and Botanist to the Dominion Experimental Farms, who died, after a brief illness, on November 8, 1908. He was born at Ashe, in the county of Kent, England, on March 28, 1852, was educated at King's School, Rochester, and came to Canada in 1874 to fill the position of a clerk in the Bank of British North America. After two years he gave up his position in the bank and became an assistant in the Library of Parliament at Ottawa. Here he devoted much of his spare time to the study of entomology and botany, and became, as years went on, a recognized authority in each of these branches of natural science.

Prior to the organization of the Experimental Farms, Dr. Fletcher acted as Honorary Dominion Entomologist to the Department of Agriculture, and in this capacity published two reports, the first in 1884, the second in 1885. These reports dealt chiefly with injurious insects and the remedies for their destruction.

On July 1, 1887, Dr. Fletcher was appointed Entomologist and Botanist to the Dominion Experimental Farms and was then transferred from the position he had occupied in the Library of Parliament to the staff of the Farms. He was thus enabled to devote himself entirely to natural history and his work became the great pleasure of his life. For twenty-one years the writer was intimately associated with Dr. Fletcher from day to day and watched the development of his work with much interest. In his capacity of Dominion Entomologist, Dr. Fletcher studied with great assiduity the many problems which presented themselves in reference to insect life, such as the life histories of many injurious insects which prey on the crops of the farmer and by their depredations often materially lessen his profits, as well as the life history and habits of the many parasitic species which feed on and destroy the farmer's enemies and thus render him substantial service. He also experimented with the remedies proposed for the destruction of the injurious species and thus tested their efficacy.

As Botanist, Dr. Fletcher studied the value as fodder plants of such species of grasses and clovers as can be grown successfully in the different parts of the Dominion. He ascertained their value for the production of hay and recommended the most promising of them for more general cultivation. These fodder plants were grown in convenient plots at the Central Experimental Farm, where they could be shown to visitors and their points of excellence explained. He also studied the subjects of rust, smut and such other low forms of vegetable life as are injurious to our grain crops. Dr. Fletcher also devoted much attention to another class of enemies with which the farmer must wage war if he is to be successful in his work; I refer to the weeds which infest his crops. These, if allowed to multiply, crowd the useful plants he is growing, rob them of light and air and of the moisture they need, also of much of the fertilizing material in the soil which would otherwise contribute to their growth.

In both these divisions of Dr. Fletcher's work the field was practically unlimited, and in preparing his Annual Reports from the large mass of material available, the chief difficulty was to select the best and most useful.

Dr. Fletcher's first report after his appointment on the Farm staff, that for 1887, may be considered in its general usefulness and the variety of important topics discussed as typical of the series. This begins with an article on the insects injurious to cereal crops, in which those affecting wheat claim first attention, followed by those species which injure other valuable cereals. The species destructive to hay and clover are next considered, then the worst pests which affect field roots and potatoes. Those insects which are destructive to the apple crop were also dealt with, followed by those which injure the grape, raspberry, currant and strawberry. A chapter was also devoted to some of the worst insects affecting forest trees. In all these instances the most useful remedies for the destruction of these injurious species were dealt with.

The twenty-one Annual Reports which were written by Dr. Fletcher together with the excellent cuts with which the text was illustrated have been of great value to the farmers of Canada by instructing them how to recognize their insect enemies as well as their insect friends, and at the same time instructed them as to the most practical measures to adopt for the destruction of the more injurious species treated of.

He also waged a constant warfare against weeds, and his reports and bulletins containing instructions as to the best methods of destroying the different injurious species are highly appreciated and followed by many of the most intelligent farmers throughout the Dominion. Bulletin No. 28 of the Experimental Farm series on Weeds, was written by Dr. Fletcher, in which one hundred and sixty-four of the most troublesome weeds are mentioned and the best methods of destroying them. Dr. Fletcher also prepared that beautiful illustrated work on Farm Weeds of Canada published by the Seed Commissioner's Branch.

Bulletins on entomological and botanical subjects were prepared, either wholly or in part, by him, of which Nos. 3, 11, 14, 19, 23, 37, 43 and 46 are examples. His last bulletin was No. 52, Insects Injurious to Grain and Fodder Crops, Root Crops and Vegetables. From his busy pen there appeared also, from time to time, many communications to agricultural and other papers giving accounts of the occurrence of insect pests in various parts of the Dominion and the best methods to adopt for their destruction.

For many years past Dr. Fletcher was invited, from time to time, to give evidence before the Select Committee on Agriculture of the House of Commons. On these occasions he rendered most acceptable service by bringing under the notice of the committee details of some of the more important lines of work carried on by the Division of Entomology and Botany.

During the past twenty-one years Dr. Fletcher carried on a large correspondence with farmers in almost every part of the Dominion. He also attended farmers' meetings in all the different provinces, where, in his addresses, he conveyed, in a pleasant and forceful manner, much valuable information to his hearers.

In his position as Entomologist he was entrusted with the management of the federal fumigation stations where arrangements are made for fumigating trees, shrubs and other nursery stock under the San José Scale Act to prevent any further introduction of that terrible pest. During the past two years Dr. Fletcher was also given the supervision of the spraying of orchards in the Indian reservations in British Columbia, to prevent their becoming distributing points for injurious insects.

In 1885 he was elected a Fellow of the Royal Society of Canada, in which he took an active part, in 1886 he became a Fellow of the Linnæan Society of London, Eng., and in 1896 he received the degree of LL.D., *Honoris causa,* from Queen's University.

Dr. Fletcher was kind and generous to all inquirers seeking information, especially to young students in entomology and botany, freely giving them much of his valuable time in helping and encouraging them in their work. His was a busy life, and the good work he has done will furnish a lasting memorial to his energy and industry which will live long in the memories of those who have profited by his instruction.

DIVISION OF ENTOMOLOGY AND BOTANY.

THE BROWN-TAIL MOTH IN SHIPMENTS OF NURSERY STOCK FROM FRANCE, 1909.

Early in January, 1909, the officers of the Bureau of Horticulture of the Department of Agriculture, Albany, New York, discovered nests of the living larvæ of the Brown-tail Moth in nursery and seedling stocks imported from France. Mr. Geo. G. Atwood, Chief of the Bureau of Horticulture, at once communicated this information to the Division of Entomology and Botany of the Dominion Experimental Farms, when the following circular was immediately prepared and sent to nurserymen and others likely to be interested in this matter throughout Canada. Copies were also forwarded to newspapers and the agricultural press.

CENTRAL EXPERIMENTAL FARM,
OTTAWA, January 19, 1909.

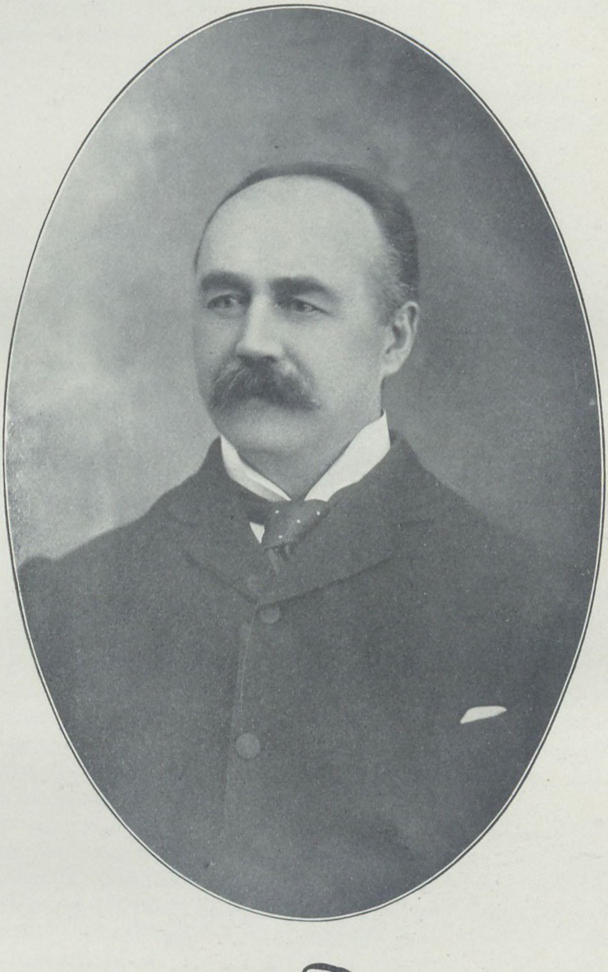
It has recently come to our knowledge through the kindness of Mr. G. G. Atwood, Chief of the Bureau of Horticulture of the State of New York, that about 75 nests of the young caterpillars of the Brown-tail Moth have been found on apple, pear and cherry seedlings, and quince stocks, recently received in New York State from France. The nests contained living caterpillars in the usual winter form.

The infested stock so far as examined was packed in or near Angers, France, and it is probable that some of the larvæ of this terribly destructive insect may find their way into different parts of Canada and become established there unless the utmost care is taken to promptly destroy them.

This insect has already done incalculable damage to orchards and woodlands in some of the eastern States where many hundreds of thousands of dollars have been spent during the past ten years in the endeavour to exterminate them, with only partial success. The Brown-tail Moth has recently been found in considerable numbers in parts of Nova Scotia, where constant efforts are being made to destroy them. It will be a great calamity to our fruit industry were this pernicious insect to become established in our important fruit districts, since this would result in a heavy annual loss.

Kindly inform me if you have or will be importing from France this season any of the seedlings or stocks referred to, as in such case I shall be glad to advise you as to the precautions which should be taken to prevent this pest from becoming established in your nursery. In case you have facilities for fumigating nursery stock with hydrocyanic acid gas on your premises, it would be well to place all boxes of fruit seedlings and stock received in the fumigating chamber for a sufficient length of time to ensure the destruction of all insect life. In case no fumigating chamber is available the cuttings from such seedlings and stocks should be carefully burned.

I am mailing you with this a copy of the report of our late Entomologist, Dr. James Fletcher, for 1906, in which you will find good illustrations of the Brown-tail Moth in its different stages, including the winter nest of the young caterpillars, the full grown larva and the male and female moths, and on pages 222 to 227 the life history and habits of this destructive species are given.



James Fletcher.

5094—p. 40.

I would strongly urge upon you the great importance of prompt attention to this impending danger, and trust that you will heartily co-operate with the government in the carrying out of such precautionary measures as it may be necessary to establish to overcome the threatened invasion of this formidable foe.

Yours very truly,

WILLIAM SAUNDERS,

Director, Dominion Experimental Farms.

After undoubted nests of the Brown-tail Moth had been found in shipments of French nursery stock imported into Ontario, the following additional circular was sent to nurserymen and others:—

DIVISION OF ENTOMOLOGY,
CENTRAL EXPERIMENTAL FARM,
OTTAWA, February 5, 1909.

NURSERYMEN—ATTENTION!

The Brown-tail Moth.

In view of the fact that a number of the winter nests of the Brown-tail Moth, all of which contained living caterpillars, have recently been discovered in Ontario, in nursery seedling stock imported from France, it is extremely important that all seedlings and stocks being brought in this season be carefully examined in a good light to see if this very injurious insect is present in shipments received. In New York State, 1,800 nests of the Brown-tail Moth have been found within the past few weeks in cases of stock imported from France. Nests have been found on apple, pear, plum, cherry, rose, quince, elm and Amelanchier.

As each winter nest of the Brown-tail Moth contains between two and three hundred small caterpillars, about one-quarter of an inch in length, it can be easily realized that the danger of this pest becoming introduced is very great. The nests are easily seen, being whitish in colour and situated between two or three twigs or along the main stem of the seedling.

We should feel obliged if every nurseryman who has this winter imported seedlings, or stocks, from abroad, would at once communicate with this Division, so that, if necessary, an inspector may be sent to examine the stock, and this is better done at the time the cases are opened.

The surest way to destroy the nests is to at once burn them as they are found. All packing material in infested boxes should also be most carefully burned, as well as the boxes, as there is danger of the small caterpillars having left the nests and secreted themselves in the crevices of the cases. All trimmings from stocks should also be promptly burned.

In the New England States, hundreds of thousands of dollars have been spent in fighting the Brown-tail Moth. This insect was first introduced into Massachusetts about the year 1890, and it is said to have been brought in on rose bushes from Holland or France. It has now become very abundant and injurious.

It would be a great calamity if this dreaded pest established itself, in any locality, from stock imported this season from France. It is hoped, therefore, that all nurserymen will co-operate with the government in every way in their power to prevent the Brown-tail Moth from being thus introduced.

The Entomological Division will be glad to receive from nurserymen, or others, any communications on this subject, and to give any further information desired as to the life-history of this insect and the precautionary measures which should be adopted.

WILLIAM SAUNDERS,
Director, Dominion Experimental Farms.
ARTHUR GIBSON,
Chief Assistant, Division of Entomology.

The nurserymen generally were keenly interested in this threatened invasion of such an injurious pest, and co-operated with the Division in every way in their power. They were thoroughly alive to the danger from such infested nursery stock, and were grateful for the prompt way in which the department had undertaken the work of inspection.

The thanks of the department are due to Mr. G. G. Atwood, Chief of the New York State Bureau of Horticulture, who was most helpful in advising us throughout the season of shipments of nursery stock coming into Canada through New York State. Most of the nurserymen, too, kept the Division well advised of any shipments they had received. As soon as advice of arrival of such stock was received, Mr. Arthur Gibson, Chief Assistant of the Division of Entomology and Botany, was at once sent to examine the same. In this work of inspection it was of course necessary to carefully examine all the material to see if any nests of the Brown-tail Moth were present. As a rule these nests are very conspicuous, but occasionally a very small nest, or one which had become broken, was found. To avoid the possibility of any of these escaping required great care.

The following list of the stock examined, and the number of nests of the Brown-tail Moth which were discovered, at each inspection, has been prepared by Mr. Gibson:—

Date of Examination.	Nurseryman or Consignee.	Nature of Stock.	Imported From.	Nests Found.
Jan. 26, 27	E. D. Smith, Winona, Ont.	150,000 fruit seedlings...	Orleans, France.....	1 nest on plum.
" 28	C. F. W. Carpenter, Winona, Ont.	27,000 " ...	Angers "	No nests found.
" 28	A. G. Hull & Co., St. Catharines, Ont.	12,000 " ...	" "	1 nest on pear.
" 29	Morris & Wellington, Fonthill, Ont.	35,000 " ...	Orleans "	14 nests, 13 on pear, 1 on quince.
Feb. 4	Trappist Fathers, La Trappe, Oka, Que.	2,000 " 3,200 ornamentals.	Angers "	No nests found.
" 10-13	Brown Bros. Nurserymen Co., Brown's Nurseries, Ont.	10,600 " 86,000 fruit seedlings.	" "	1 nest on plum.
	J. E. McCombs, Pelham Corners, Ont.	13,000 " ...	" "	4 nests, 3 on pear, 1 on apple.
	B. W. Secord, Pelham Corners, Ont.	52,000 " ...	" "	4 nests, 2 on pear, 2 on apple.
	J. E. Crow, Ridgeville, Ont.	16,000 " ...	" "	4 nests, 3 on pear, 1 on apple.
	J. Page, Ridgeville, Ont ..	18,000 " ...	" "	1 nest on cherry.
" 15	E. D. Smith, Winona, Ont.	150,000 fruit seedlings... 3,000 ornamentals.	Orleans "	20 nests on pear.
" 20-22	Morris & Wellington, Fonthill, Ont.	56,000 fruit seedlings... 6,985 ornamentals.	" "	No nests found.
Mar. 2	E. D. Smith, Winona, Ont.	40,300 fruit seedlings...	" "	24 nests on apple.
" 3	C. F. W. Carpenter, Winona, Ont.	14,000 " ...	Angers "	8 " "
" 4	Morris & Wellington, Fonthill, Ont.	600 ornamentals.....	Orleans "	No nests found.
" 17	Brown Bros. Nurserymen Co., Brown's Nurseries, Ont.	10,550 gooseberry bushes	Hexham, England..	"
" 19, 20	" " ..	85,000 fruit seedlings... 2,000 ornamentals.	Angers, France.....	66 nests, 42 on pear, 21 on plum and 3 on quince.
" 22	E. D. Smith, Winona, Ont.	53,000 fruit seedlings...	Orleans "	17 nests on apple.
	G. W. Robinson & Co., Hamilton, Ont.	6,590 assorted roses, &c.	Boskoop, Holland...	No nests found.
" 23	J. A. Simmers, Toronto, Ont.	6,950 " ..	" " ...	"

Date of Examination.	Nurseryman or Consignee.	Nature of Stock.	Imported From.	Nests Found.
Mar. 29,30	W. O. Burgess, Queenston, Ont.	50,000 fruit seedlings... (some birch).	Angers, France.....	10 nests, 5 on plum, 3 on pear, 1 on apple and 1 on quince.
" 30, 31	Morris & Wellington, Fonthill, Ont.	60,865 asst. shrubs & trees	Orleans "	No nests found.
		3,815 " " .	Alma Nurseries, Holland.	"
April 1	E. D. Smith, Winona, Ont.	24,800 asst. shrubs......	Angers, France.....	5 nests, 1 on sugar maple 2 on rose and 2 on spiræa.
" 1-3	W. Rennie Co., Ltd., Toronto.	29,490 "	Boskoop, Holland...	No nests found.
" 5	G. M. Hill, Fruitland, Ont.	10,000 fruit seedlings...	Angers, France.....	2 nests on pear.
		10,800 " and ornamental shrubs	Orleans "	No nests found.
		2,300 gooseberry bushes	Carlyle, England....	"
" 5, 6	Steele, Briggs Seed Co., Ltd., Toronto, Ont.	14,038 ornamental shrubs	Boskoop, Holland...	"
		1,300 gooseberry and currant bushes.	Hexham, England..	"
" 6	C. Macdonald, Toronto ...	715 ornamental shrubs	Boskoop, Holland...	"
	R. Brecken, Toronto......	1,000 " ..	" ...	"
" 7	Estate of John Stewart, Goderich, Ont.	6,200 fruit seedlings... 500 ornamentals.	Orleans, France.....	"
	Jos. Tweddle, Stoney Creek, Ont.	7,225 gooseberry bushes	Hexham, England ..	"
" 8	Connor Floral Co., Hamilton, Ont.	10,710 assorted shrubs..	Orleans, France.....	"
		24,843 " ..	Boskoop, Holland...	"
" 14	Graham Bros., Ottawa....	575 " ..	" ...	"
" 16, 17	Canadian Nursery Co., Pointe Claire, Que.	37,160 " and trees.	" ...	"
		20,000 fruit seedlings...	France.............	8 nests on pear.
		250 ornamentals.....	"	No nests found.
		630 assorted roses....	Holland	"
" 18	A. Roszel, Pelham Corners, Ont.	16,000 fruit seedlings...	Angers, France.....	"
" 23	J. E. McCombs, Pelham Corners.	1,250 assorted shrubs..	" "	"
" 24	Steele, Briggs Seed Co., Ltd., Toronto.	12,360 ornamental shrubs and trees.	France	1 nest on Prunus pissardi.
" 26	J. W. Smith & Sons, Vineland, Ont.	20,000 fruit seedlings...	"	No nests found.
" 27-28	Morris & Wellington, Fonthill.	24,000 " ...	"	"
		5,250 assorted shrubs..	Oudenbosch, Holland	"
" 28	J. E. McCombs, Pelham Corners.	23,000 fruit seedlings...	France	"
		2,250 ornamentals.....	"	"
	John Dobbie, Niagara Falls, Ont.	300 assorted roses....	Hilligorn, Holland..	"
" 29	J. Page, Ridgeville, Ont ..	30,000 fruit seedlings...	Angers, France.....	3 nests, 1 on apple, 2 on pear.
May 3	J. E. McCombs, Pelham Corners, Ont.	9,500 " ...	" "	No nests found.
	W. Baker & Son, Longueuil, Que.	734 assorted roses....	Orleans "	"
" 10	B. W. Secord, Pelham Corners, Ont.	25,000 fruit seedlings...	Angers "	2 nests, 1 on pear and 1 on apple.
" 10, 11	Brown Bros. Nurserymen Co., Brown's Nurseries, Ont.	124,780 assorted trees and shrubs.	Ussy, Calvadoes, France.	No nests found.
" 12, 13	Pointe Claire Nurseries, Pointe Claire, Que.	9,050 " ..	" ..	"
		874 assorted roses....	Boskoop, Holland...	"
		11,850 assorted trees and shrubs.	Ussy, Calvadoes,	"
" 14	W. C. Reid, Belleville, Ont.	7,000 fruit seedlings...	" ..	"
		1,640 assorted shrubs and trees.	France.	"
" 20	W. J. Kerr, Ottawa......	1,300 assorted shrubs..	Leloire, France.....	"

From the foregoing statement it will be seen that, in the provinces of Ontario and Quebec, 1,503,129 plants were examined. The larger proportion of this stock was fruit seedlings—apple, pear, plum and cherry—either for grafting or budding. The total number of nests of the Brown-tail Moth found in the shipments made to the two provinces named, is 196, all on stock imported from France. Of this number, 188 were found in Ontario, and 8 in Quebec. These occurred as follows: 100 on pear, 56 on apple, 28 on plum, 5 on quince, 1 on cherry, 2 on rose, 2 on spiræa, 1 on sugar maple and 1 on Prunus pissardi. As each nest contains from 200 to 300 small caterpillars, it can be easily understood how the above provinces would probably have become badly infested by this extremely pernicious insect had these nests not been discovered and destroyed.

Shipments destined for other parts of Canada, of which advice was received, were at once reported to the provincial officers. Those for British Columbia were reported to Mr. Thos. Cunningham, Inspector of Fruit Pests, Vancouver, B.C., and those for Nova Scotia to Prof. M. Cumming, Secretary for Agriculture, Truro, N.S. Mr. Cunningham has advised us that nests of the Brown-tail Moth were found by his department on stock imported from France, but as yet we have no complete list of his findings. Mr. E. R. Clarke, of Annapolis, N.S., reported to the Division, that he had found one nest on stock which he had imported from France. Prof. Cumming stated, under date of June 14, that 'no Brown-tail Moth nests were discovered on imported stock officially examined this year in the province of Nova Scotia.'

At the outset of the above work, the Ontario Department of Agriculture was notified from time to time of the finding of the nests of the Brown-tail Moth in shipments of nursery stock from France coming into the province. Through the kind cooperation of Prof. C. C. James, Deputy Minister of Agriculture for Ontario, and Mr. P. W. Hodgetts, Director, Horticultural Branch, Mr. Harry Arnold, the San José Scale Inspector for the township of Pelham, was instructed to assist Mr. Gibson in examining some of the shipments received, chiefly those which came into the larger nurseries in the above township. Mr. Arnold is a very careful worker, and his valued help was very much appreciated. In a few instances owing to stress of other work at Ottawa, which prevented Mr. Gibson from covering the whole ground, Mr. Arnold examined several shipments alone. In these cases he reported that he had been most careful in looking over the consignments.

Mr. Gibson further reports: 'Every nurseryman or firm visited was asked to be most careful to see that all packing (such as moss and paper) was burned as soon as possible, also all cases in which stock had been received, particularly such in which nests had been found. It was also pointed out that in New York State the stock received in such cases was being dipped in a standard miscible oil, diluted with ten to twenty parts of water. This was shown by experiments to be sufficient to kill the caterpillars. As most of our nurserymen have not had any experience with these miscible oils, they were told that the ordinary well-known kerosene emulsion, diluted with nine parts of water, would probably answer the same purpose.'

'About the middle of January some of the nurserymen received shipments of fruit seedlings from France. These arrived during a particularly mild spell of weather and were at once heeled in, in the ground outside. When advice came from the Chief of the Bureau of Horticulture of New York State that nests of the Brown-tail Moth had been found in shipments from France, the ground in Ontario was frozen hard, so it was impossible then to remove the stock which had been heeled in, to examine it. Hence this work had to be done in spring as soon as the weather permitted. The stock examined on the 18th, 26th, 28th (Mr. J. E. McComb's) and 29th April, and on 3rd and 10th May, had all been heeled in, outside, with the exception of that of Mr. B. W. Secord's, which had been packed away in layers, with earth between, in a cool cellar.'

'From the careful way in which all shipments of nursery stock were examined, we have every reason to expect that every nest of the Brown-tail Moth present was found. Nurserymen and others, however, should watch as far as possible this summer all imported stock which has been planted out, and if any strange looking caterpillars are noticed, send them at once to the Division of Entomology at Ottawa. It is important that this should be done, in case any stray caterpillars may have escaped. In certain instances where broken nests had been found, the great danger of leaving around any packing, of whatever kind, which had been in the case, was particularly pointed out. If such packing were not destroyed before spring, it can very easily be seen how some of these caterpillars might get out and establish themselves.'

In view of the widespread interest in the Brown-tail Moth in Canada at the present time, the following account of the insect has been compiled by Mr. Arthur Gibson, Chief Assistant, mainly from the report of the late Dr. Fletcher for 1906:—

INTRODUCTION AND SPREAD IN AMERICA.

The Brown-tail Moth was introduced into America about the year 1890, at Somerville, Mass. It is said to have been brought in on nursery stock imported from Holland or France. It was not until 1897, however, that it attracted particular attention, from its ravages upon pear trees. In Europe this insect has long been known as a pest of fruit and shade trees; it is spoken of there as the 'common caterpillar.' Since its introduction into Massachusetts it has spread into every New England State except Vermont. The following is reprinted from the report for 1906 of the late Entomologist and Botanist, Dr. James Fletcher:—

THE BROWN-TAIL MOTH IN CANADA.

'In 1902, Mr. William McIntosh, of St. John, New Brunswick, took a single male specimen of the Brown-tail Moth (*Euproctis chrysorrhœa*, L.) about 20 miles from St. John, N.B. About the same time another specimen was taken by Mr. Gordon Leavitt, at St. John; and in July of 1905, Mr. John Russell took a third specimen at Digby, Nova Scotia. Up to the present time these have been the only authentic records of this much-to-be-dreaded insect having been taken in Canada. Recently, however, I have received from Mr. C. Perry Foote, of Lakeville, Nova Scotia, one of the winter nests of the Brown-tail Moth, filled with the living caterpillars, thus proving that this insect has established itself at one place at least in Canada.

'It was to be expected that the moths might be found here at any time, having been brought up direct from Massachusetts on one of the steamboats which ply regularly between Boston and the Maritime Provinces; but this would not necessarily prove that the insect had established itself. The occurrence of the young caterpillars, however, is a more serious matter, and shows that energetic measures are necessary at once to suppress and possibly to wipe out this unwelcome visitor before it becomes more widespread. The recognition of the winter nests is an easy matter, and this is the time of year to attend to their destruction. The Brown-tail Moth passes the winter as a very young caterpillar, and large numbers of these form colonies at the tips of the branches of the trees upon which they have been feeding the previous summer. The eggs are laid during July, and, on hatching, the caterpilars feed for some time on the upper surface of the leaves. As winter approaches, they crawl to the tip of a branch and bind together a few leaves so as to make a tent. This is securely closed up with silk, and the caterpillars remain dormant all through the winter and until the buds burst the following spring. These winter nests are easily recognized from being almost invariably at the tips of the branches, and from being at this time of the year the only nests which contain colonies of living caterpillars. These latter are black, but covered with rusty hairs, and on the 10th and 11th segments towards the end of the body there are two very conspicuous, reddish-yellow, cushion-like tubercles, one on each segment, which the caterpillars can elevate or depress at pleasure.

A DANGEROUS ENEMY.

'With the exception of the San José Scale, there are no two insects which have attracted so much public attention, nor with regard to which so much money has been spent in America by the State and Federal Governments of the United States, as the Gypsy Moth and the Brown-tail Moth. Both of these are pests introduced into America from Europe—the Gypsy Moth about 1869, and the Brown-tail Moth somewhere about 1890. Millions of dollars have now been spent on fighting the Gypsy Moth and the Brown-tail Moth in Massachusetts and the adjoining States. Dr. Howard, when treating of this insect and of an effort which is being made to introduce European parasites says, in the Year-book of the Department of Agriculture for 1905: "The Brown-tail Moth has become even more abundant and injurious than the Gypsy Moth, and, owing to the fact that the female flies readily, whereas the female of the Gypsy Moth does not fly at all, the Brown-tail Moth has far exceeded the Gypsy Moth in its spread."

PLANTS INJURED.

'These caterpillars injure nearly all of the large and small fruits, and many perennial plants. The pear and apple seem to be favourites; but stone fruits, elms, maples and the oak are also commonly injured. A list of over 80 different kinds of food plants was published in 1903. Thousands of fruit trees in the vicinity of Boston, Dr. Howard says, have been killed by the Brown-tail Moth.

THE BROWN-TAIL RASH.

'Not only are the caterpillars of this insect voracious feeders upon the foliage of many kinds of trees, but they cause much annoyance from their stinging hairs, which cause excessive irritation when they come in contact with the human skin. Each hair is barbed, and at the time the cocoons are spun these hairs are broken off and carried by the wind, when they fall on the neck and other exposed parts of the body, giving rise to a painful rash, which is very serious with some people, even although they may not have actually touched the caterpillars. Dr. Howard's assistants who have been working on this insect, have suffered very severely; and persons engaged in removing the nests from trees in the winter time must be careful not to handle these nests too freely, or they may be inconvenienced by this rash. The nests should be cut off from the trees, placed in a basket with as little handling as possible, and burnt at once. Dr. Howard states that "a large part of the popular feeling in New England that the Brown-tail Moth must be exterminated, is due as much to the annoyance of this rash as to the loss of vegetation from the caterpillars." As a remedy for this rash a free use of vaseline is recommended.

DESCRIPTION OF INSECT.

'The Brown-tail Moth resembles very closely the well-known Fall Webworm, being of a beautiful pure white, except the tip of the body, which in both sexes is brown, and from which the popular name is derived. The female bears at the tip of the body an almost globular tuft of brown hairs. Both sexes fly freely, and are much attracted to lights—a fact of some importance as affecting their spread. The search-lights of night-sailing passenger steamers have attracted so many as to have drawn the attention of the officers of such vessels, who reported that moths had alighted upon their ships in great numbers in the vicinity of Boston about midnight on several occasions, and the introduction of the species at more than one seaport in Maine is attributed by Dr. Howard to vessels coming from the infested districts rather than by natural spread by direct flight.

ONLY ONE BROOD IN THE YEAR.

'The eggs are laid in masses containing about 300 eggs. These masses are brown in colour from a thick covering of the golden brown hairs from the tip of the body of the female moth; and the whole egg mass more nearly resembles a silky, downy caterpillar than a cluster of eggs. These masses average about two-thirds of an inch in length by one-fourth of an inch in width, and are found on the lower surface of the leaves in July. The caterpillars hatch in August, but do not injure the trees much before winter. As soon as the buds burst in spring, they are at once attacked by the caterpillars, which emerge from their winter shelters and do much harm.

SUMMER TREATMENT.

'If the winter nests of the caterpillars have not been destroyed, trees should be sprayed with arsenical or other poisonous washes, so as to destroy the caterpillars during May and June. The caterpillars of the Brown-tail Moth are not so resistant to the poisonous effects of Paris green as are those of the Gypsy Moth. The spraying of all orchards with the poisoned Bordeaux mixture as a regular practice is recommended to all Canadian fruit-growers as the best general means of securing first-class fruit free of most of the ordinary pests which injure fruits. As the Brown-tail Moth caterpillars attack many other kinds of trees than fruit trees, it will be necessary that they should also be sprayed, and for this purpose Paris green may be used. A good useful poison wash consists of Paris green, 1 pound; fresh lime, 1 pound; water, 160 gallons. It is a very useful practice, however, among fruit-growers to use more than 1 pound of Paris green with lime in the 160 gallons, and, indeed, 2 pounds may be used without danger if 2 pounds of lime are added. Arsenate of lead is a newer remedy of great value, from the fact that it does not injure foliage so much, and remains on the leaves for a longer time. Three pounds of arsenate of lead may be used in 40 gallons of water without injury.

RÉSUMÉ.

'The Brown-tail Moth, which has been the cause of enormous loss in Europe and the United States, is undoubtedly established in one locality in Nova Scotia, and probably in several others. It is important to find out as soon as possible the range of infestation; and everybody is urged to send in as soon as possible any suspicious nests of insects, or clusters of leaves webbed together, particularly if they contain caterpillars, whenever any are noticed on their trees.

'The collection of the winter nests is the best and easiest means of controlling this insect.

'The collection of these nests must be done carefully, with as little handling as possible, and all should be burnt at once when cut from the trees.

'This work must be done before the buds burst.

'Any trees bearing nests of the Brown-tail Moth, after the buds have opened, must be sprayed with some poisonous mixture for the destruction of the caterpillars,

'The establishment of the Brown-tail Moth in Canada is a serious matter, affecting everybody in the district where the insects occur.

'What is now only a matter of considerable interest, may, if neglected, become a public calamity.

'Specimens for examination may be sent to the Entomologist, Central Experimental Farm, Ottawa. If so addressed, no postage will be required.

JAMES FLETCHER.'

Since 1906, the Nova Scotia Department of Agriculture has been most active in its endeavours to rid the province of this dreaded pest. The following letter gives concisely the present state of the Brown-tail Moth in that province.

Truro, N.S., June 14, 1909.—'During the year we have had reported to us as destroyed, after a very careful search, about 750 Brown-tail Moth nests, as compared with about 6,000 two years ago, and 4,000 last year. I should also add that this season's search was the most thorough which we have yet made. It would accordingly appear that unless something unforeseen happens, we are making some headway in fighting this pest. Practically all nests have been discovered between Middleton, Annapolis county, and Digby, Digby county, and the majority in the vicinity of Bear River, Digby county.—M. CUMMING, Secretary for Agriculture.'

In another letter, Prof. Cumming stated that he had received a number of nests from oak and other forest trees. For two years a bounty had been paid on every nest collected, but during the present year this was discontinued, and instead, as is stated by Prof. Cumming in a letter dated March 20: 'We have now got down to what might be termed house to house work, which is being done by graduates of our own college.'

Mr. Gibson deserves great credit for the hearty enthusiasm he has thrown into this work and for the patient and thorough examination he has made of an enormous amount of material.

EXPERIMENTS WITH HYDROCYANIC ACID GAS TO KILL THE LARVÆ OF THE BROWN-TAIL MOTH.

(By Arthur Gibson, Chief Assistant, Division of Entomology and Botany.)

In order to test the value of fumigation with hydrocyanic acid gas, to kill the caterpillars of the Brown-tail Moth, the following experiments were conducted:—

February 26, 1909.—Two nests on pear seedlings, which had been put in a large wide-mouthed glass jar, with cheese-cloth covering, were fumigated at the same strength as is used in the federal fumigation stations, viz.: 1 ounce of cyanide of potassium, 1 ounce of sulphuric acid and 3 ounces of water, to every 100 cubic feet of air space. The fumigation box which was used is 4 feet high, 4 feet wide and 8 feet long = 128 cubic feet. The amounts of chemicals used were 1¼ ounces cyanide of potassium, 1¼ ounces sulphuric acid and 3¾ ounces of water. The nests were exposed to the gas for 45 minutes, and afterwards when opened and examined the larvæ were all found to be alive.

February 27.—Two different nests on pear fumigated. Chemicals used: 2 ounces of cyanide of potassium, 2 ounces of sulphuric acid and 4½ ounces of water, for the 128 cubic feet in box. Exposure 55 minutes; no larvæ killed.

March 2.—The two nests fumigated on February 27 were again submitted to the same strength, but the exposure was for 45 minutes. A few caterpillars had emerged from the nests and were on the outside of the same. Result: none killed.

March 12.—The same two nests were fumigated a third time. The strength was increased to 2½ ounces of cyanide of potassium, 2½ ounces of sulphuric acid and 7½ ounces of water to the 128 cubic feet of space. The exposure too, was lengthened to one hour. Many of the caterpillars had left the nests and were resting on the sides of the jar. One small parasite was found alive in the jar, just before the fumigation took place. This, of course, had not been affected by the two previous fumigations to which these nests were subjected. Result: thirty dead larvæ in the jar after the fumigation, which was about one-fourth of the number of living caterpillars which had occupied the nests.

March 15.—The remaining larvæ in the same two nests were fumigated a fourth time. The strength used was the same as on March 12, but the exposure was lengthened to two hours. Many of the caterpillars were active on the sides of the jar. Result: only twelve dead, although several others were apparently without much life.

March 16.—The balance of the larvæ in these two nests were fumigated a fifth time. The strength was the same as on March 12, but the exposure was lengthened to three hours. The larvæ were active in the jar before the fumigation. Result: 32 larvæ were found the following day to be dead, but the larger number were still alive.

March 18.—Two new nests on pear were fumigated at a strength of 3¾ ounces of cyanide of potassium, 3¾ ounces of sulphuric acid and 11¼ ounces of water to the 128 cubic feet of space. This is three times the strength used in the federal fumigation houses for the destruction of the San José Scale on stock imported into Canada under the San José Scale Act. These two nests had been kept in cold storage until the day previous, and on bringing them into a warm office the larvæ soon began to leave the nests, and by the time the fumigation took place, by far the larger number of the caterpillars had emerged. The fumigation lasted for one hour. Result: only 18 larvæ dead.

On March 19 it was discovered that the chamber was leaking somewhat. It was at once tightened with new felt.

March 22.—The larvæ from the two nests fumigated on March 18 were again submitted to the same strength, but the exposure was lengthened to two hours. Result: about 30 larvæ killed, the balance active.

March 29.—Other larvæ, not previously fumigated, but many of which had been out of the nests for a considerable time, were exposed to the same strength of gas, and length of time, as those fumigated on March 22. In this jar there were 55 living larvæ. At first it was thought that 50 of these had been killed, but a later examination showed that only 37 were dead and that the rest were reviving.

The above experiments, although not very extensive, go to show that fumigation with hydrocyanic acid gas evidently cannot be relied upon as a practical remedy for this insect when in its winter condition. At the above strengths, even when the fumigation chamber was tightened, only a very small percentage of larvæ which had left the nests were killed. It would certainly require considerably greater strength and much longer exposure to kill the larvæ when within the nests, and, owing to the tough, closely-woven nature of these nests, the outcome would be very doubtful.

The following notes on some of the more important injurious insects of the past year have been compiled by Mr. Arthur Gibson, Chief Assistant, mainly from memoranda gathered by the Division of Entomology and Botany prior to the decease of the late head of the Division, Dr. James Fletcher.

THE CHIEF INJURIOUS INSECTS OF 1908.

INSECTS INJURIOUS TO CEREAL AND OTHER FIELD CROPS.

(By Arthur Gibson, Chief Assistant.)

During the season of 1908 very few of the well-known insect enemies of grain crops were injuriously abundant.

THE HESSIAN FLY, *Mayetiola destructor,* Say.—From Manitoba a single report came to the Division of injury by this insect. The only occurrence in Ontario which came under our notice was of a rather important outbreak which occurred in some wheat fields near Ottawa. Plants were noticed to be infested about the end of May, and in some places the attack was quite serious. In fields where the soil was poor and where the unfavourable weather conditions had weakened the plants, probably as many as fifty per cent were infested by the Hessian Fly. In other fields where the soil was better, the plants were stronger and better able to withstand the unfavourable conditions of the season, and in these fields the loss from Hessian Fly would amount to about five per cent. From collected material, both sexes of the flies emerged on June

20, 22 and 23. Prof. Bethune reports that this insect was present in 1908 in injurious numbers, affecting winter wheat, in the counties of Norfolk, Brant and Essex in the Niagara district. The postponement of the time of seeding of fall wheat, until towards the end of September, has proved to be an important preventive remedy. By that time the flies of the second brood will have emerged and be dead. Care should be taken, of course, to prepare the land as well as possible for the crop, and it will also be a good plan to sow strips of wheat in August, in periods of excessive abundance, which should be ploughed under before the middle of September to kill all the contained larvæ. Land in which infested wheat has been growing should be put into another crop the following year.

THE WHEAT JOINT WORM, *Isosoma tritici*, Fitch.—In some parts of western Ontario this insect was present in considerable numbers. One correspondent, Mr. Sydney Cooper, of Mull, Ont., reports as follows:—

'September 3, 1908. As requested, I send you the wheat plants injured by the Joint Worm. On further investigation I find that the country for miles around has the Joint Worm in the wheat. Our thresher is quite observant, and he says that he has not threshed one crop as yet which is free of it. He also states that in one instance, as the sun was shining on a bin of wheat, it had the appearance of moving, the insects were so thick.'

The adult insect is a true fly, with only two wings. It is very small, about one-tenth of an inch long, jet black in colour, with pale legs. The females pierce the straw and lay from six to twelve eggs inside its tissues. These eggs hatch into very small, slender, footless grubs, of a pale yellow colour, which when mature are about one-eighth of an inch in length. As the young grubs grow they cause a distortion of the stems a little above the first or second joints from the roots. Most of the grubs pass the winter inside of the galls or swellings, but a few transform and appear as flies in late autumn.

The following recommendations are taken from Bulletin 52, by the late Dr. Fletcher:—

'There is apparently only one brood of the Joint Worms in Canada; and, as they pass the winter in the straw, for the most part so near to the ground that a large proportion of the larvæ are in the stubble left on the fields, they can be largely reduced in numbers by burning over the stubble or by ploughing it down deeply. The broken off hardened pieces of straw which become separated in threshing and cleaning should be carefully gathered and burnt. Sometimes no apparent galls are formed, merely slight swellings with a hard, thickened condition of the straws representing the galls. These portions break off in threshing, and many are carried through with the grain. Straw from an infested crop should be got out of the way, either by feeding or burning before the ensuing spring.'

A regular short rotation of crops, while reducing the number of bad weeds and preventing them from increasing, will also do much to reduce the numbers of the Joint Worms. All recorded occurrences of Joint Worms in Canada have been of short duration.

THE CHINCH BUG, *Blissus leucopterus* Say.—Occasional records in Canada of this very destructive insect have been made, but fortunately no serious outbreak has, as yet, occurred, within the Dominion. In September, 1908, specimens of an insect were sent to the Division from Mr. R. Benedict, of Crowland, Ont., with the statement that it had destroyed all the late oats in his district. The oats, he said, turned white just after they had headed out, and thousands of the insects were on the ground. When the specimens were examined, it was at once seen that they were the well-known Chinch Bug, which has caused millions of dollars of loss to crops in a single year in the United States. Writing further, under date of October 5, Mr. Benedict says: 'With regard to the Chinch Bug, I may say that the insects did practically no damage except to the late oats, of which, owing to the late season, there was quite a large acreage. The damage was general over the county of Welland.'

Prof. F. M. Webster, of the Bureau of Entomology, Washington, D.C., who is one of the leading American economic entomologists, and a high authority on insects affecting cereals, writes, in the Annual Report of the Entomological Society of Ontario, for 1898: 'While the Chinch Bug, in all probability originally a neo-tropical species, has as you know, spread northward over a portion of the Dominion of Canada, and while it has not as yet been known to depredate upon your crops to any noticeable degree, yet it may do so in the future, in which case it may be expected to first make its presence known in your timothy meadows rather than in your grain fields, and quite likely will work considerable injury before it is recognized by your agriculturists.'

The Chinch Bug when mature is about one-fifth of an inch long. It is blackish in colour, with conspicuous white wing-covers. In the immature form, the young bugs are mostly red, but the colour varies in the different stages. The winter is passed in the adult state. In the United States the mature insects hibernate in clumps of grass, under pieces of board, loose bark, stones, &c., and in the first warm days of spring appear again, pair, and the females soon begin to lay their eggs, according to most writers, either about or below the surface of the ground, among the roots of grass or grain. Prof. Webster says: 'It is more than likely that this varies with the condition, as the eggs are not infrequently found above ground about the bases of the plants, and even upon the leaves, though I have never found them there, but have often found them under the sheaths of grasses.' The eggs hatch in from two to three weeks. In most areas in North America, where the Chinch Bug is destructive, there are at least two broods, but in northeastern Ohio, which is just across the lake from the Canadian border, Prof. Webster doubted the occurrence of a second brood of young.

The Chinch Bug feeds on a number of different plants. It is recorded as feeding on all kinds of grain, several of the native grasses, as well as on broom-corn, sorghum, chicken-corn, rice, &c. In the western portions of the United States the damage is done chiefly to wheat, barley, rye and corn.

The remedies recommended for this insect are the cleaning up of all refuse in autumn which might serve as hibernating quarters for the adults; the making of deep furrows around infested fields at the time the insects migrate in which they can be killed by an application of kerosene emulsion; and the spraying of the outer edges of the fields with the same material when the insects are leaving one crop to attack another. If this latter is done it will stop the invasion for the time being and give the farmer a chance to plough another deep furrow along the edge of the field to be protected. The Chinch Bug is treated of very fully by Prof. F. M. Webster, in Bulletin No. 15, new series, of the Bureau of Entomology, Washington, D.C.

THE GRAIN APHIS, *Macrosiphum granaria* Kirby, which caused considerable alarm in the northwestern provinces in 1907, owing to the supposition that it was the so-called 'Green Bug,' was in 1908 very prevalent in many parts of Ontario and Quebec. Towards the end of August reports of its presence in large numbers began to come in, the complaints referring to its attacks on wheat. In his report, as Entomologist and Botanist, on the insects of the year 1907, the late Dr. Fletcher says: 'Unfortunately for the Grain Aphis there is no practical remedy which can be applied in a wholesale manner, but Prof. F. M. Webster, who has devoted much attention to the insects which attack grain crops, has constantly drawn attention to the great advantage of practising good agricultural methods in working land, such as the adoption of a regular rotation of crops, so as to keep up the fertility of the soil, and advises that care should be taken to sow grain at the best time to secure a vigorous growth, which will enable the plants to withstand the attacks of the aphis sufficiently long to allow the natural parasites which always sooner or later appear, to increase, so that the numbers of the plant lice may be reduced before serious injury is done to the grain plants.'

In 1908 it was noticed, in many places, that towards the end of the season, the parasites were present in large numbers and were quickly reducing the colonies of the aphis, but some reports say that they did not appear soon enough to prevent some damage.

THE CLOVER-SEED MIDGE, *Cecidomyia leguminicola* Lint.—During the past season the Clover-seed Midge has done serious damage in districts in Ontario, where clover is grown for seed. Many complaints have been received from farmers of the presence of the small, legless, pink maggots in their clover seed at threshing time, and some anxiety has been felt as to whether these would mature, and affect the crop of next year. In the samples received at the Central Experimental Farm, all the maggots were dead and shrivelled up.

The life-history and habits of this insect are well known. There are two broods in the season, corresponding with the two crops of clover seed. The eggs are laid in the forming flower heads of the clover; when these eggs hatch, the maggots penetrate the seed pods and destroy the seed. When the larvæ are full grown, about the end of June, they leave the clover-heads and enter a short distance into the ground, to change to pupæ. The perfect insects, forming the second brood, emerge from the ground, just as soon as the second crop of clover is coming into flower, and the females at once begin to lay their eggs amongst the forming blossoms. These eggs soon hatch, and about the time the seed is ripe the maggots leave the clover and enter the ground to pass the winter, whence they emerge again the next spring, just at the time the clover comes into flower.

Experience has taught farmers that the practice of feeding off their clover fields with cattle and sheep, until the beginning or middle of June, or cutting it before the 20th of that month, is the only way to secure an autumn crop of seed; thus the maggots of this first brood are destroyed by the cattle eating them, or they dry up with the clover hay which has been cut before they were mature enough to leave the heads of clover and go into the ground to pupate and change to the perfect insect, which is a small midge. If the clover is left standing in the fields till the end of June, a sufficient time elapses for this latter process to take place, and the perfect flies emerge again just in time to lay their eggs in the opening flowers of the second crop. In this way the seed of the second crop is destroyed, as well as that of the first.

As mentioned above, in all the samples of clover seed received last autumn and during early winter, the maggots were already dead and dried up; consequently there would be no advantage in destroying, by burning, such material. At threshing time, however, if the living maggots are noticed, it would be a good practice to have all screenings swept up and burned.

THE HOP FLEA-BEETLE, *Psylliodes punctulata* Melsh. —This insect in 1908 again did extensive injury to the hop plants in the large yards in British Columbia. During the last three years it has been estimated that this small black flea-beetle has destroyed fully three-fourths of the hops grown in British Columbia.

The following letters from the correspondence received by the late Dr. Fletcher show how extensive this outbreak was in 1908, in the large hop yards of Sir Arthur Stepney, at Agassiz, B.C.:—

'Vancouver, B.C., April 23.—The flea-beetles since my last visit (to Agassiz) two weeks ago have appeared in large numbers, and are now destroying the shoots of vines which are some five or six inches high. They are also in considerable numbers in the poles. Mr. Wilson showed me your letter to him, advising the spray of whale-oil soap, one pound in ten gallons of water. Fortunately we had a considerable supply of this on hand, and I immediately tried the solution advised by you, with most gratifying results. Outside of kerosene it is the only thing we have found so far that kills the beetle practically wholesale. I am much obliged, indeed, for your suggestion, as yesterday when I saw the results of our other experiments and the beetle covering such a large area, I was in despair. I think the remedy is just in time to save things. I have discovered that the beetles are not confined to the yard, having found a number in the wood adjoining and also on nettles and other plants nearby.—H. C. AKROYD.'

Mr. Akroyd was written to on May 9 as follows:—'I sincerely hope that the good effects of the whale-oil soap spraying continues. I am sorry I did not ask you to add to this wash 3 lbs. of arsenate of lead to each 40 gallons of wash. I cannot believe that this beetle is immune from the effects of that poison. I am really much interested in this experiment and am determined that we will control this beetle. The chief difficulty, I feel, is the occurrence of the beetle in the wood, which will mean frequent relays of the pest from that source. I believe the whale-oil soap will kill all the beetles it touches. The strength I advised of 1 lb. in 5 gallons of water (not 10 as you say in your letter), but if 1 in 10 answers so much the better, because it reduces both the cost and the risk of injury to the plants.—JAMES FLETCHER.'

'Vancouver, B.C., May 19.—At the present time the beetles have completely devastated the whole of our yard with the exception of some 20 acres which we are spraying daily. The spray suggested by you proves a great success, but it appears to us we are unable to keep pace with the beetles, for the vines are covered with new insects inside of 24 hours. We experimented in several ways with the whale-oil soap, but found your suggestion of 1 lb. to 5 gallons of water the best. We have not, however, found so far the arsenate of lead to be advantageous. We have been using it in the proportion of 1 lb. to 10 gallons of water. We have also been experimenting with a bucket of kerosene to 80 gallons of wash, but this also does not seem to have made any difference. The whale-oil soap we are using is made by the Royal Soap Company of this city, and guaranteed to be 80 per cent whale-oil. We have five sprayers—three of 45 gallons each and two of 90 gallons each—now in use on the yard, and we have been endeavouring to save a portion of the yard, which was badly damaged when we first commenced spraying. The only way I can see of saving the yard this year would have been by spraying with your solution every 24 hours when the shoots first appeared. Of course this would mean a very large outlay in horses and sprayers. Mr. Wilson has written me this morning stating that the Horst Company have abandoned all hope of any crop this year. I personally went over their yards about a week ago and found them practically devastated. I think I wrote you in my last letter that the beetle had completely eaten up all tomato plants in the district.—H. C. AKROYD.'

In a letter written early in July, Mr. Akroyd stated that the constant spraying of the vines with whale-oil soap and water had the effect of curling up the leaves and making them very brittle and tender. Spraying was tried with a slightly less proportion of the whale-oil soap than recommended, but it was found that with less strength it would not destroy the beetle. About the middle of July the beetles were reported to have gradually diminished in numbers and that very few were seen on the vines. Towards the end of the month the beetles had practically disappeared. In early September, Mr. Akroyd visited the hop yards, and reported that more beetles were then present but not in very large numbers. At that time coal-oil pans and tarred boards were being used to keep the beetle in check. The vines which were sprayed most extensively were reported by Mr. Akroyd, on September 4, to be bearing well, but the crop as a whole would be small.

Writing under date of May 28, Mr. Hulbert, of Sardis, B.C., reported that the Hop Flea-beetle was doing great damage in the hop yards in his district. He stated that he had been keeping his under control for several years by catching them on tarred sheets, which are placed under the vines, and as these are jarred lightly with a branch or light stick, the beetles fall off and adhere to the tar.

In a recent bulletin by Dr. F. H. Chittenden on this insect (Bulletin 66, part VI., Bureau of Entomology, Washington, D.C.), valuable information is given on its habits in British Columbia, data for which have been furnished by Mr. H. J. Quayle, of Whittier, Cal., who made studies on the life-history of the flea-beetle in British Columbia in July last. The beetle is a general feeder and besides the hop, is known to feed on rhubarb, beet, cucumber, turnip, radish, cabbage, mustard, potato, and red and white clover, as well as a number of weeds. The eggs, larvæ and pupæ of the insect were found by Mr. Quayle at a depth of from three to six inches from the surface of the ground, and, it is stated by him, that the larvæ apparently feed on the roots of the hop as well as upon other plants growing in the yard. Dr. Chittenden says: 'The abundance of the beetles when they appear early in the season on young plants, their constant reappearance, and the constant new growth of the plants from day to day, make it difficult to apply direct remedies with more than temporary benefit. Where the hops are sprayed with kerosene emulsion or whale-oil soap for the hop aphis the numbers of the beetles are lessened. Among measures which give promise of value are the institution of clean methods of cultivation, including deep fall ploughing, treating hop poles in such manner as to prevent the beetles from hibernating in them, and clearing all remnants from fields so as to leave them as bare as possible to prevent the beetles from sheltering there in winter. Arsenate of lead, Paris green, kerosene emulsion, whale-oil soap and Bordeaux mixture should receive further tests, as should the employment of trap crops.' With regard to the trap crops, as the beetle is particularly fond of rhubarb, it is suggested in the above bulletin that this plant be grown 'between rows, *e.g.* in the vicinity of woods, as an attraction, or lure, for the beetles, it being believed that the beetles will concentrate on these plants and thus give the crops an opportunity to grow to a sufficient height and strength to be able to resist the ravages of the pest.'

INSECTS INJURIOUS TO ROOTS AND VEGETABLES.

These crops were affected to a considerable extent by insects during 1908. The season in most districts was a remarkable one, owing to the long continued drought. At Ottawa the months of June, July, August and September were particularly dry, the rainfall from the end of May till the beginning of October being only 6·80 inches. Roots and vegetables consequently suffered severely from this cause and from attacks of various insects. Wire-worms were prevalent in land which had been in sod and which had just been used for potatoes. The Striped Cucumber Beetle was reported as being destructive in western Ontario. The Turnip Flea Beetle was very troublesome in many gardens. These small, very active, shining beetles did much harm to young turnips and were also very destructive to the first sowings of radishes. Root maggots were more abundant than in 1907. Plant lice were much in evidence during the season. Towards the end of the summer, Swede turnips, cabbages and cauliflowers were attacked in many districts by the Turnip and Cabbage Aphis. At Ottawa, early in October, celery plants were severely injured by plant lice and many rendered useless.

THE SMALL WHITE CABBAGE BUTTERFLY, *Pontia rapæ* L.—This well-known enemy of market gardeners has been much inquired about. Its injuries during the past season have been prevalent throughout Ontario, Quebec and New Brunswick. The velvety green caterpillars, are about an inch long, with a broken yellow line along each side, and an unbroken one down the middle of the back. At first they eat the outside leaves, but eventually bore right into the head of the cabbage. As soon as the first appearance of the caterpillars is noticed, the plants should be dusted with pyrethrum insect powder, 1 lb. in 4 lbs. of cheap flour, after the whole has been mixed together and kept in a tight jar for 24 hours. As this remedy is so simple and has been recommended so often the annual loss by this insect should not be allowed to take place.

CUTWORMS.—Early in the season, cutworms, as usual, were present in injurious numbers in many districts throughout the Dominion. Reports of serious injury by these caterpillars came from British Columbia, but as no specimens were received, it was impossible to say with certainty what the species was which was at work.

'Peachland, B.C., May 28, 1908.—I have a lot of garden stuff this spring and the cutworms are devouring everything. Thousands of tomato and other plants have been cut. Where the land is kept cultivated and no other crops growing between the peach trees, they are climbing the trees.—H. W. CRAWLEY.'

'Peachland, B.C., June 20.—The cutworms here have caused a loss of thousands of dollars in seeds and plants and labour, not counting the loss of the season's crops of such things as tomatoes, cucumbers, melons, &c. Young fruit trees have suffered; rhubarb, onions, strawberries, in fact everything is attacked by them.—H. W. CRAWLEY.'

In Ontario the Dark-sided Cutworm, *Paragrotis messoria* Harr. and the Red-backed Cutworm, *P. ochrogaster* Gn. were responsible for most of the damage. The Greasy Cutworm, *Agrotis ypsilon* Rott. was locally injurious in fields of corn, as was also the Glassy Cutworm, *Hadena devastatrix* Brace.

The most effective remedy against cutworms is the poisoned bran which has lately come into such wide use. This 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 or molasses. After mixing thoroughly, add the Paris green by dusting it on the surface and stirring all the time. 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 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 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 rather dry, and then distribute it by means of a Planet Jr. or other wheel seeder. In field practice, among such close growing crops as standing grain, the poisoned bran is also serviceable. The mixture can be distributed by means of a paddle or shingle, and can be thrown easily to a distance of 20 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. Strange to say, the cutworms will devour the poisoned bran in preference to the growing plants.

THE APPLE LEAF-HOPPER, *Empoasca mali* LeB.—In eastern Ontario and Quebec, the ravages of the Apple Leaf-hopper, to potatoes, beans and many other kinds of plants, were very serious; in fact, this outbreak was one of the most important of the year. This insect, which is very small, slender, pale greenish, about one-eighth of an inch long when mature, is closely allied to the Thrip, which commonly attacks the Virginian Creeper and causes the leaves to dry up and fall about the beginning of August.

The Apple Leaf-hopper began to make its presence apparent towards the end of June, by causing the leaves of the attacked plants to curl up and turn brown. The injury is done by thousands of these small insects, sucking the juices from the leaves and stems of the plant, which very soon blackens and fades. Some correspondents have thought that the injury to potatoes was due to the ravages of the well-known Potato Blight, a fungous disease, and have been surprised that the standard remedy for that disease, viz.: spraying the foliage with Bordeaux mixture, had not had the desired effect of stopping the injury. The young leaf-hoppers do not get their wings for some time after they hatch from the egg. It is during this stage that most of the harm is done, and this is the only time when a remedy can be applied with much success. As they are sucking insects, something which will kill by merely coming into contact with their bodies must be used, such as whale-oil soap, one pound in five gallons of water, or the ordinary kerosene emulsion. Potatoes which were sprayed with both of these mixtures early in July, before the young leaf-hoppers had acquired their wings, were freed from the pest and not since injured to any appreciable extent. As these insects feed on the lower side of the leaves, it is necessary, in order to reach them with a spray, to attach the nozzle to a short joint of pipe about a foot long, having an angle of about 45 degrees in it. This can be made by any blacksmith. The severity of the outbreak of this insect in 1908, was doubtless much aggravated by the exceptional drought and heat which weakened the plants and made them more than usually susceptible to injury by the Apple Leaf-hopper and other insects.

The following letters will give some idea of the extent of the injury done by the Apple Leaf-hopper.

'Aultsville, Ont., July 30, 1908.—The potato crop in this vicinity is attacked by a very small green fly, which is present in enormous numbers and doing much damage. They appear to work under the leaf, with the result that the leaves curl up and finally die.—JOHN H. CROIL.'

'Almonte, Ont., July 30.—I send a sample of some of our potato tops. Is it a blight, or is it a trouble caused by the extreme heat? The trouble appears to effect the older leaves first in most cases, as there will be more or less appearance of it near the base of the stalk while the top is very thrifty and green.—J. K. DARLING.'

The potato tops were carefully examined on arrival, and they showed the injury caused by the Apple Leaf-hopper.

'Ottawa, Ont., July 30.—A little green fly is killing our scarlet runner beans. Please tell me what will destroy it.—A. R. RALPH.'

'Perth, Ont., August 1.—The potatoes in this vicinity are badly infested with a small green insect. We should like to get some information concerning this pest.—R. S. HAMER.'

'Lakefield, Ont., August 31.—I am writing in reference to the widespread failure of the potato crop in our county—Peterborough. The weather has been favourable, though rather dry in August. The potato beetle has been kept in check, and in some cases plants have been sprayed with Bordeaux mixture, but the tops have withered and the tubers are small. On a visit to Bobcaygeon, I found the same conditions there. One grower here says that the plants have been destroyed by little green bugs. —A. W. MACKENZIE.'

Reports of great damage to potatoes and other vegetables were received from other points in Ontario and Quebec. Mr. Harold Jones, of Maitland, Ont., called at the Division on August 22, and reported that the leaf-hopper was very bad on potatoes in his district. He gave an instance of where nine potatoes only were gathered from nine hills. The presence of this insect in injurious numbers was also reported from northern points in New York State.

THE DESTRUCTIVE PEA APHIS, *Nectarophora pisi*, Kalt.—Early in August reports were received from correspondents in Ontario and Quebec of serious injury to the pea crop by a large green aphis, which suddenly appeared in enormous numbers. From specimens received, and from an investigation in the Ottawa district, it was soon seen that the insect at work was the destructive Pea Aphis. This plant-louse is pale green, with legs darkened, particularly at the joints, and has long honey tubes. It clusters in enormous numbers at the tips of the shoots, beneath the leaves, and, when very numerous, spreads over the whole plants of field peas, as well as upon the flowering Sweet Peas. These insects, as already mentioned, appear suddenly in large numbers, and very soon kill the plants by sucking their sap. The winged specimens are rather large for plant lice, being about one-eighth of an inch in length, with a wing expanse of nearly one-quarter of an inch.

'Lysander, Que., August 7, 1908.—I send specimens of a pale green insect which are covering my field peas. The plants are turning red and are withering up.—T. W. LONGMOOR.'

'Bedford Park, Ont., August 3.—A green insect has appeared on the pea crop in this neighbourhood. Some of the farmers are weeping and wailing because they are going to lose their pea crop. There are myriads of this insect in this district.—SAMUEL WICKS.'

'Vars, Ont., August 5.—I am sending you a portion of a pea vine which is infested with a small green insect. This insect is playing havoc with the pea crop in some sections. My peas are being destroyed by this insect and some of the neighbours' peas are also affected.—D. N. JOHNSTONE.'

'Plainville, Ont., August 6.—Please find inclosed a specimen of louse that is attacking peas to such an extent that many fields will be scarcely worth harvesting. Will you have the kindness to give their history? Are they likely to continue for a number of years, and will it be safe to sow peas next year? While playing havoc with later peas, they did not attack the early peas.—W. J. WESTINGTON, President, Farmers' Institute.'

In reply to the above, Mr. Westington was informed that the Destructive Pea Aphis was this year being attacked by several important parasites, and owing to this, the injury was being stopped. As to whether it will be safe to sow peas again next year, it was pointed out that this would depend upon the amount of destruction wrought, generally, on the plant lice by the parasites during the autumn. In the last outbreak, in 1889 and 1900, the attack lasted for two years, but it stopped suddenly, just as it began, and in 1901, not a specimen of the insect was seen.

'Freeman, Ont., August 10.—You will be interested in knowing that we have an outbreak of aphis in the pea fields about here. In most cases the little green lice are so plentiful that no portion of the crop is spared.—GEO. E. FISHER.'

'Shawville, Que., August 31.—I have a large field of peas which has been destroyed by a large green louse. They do not eat the leaf, but suck all the substance out of the vines, and the plants dry up. The peas were a pretty heavy crop. Would like to know what this insect is and the cure, as my crop is a total failure. My neighbour's peas are also affected.—ANDREW SLY.'

In the Ottawa district the Destructive Pea Aphis was particularly noticed on Sweet Peas in gardens. From observations made after the middle of August, it was noticed that several kinds of parasites were busily at work, and that the plant-lice were thus being reduced rapidly in numbers. Lady-bird beetles and syrphus-flies were doing the larger share of this good work, but two other kinds of parasites which had never before been reared in the Division were present in considerable numbers. One of these belongs to the Cecidomyid genus *Aphidoletes*, the members of which are well known on account of their habits of preying upon aphids. The other was a small four-winged hymenopterous fly which proved to be an undescribed species, and which has since been described (Canadian Entomologist, March, 1909) as *Megorismus fletcheri* of Crawford.

Remedies.—In the report of the Entomologist and Botanist for 1899, the late Dr. Fletcher wrote as follows:—'When an insect appears in such large numbers as the Destructive Pea Aphis did during the past season, and increases with such rapidity, it is evident that it would be impossible to apply any remedy over such a large acreage as was simultaneously attacked, in most places where the insect occurs; but upon green peas and the flowering Sweet Peas in garden, the ordinary remedies used against other plant lice were found to be quite effective against this one also. Upon the Central Experimental Farm the Horticulturist had the plants sprayed with a tobacco and soap wash made of ten pounds of tobacco leaves in half a barrel of water, the liquid from which was strained off after a few hours, and two pounds of whale-oil soap were added. When the soap was all dissolved water was added to make forty gallons, and the liquid was then applied with a spraying pump. Most of the plant lice were found to be dead two days afterwards, and on such parts of the rows as received two applications, the vines were quite cleared of the insects.'

In his report for 1901, in speaking of the work of the late Prof. Johnson, he says: 'Many remedies were experimented with by Prof. Johnson, and it was found that what he has called the "brush and cultivator method" was the most effective remedy. For this it is necessary that the peas should be planted in rows, and when the insects are noticed the vines are brushed backward and forward with a good pine switch, in front of an Iron Age cultivator, drawn by a single horse. In this manner the plant lice which leave the vines quickly when these are shaken were covered up as soon as they fell to the ground, and a large proportion of them destroyed. The operation was not repeated until the third day, as it usually required over 48 hours to destroy the insects when covered with earth. All the practical methods were tried, and it was found that the brush and cultivator method was the most effective. Another method which was tried with considerable success, consisted of a brush which dislodged the insects so that they fell into a pan containing coal oil and water drawn between the rows of peas. In this way a bushel of plant lice were caught to each row of peas 125 rods long. Spraying was tested by a thorough trial upon 100 acres, and all sorts of insecticides for sucking insects were used, but this method was abandoned because no spray could be found which would destroy a large enough percentage of the insects to warrant the expense of the operation.'

Root Maggots.—These troublesome insects were much inquired about during 1908. From almost every province in the Dominion the complaints refer particularly to ravages to onions. In many instances, whole fields of onions were destroyed. In British Columbia the maggots were still at work when the onions were taken up in autumn. Cabbages, cauliflowers and radishes were also much injured.

As these insects are so often inquired about, it has been thought wise to repeat here what the late Dr. Fletcher says in his Bulletin No. 52 of the Dominion Experimental Farms series.

'The Cabbage or Radish Maggot, and the Onion Maggot, which for all practical purposes may be treated of here as the same species, cause great loss in crops of cauliflowers, early cabbages, turnips, radishes and onions, almost every season.

'The maggots which are found attacking cabbages, radishes, cauliflowers and turnips, and those in onions, and in beans and corn, are very similar, but they belong to three different species, *Phorbia brassicæ,* Bouché, attacking plants of the cabbage family, *Phorbia ceparum,* Meig., infesting onions, and *Phorbia fusciceps,* Zett., injuring beans and corn.

'Corn sown during a cold, wet period by which germination is unduly delayed, is very liable to be attacked by the Corn-seed Maggot (*P. fusciceps*). In such cases it is well to wait for warm weather to re-sow and then push on the crop with a light dressing of nitrate of soda, ·200 lbs. to the acre.

'The perfect flies of all these maggots are very similar to the ordinary observer and may be described as slender flies, somewhat smaller than the ordinary house fly, which fly about close to the ground and lay their white eggs on the stems of the young plants. Here after a few days the maggots hatch and work their way down beneath the soil, where they lie close to the root or burrow into it, tearing the tissues with their hook-like mandibles and living on the sap, thus soon reducing the root or stem to a rotten mass. When full grown these maggots turn to reddish brown puparia in the soil close to the roots. The exact number of broods of these maggots which may be found in a season seems to be rather complicated by the overlapping of broods, and the delay in issuing of some individuals of each brood; but practically it may be said that cabbage and radish maggots do by far the greatest amount of harm during the month of June, and early in July, and in many years their injuries are slight after that period. With onions the injury continues throughout the season and is most noticeable in June, August and September. The injury to beans and Indian corn is only in spring, and, as a rule, is confined to plants which have been weakened by the seeds being planted too deeply or by late frosts. However, in seasons of excessive abundance cabbage and onion maggots may be found all through the growing season, and cabbages and cauliflowers are occasionally injured in autumn by the maggots attacking the heads of the plants.

'*Remedies.*—Up to the present time it cannot be claimed that any perfectly efficacious remedy has been discovered for root maggots. In certain years they seem to be so extremely abundant that even the best remedies merely seem to prolong the lives of the plants, and only a very small proportion of a crop can be saved. In ordinary years, however, much can be done to protect crops liable to attack, and the following are the remedies which have given the best results:—

'For Onions.—White hellebore dusted along the rows once a week from the time the young plants appeared above the ground gave comparatively clean onions, very few being attacked. Fresh gas lime broadcasted over onion fields at the rate of two hundredweight to the acre had a similar effect; but, where the caustic lime came in contact with the young onions, they were burnt out. A light dressing, between the rows of onions, of the same material gave almost as good results as where it was distributed over the whole field. When onions have begun to form their bulbs, the earth may be hoed or brushed away right down to the roots, and in some years the maggots do not penetrate the bulbs. As soon as the earth is hoed away in garden practice, a dusting along the rows with white hellebore makes the protection more complete.

'Dressings of salt, Paris green and plaster and wood ashes have been found useless in protecting onions from the attacks of root maggots.

'For Cabbages.—(1.) Tarred Paper Disks.—Pieces of ordinary tarred paper three inches in diameter, with a slit running to the centre so as to allow of their being placed around the stems of young cabbages and cauliflowers at the time of planting, and pressed down close to the ground, will prevent to a large measure the flies from laying their eggs on plants so protected, or will kill the young maggots.

'(2.) Insect Powder.—About half a teacupful of a decoction of pyrethum insect powder (four ounces to a gallon of water), or of white hellebore of the same strength poured around the root of each plant, after drawing away the earth right down to the root, will destroy any maggots which may have started to work. The earth should be put back again and the plants well hilled up, when new rootlets will soon be formed. A light sprinkling of nitrate of soda or some special fertilizer will encourage a quick growth and much help the plants to overcome attack. Dressings of one ounce to the square yard may be used for this purpose. Cabbage plants should be examined late in June to see if the maggots are at work. The earlier the treatment with insect powder or white hellebore is applied the more effective it will be. If the mixture is applied to the roots with a force pump, although more liquid is consumed, it has the advantage of dislodging many of the maggots so that their injuries cease at once.'

'(3.) Cheese-cloth inclosures.—A very effective and practical means of procuring early radishes, cabbages and cauliflowers, perfectly free from root maggots, is by growing them beneath cheap frames made of light wood covered with cheese-cloth. A convenient size for small beds is 8 feet long, 2 feet wide and 2 feet high. This frame can be made for about 25 cents, of one and a half inch square wood, nailed together at the corners, and with the cheese-cloth tacked on the outside. In such a frame five cauliflowers and two rows of radishes have been grown to perfection. The frame was kept on from the time the young plants came up until the radishes were pulled.

'Cauliflowers were sufficiently advanced to require no further protection and the frames were removed about the first of August.

'For Radishes.—The maggot which attacks the radish is the same species as also attacks cabbages and turnips, the severity of attack on these different crops being about in the order in which they are named, so that in years of light attack radishes will draw off injury from the cabbages.

'Injuries to turnips are seldom severe, and in most instances a crop shows little sign of this attack in autumn, even in seasons when the maggots may have been found in considerable numbers in the spring.

'(1.) 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.

'(2.) White hellebore dusted along the rows of radishes once a week from the time they appear above the ground, has given good results in most years.

For Beans and Corn.—Injury to these crops in Canada is a rare occurrence. The only remedy which can be suggested, is to sow these crops in good season in well prepared soil and not deeper than one or two inches.'

During 1908, some experiments were conducted at the Central Experimental Farm with several mixtures in the hope of obtaining something more definite in the way of a practical remedy. The most encouraging results were obtained from a use of sulphate of iron, two ounces to every gallon of water, applications made a week apart from the time the onions appeared above ground.

INSECTS INJURIOUS TO FRUITS.

Among the insects which have been most destcurtive to fruits during 1908, the following may be mentioned:—

THE APPLE MAGGOT, *Rhagoletes pomonella* Walsh.—This insect continues to be prevalent in certain districts in Ontario and Quebec. During 1908, it was again present in injurious numbers at Como and one or two other points in Quebec province. In Ontario, in Prince Edward county, it was much inquired about and did serious damage in some orchards. Fortunately, when the Apple Maggot once gets into an orchard its spread is very slow. The mature flies apparently do not fly away to any distance for the purpose of egg-laying, but confine their attention to the trees nearest to the place from which they emerged. The female fly lays her eggs in the flesh of the apple, by means of her sharp ovipositor. A single female may lay from 300 to 400 eggs, according to Quaintance. The eggs hatch within a week, and the maggots become full-grown in from a month to six weeks. The maggot leaves the apple after this has fallen to the ground and enters the earth just below the surface, where it remains in the pupal stage until the following summer, when the fly emerges. As the larvæ do not leave the fruit until this has fallen to the ground, all windfalls should either be carefully gathered by hand or a herd of pigs should be allowed to run in the orchard from July, when early apples which are specially susceptible to attack begin to fall, until all fruit is gathered. Cattle and sheep are also useful for such a purpose, and if allowed to pasture in the orchard, for a while, when the fruit is falling, much good will be accomplished. If the windfalls are gathered and there is no stock to feed them to, they should be buried in a deep hole with not less than three feet of earth on the top. As the larvæ of the Apple Maggot work entirely within the apple, it cannot be reached by any of the poison sprays such as are used for insects which feed on foliage.

THE CODLING MOTH, *Carpocapsa pomonella* L.—This insect was again reported as being very destructive in many districts in Ontario and Quebec. Its injuries were most apparent of course in unsprayed orchards. Growers who had regularly sprayed their trees with the poisoned Bordeaux mixture were well repaid for their labours.

In Canada, east of Toronto, where there is usually only one annual brood, thorough spraying with the above mixture, three or four times in spring, the first application to be made within a day or two after the blossoms fall, and the subsequent sprayings, each ten days apart, is a satisfactory and well-paying remedy for the Codling Moth. West of Toronto there are two broods, the second of which is the more destructive. It has been found that in addition to the spring spraying, as above mentioned, it is there necessary to band the trees with burlap, sacking, or some other material which will form a refuge in which the caterpillars will spin their cocoons. These bands should be removed at short intervals of a week or ten days, after about the middle of July, at which time the caterpillars begin to spin their cocoons. The caterpillars within the cocoons found may be destroyed by passing the bandages through a clothes-wringer carried on a wheelbarrow. The bark beneath the band should be scraped with a wire brush to kill any of the caterpillars which may have burrowed into the bark.

The value of banding the trees has been demonstrated by many writers. In 1908, a small experiment was conducted in an apple orchard close to Ottawa, a part of which showed infestation by the Codling Moth. Twenty trees were banded on August 15. The bands were removed and examined on the following dates, with the results as mentioned:—

	Cocoons found.
August 31	129
September 8	24
" 15	49
" 23	60
" 30	24
October 7	8
" 15	12
" 23	13
" 30	1

The windfalls under these trees were left undisturbed until after the experiment ended.

The White-marked Tussock Moth, *Hemerocampa leucostigma* S. & A. and the Rusty Tussock Moth, *Notolophus antiqua* L.—A large number of inquiries were received from the Maritime Provinces, chiefly from Nova Scotia, regarding these insects. In most cases the letters were accompanied by the egg masses. Both of these species, particularly the former, have been abundant in orchards in the above provinces for the last few years, and have in some instances been the cause of considerable injury. The White-marked Tussock Moth is the more injurious and the better known of the two, chiefly from its injuries to ornamental trees. In Montreal, Toronto, Kingston and other Canadian cities it has attracted much attention from its attacks to shade trees, many being entirely denuded of their foliage by the caterpillars. These insects were treated of at some length in the late Dr. Fletcher's report for the year ending March 31, 1908. The egg masses of these two Tussock Moths are quite different in appearance. Those of the White-marked Tussock Moth are laid on or close to the cocoon from which the female moth emerged and are covered with a frothy white deposit, so that they cannot be seen without breaking up the mass. The eggs of the Rusty Tussock Moth having no such frothy covering, are bare and easily distinguishable.

The remedies for these insects are the collection of the egg masses before spring and the spraying of the trees with an arsenical poison as soon as the young caterpillars are noticed. Orchards that are regularly sprayed with the poisoned Bordeaux mixture will be kept free from the attacks of these and many other leaf-eating insects.

CANKERWORMS.—In 1908, Cankerworms did serious damage in many of the orchards in the Maritime Provinces. From Nova Scotia, particularly, many complaints were received of the prevalence of these insects, correspondents claiming that the injury had been very severe in many districts.

There are two kinds of caterpillars which attack apple trees, which are known as Cankerworms, viz., the Spring Cankerworm and the Autumn Cankerworm. The female moths of both kinds are wingless and have a very spider-like appearance. Those of the Spring Cankerworm appear chiefly in spring and lay oval, pearly-white eggs, in irregular masses, beneath flakes of bark, &c. The moths of the Autumn Cankerworm, on the other hand, appear late in the season (October and November), and the females lay eggs which are brown, flattened at the top, like miniature tumblers with caps on them, and stand close together in clusters of about 100 or more on the outside of the bark. The males are delicate moths, with gauzy wings. The caterpillars of both species are slender brown, blackish, or green loopers, or 'measuring worms,' about an inch in length when full grown, and with only six pairs of legs, three pairs of which are on the front part of the body, the other three pairs at the rear.

The young caterpillars appear about the time that the leafbuds open, and at that time the trees should be carefully examined, and, if any are found, the trees should at once be sprayed with an arsenical poison. When the caterpillars are small they are very easily killed by the ordinary poisoned Bordeaux mixture, or by Paris green 1 pound in 150 gallons of water, or arsenate of lead 3 pounds in 40 gallons of water. When they are more than half an inch long, however, they are very difficult to kill with any such poisons. At such times, Dr. Fletcher recommended as much as one pound of Paris green in 100 gallons of Bordeaux mixture, and that this latter should be made with five pounds of lime to the four pounds of copper sulphate in the 40 gallons of water.

As the female moths crawl up from the ground to deposit their eggs on the trees, all trees in orchards where the Cankerworms have been destructive should be banded in autumn and spring with one of the mechanical tree protectors, or the moths may be prevented from climbing by being caught on bands of thick paper which have been painted with an adhesive mixture, and tacked closely and firmly around the tree. A mixture of castor oil two pounds and resin three pounds has been found satisfactory for cold weather, but in hot weather it is necessary to add one more pound of resin. These ingredients are heated slowly until the resin is all melted and the mixture is then applied to the bands while it is warm. Another formula is five pounds of resin and three pounds of castor oil for warm weather and equal parts by weight for cold weather. As mentioned above, the most convenient way to apply these mixtures is to paint them on bands of thick paper, but they may be applied to the tree without injury to the latter. If this is done it is sometimes necessary to put on a second coating if too much of the oil is absorbed by the bark. Printers' ink five pounds, mixed with one gallon of fish oil, is also much used in Nova Scotia, and the amount mentioned will treat an acre of orchard.

The Chemical Division of the Dominion Experimental Farms recently carried on some experiments in the hope of finding a more economical adhesive material which could be used for such insects. Considerable progress was made, but the Chemist, Mr. Shutt, has informed us that this work is not yet far enough advanced to make a report upon. It is hoped, however, that when further experiments have been conducted, some useful deductions may be made.

THE PEAR LEAF BLISTER MITE, *Eriophyes pyri* Nalepa.—This old enemy of the pear is steadily spreading in the apple-growing districts of the southern portions of Ontario. It occurs in every part of Canada where the pear is grown, but it is only of late years that it has turned its attention to the apple, although in Europe it is well known to attack that tree. During 1908, it was much complained of, and information asked as to the best known remedy for its destruction.

The Pear-Leaf Blister Mite, as its name implies, is not on insect, but a mite. It is a microscopic creature, being only about 1/125 of an inch in length. Regarding the life habits of these mites, Prof. Parrott, of the New York Agricultural Experiment Station, says: 'The mites spend the winter in the buds usually under the second and third layers of bud-scales. They frequently collect in colonies of fifty or more in little depressions in the scales and are more or less concealed and protected by the pubescence of the buds. As the buds burst, the mites move to the unfolding leaves in which they burrow and establish new colonies. In October the mites abandon the leaves and hide in the buds.'

The irritation caused by the mites burrowing into the leaves from below, induces the growth of galls, or blisters. Within the blisters the eggs are laid; these hatch in a few days and the young mites feed upon the juices of the leaf. If the blisters are examined closely, tiny openings will be seen; these are made by the mites on entering and leaving the leaf. The chief injuries by the Blister Mite are to the leaves, but the fruit stems and fruit are often attacked. Prof. Lochhead in writing of this pest, in the Annual Report of the Fruit Growers' Association for 1908, says: 'The galls on pear leaves are at first greenish, then reddish, afterwards bright red, and finally with the death of the affected tissues, brown or black, often most conspicuous on the sides of the midrib. When the mites are very numerous the injuries produce defoliation of the trees. The colour of the galls on apple leaves is much less striking than that on pear leaves. The galls are usually more abundant on the margins of the leaves, and are at first greenish, soon becoming brownish, and only occasionally red. The coalescence or merging together of several of the galls produce irregular-shaped dead areas, which often rupture at the margin.' Quoting from Prof. Parrott, he says: 'About July first the most striking effects of the mites upon the leaves appear, especially if there is much yellowing of the foliage, as frequently occurs. Upon the upper surfaces of such leaves the mite-infested spots are of a light brown or of a dark green colour, and are uniformly brown beneath. These spots are thickly massed, forming a dark, broad band of irregular width along each side of the leaf, which contrasts conspicuously with the intervening light yellow area about the main rib. To one standing on the ground and viewing the leaves from beneath, this striping of the leaves is very suggestive of the variegated foliage of certain ornamental plants.'

The remedy for the Pear Leaf Blister Mite is to spray the trees with the lime-sulphur wash just as the buds are swelling. Although the mites pass the winter hidden away securely beneath the bud-scales, the expanding of the buds in spring opens the bud-scales sufficiently to allow the entrance of the spraying mixture.

DONATIONS TO COLLECTIONS OF INSECTS AND PLANTS.

Among the more important donations to the collections of insects and plants of the Division of Entomology and Botany, which have been made during the year ending March 31, 1909, the following may be mentioned:—

J. R. Anderson, Victoria, B.C. Pressed botanical specimens of *Delphinium menziesii*, and other interesting plants.

G. Chagnon, Montreal, Que. A fine specimen of the noctuid moth *Graphiphora furfurata*.

Norman Criddle, Treesbank, Man. Many specimens of rare Manitoban lepidoptera.

Horace Dawson, Hymers, Ont. Specimens of arctian and noctuid moths of special interest, taken at Hymers.

W. A. Dent, Sarnia, Ont. Seeds and living roots of *Dioscorea villosa*.

Rev. H. Dupret, Montreal. Fine specimens of *Chærophyllum sativum, Anthriscus cerefolium*, &c.

Miss B. Green, Fairview, B.C. Several pressed botanical specimens, including *Pedicularis langsdorffii*.

A. W. Hanham, Duncans, B.C. Four boxes containing collections of lepidoptera, coleoptera and hymenoptera, all in splendid condition, among which were many rare specimens.

Rev. J. H. Keen, Metlakatlah, B.C. A good series of the rare Byrrid, *Exoma pleuralis* and other insects.

W. Metcalfe, Ottawa. Diptera and other insects collected in Ontario.

Mrs. D. W. Stewart, Renfrew, Ont. A botanical sheet of *Medicago falcata.*

Rev. G. W. Taylor, Nanaimo, B.C. Many specimens of lepidoptera, coleoptera, hymenoptera and a named collection of neuropteroid insects, all from British Columbia.

Rev. Frere Victorin, Longueuil, Que. Pressed botanical specimens of *Rubus hispidus* and *Rubus permixtus.*

E. P. Venables, Vernon, B.C. Specimens of hemiptera and other insects from British Columbia.

J. B. Wallis, Winnipeg, Man. A fine series of *Catocala coccinata,* together with acceptable noctuids, and named specimens of neuropteroid insects.

Miss E. Maude Warren, Kelowna, B.C. Living plant of *Cypripedium occidentale* and botanical specimens of *Œnothera muricata, Potentilla camphorum,* and other plants for the herbarium.

C. H. Young, Ottawa. Beautifully mounted specimens of micro-lepidoptera, some of which have been only recently described.

THE APIARY.

The apiary is under the management of Mr. D. D. Gray, the farm foreman, whose report I append herewith. The practical work of handling and caring for the bees has been done by Mr. C. A. Burnside. It was thought best to reduce the number of colonies in the apiary during the year, and some of the strong and healthy ones were sold and the number on our stands was thus reduced to thirty-two.

REPORT OF APIARY FOR SEASON OF 1908-9.

I have to report a fairly successful year with the bees. The weather at the beginning of the season was much the same as in 1907—very wet and cold. The bees were put on their summer stands on April 24, coming from their winter quarters in good condition.

They were put in the bee cellar in the fall of 1907, weighing an average of 56·4 pounds each, and, when put out in spring of 1908, the weight was 38·6 pounds each, having lost an average of 17·8 pounds per colony during the winter, somewhat higher than most years. The first supers were put on on May 27 and the extractor was started on July 9.

An effort was made to retard swarming as much as possible; there was, however, an increase of ten swarms during the season, the first coming off on June 20.

The bees were put in the bee-cellar at the close of the season on November 6, all the colonies weighing over 50 pounds each.

An experiment was carried on during the winter to get some data as to the amount of air-space required to winter the colonies satisfactorily.

As there is yet practically a month before the bees go out, and this the most trying month of the year, nothing definite can be said at present as to the state of the colonies; all save one appear to be in good condition.

D. D. GRAY.

REPORT OF THE AGRICULTURIST.

J. H. GRISDALE, B. Agr.

Dr. William Saunders, C.M.G.,
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 very successful year in connection with live stock, but the crop returns in 1908 as in 1907 and 1906 fell very considerably below the average, due largely, as in the previous years, to an exceptionally dry summer. The reports of the returns from the different fields under cultivation attached hereto, indicate clearly the injurious effects of the dry weather upon all crops. The hay and corn crop although light in quantity were rather exceptionally good in quality. The roots and grain were both light and of inferior quality.

The work in my division was as usual carried on with the efficient co-operation of the farm foreman, Mr. D. D. Gray, and the herdsman, Mr. Wm. Gibson. Mr. Meilleur continues to do good work in the dairy. In correspondence and clerical work I am indebted to Mr. L. Giguere for careful and intelligent co-operation.

During the year I have attended a large number of meetings in various parts of Canada in addition to my regular duties on the Central Experimental Farm.

From April 1, 1908, to March 31, 1909, 2,789 letters were received and 3,524 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 (April 1, 1909) 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 work-horses, as well as experiments to determine the comparative values of different foods as forage for same.

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

Thirteen heavy horses of Clydesdale 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. The 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 barn at present are as follows:—

Twenty-seven Shorthorns, including 3 bulls and 24 females.

Thirty-four Ayrshires, including 7 bulls and 27 females.

Fifteen Guernseys, including 2 bulls and 13 females.

Twenty-six Canadians, including 4 bulls and 22 females.

GRADE CATTLE.

At present the grades number 23 head, made up of 2 Shorthorn grades, 5 Ayrshire grades, 8 Guernsey grades and 8 Canadian grades.

STEERS.

Thirty steers are under feed at present. They are of different ages and breeding, and the number is made up of: 18 yearlings, 12 calves.

SHEEP.

Sheep are not kept in large numbers, only 31 being now in the pens. Two breeds are kept, namely: Shropshire and Leicester.

There are 24 Shropshires, as follows: One aged ram, 1 ram lamb, 15 aged ewes and 7 shearling ewes.

There are 8 Leicesters, as follows: 5 ewes and 3 yearling ewes.

SWINE.

One hundred and thirty-six 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 38 in number, including: Two stock boars, 3 young boars and 33 breeding sows.

The Berkshires are 21 in number, including: Two stock boars, 13 breeding sows and six young pigs.

The Tamworths are 14, including: One stock boar, 1 young boar and 12 breeding sows.

Sixty-three feeders, different sizes and breeds.

HORSES.

There are usually 19 horses in the stables. These horses are expected to do the work in the various divisions 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 cereal divisions, as well as upon the lawns and in the arboretum. In addition a large amount of hauling or cartage in connection with the different divisions, as well as road-making and messenger service, takes up much of their time.

HORSE LABOUR.

During the year from April 1, 1908, to March 31, 1909, the work done by the 19 horses kept in the stables here was equivalent to 6,574·9 days' work, distributed as follows: Live stock, hauling feed, marketing stock, &c., 162·8 days; farm work '200-acre farm,' 867·1 days; draining and care of roads, including removing snow and breaking roads in winter, 156·1 days; manure on '200-acre farm,' 331·2 days; horticultural division, 722 days; lawns, &c., 152·5 days; cereal division, 732·4 days; bulletins and reports from and to farm offices, 44·1 days; poultry, 71 days; mail, including milk delivery, 153 days; omnibus service, including three horses for omnibus, two horses for general driving and horse for supervision of work, 2,467 days; work about greenhouse, outbuildings, sidewalks, exhibitions, &c., 715·7 days.

In estimating the cost of farming operations further on in this report, $3 a day is charged for team and driver. To feed and care for the horses, costs 32⅓ cents per horse per working day, and the driver receives an average of $1.72½ per 10-hour day. It is evident, therefore, that the team and driver costs $2.37⅛ per day, leaving a margin of 62⅝ cents, or 31⅓ cents, nearly, per horse per day for wear and tear.

DAIRY CATTLE.

The herd of dairy cattle during the year 1908-9 consisted of 49 milch cows, all told. They were:

Ayrshires	11
Guernseys	8
Canadians	11
Shorthorns	9
Grades (various breeding)	10

FEEDING THE DAIRY COWS.

The year 1908-9 has been probably the most trying year dairy farmers have experienced since dairying became one of the chief agricultural lines of effort in Eastern Canada. A very late spring was followed by a very dry summer, so that feed was scarce, not only all summer, but all crops being very light, winter feed also was far from plentiful. On this account dairy herds were materially reduced, going even below low-level mark set the previous autumn. Feed prices have remained very high. They have in fact ruled higher than for many years past.

SUMMER FEEDING.

As during the previous three years, the dairy cattle were allowed only a very small area for pasture. They depended very largely upon soiling crops and corn silage.

A regular succession of crops was planned to supply the necessary forage.

A fourteen acre field was available for pasture for 50 head. This field had been seeded down the previous year with the following mixture of seed per acre :—Red clover, 5 lbs.; alfalfa, 7 lbs.; timothy, 10 lbs.

This seeding made such a strong growth in late May and early June that it was decided to divide the field, pasture the cattle on one half and cut the other part for soiling purposes. This proved to be a very satisfactory plan and enabled us to materially increase the carrying power of the field.

For July, feeding provision had been made by sowing a mixture of peas and oats at the rate of 3 bushels per acre, equal parts of each by weight. For later feeding, corn was depended upon entirely. The fourteen acre field had yielded a good crop, but the dry summer did nothing to encourage growth in July, August and September. hence the pasture was merely an exercising ground. The hot dry summer affected the milk flow very seriously and milk was produced at a considerably higher cost per hundred pounds than usual.

WINTER FEEDING.

The winter feeding was carried on under much more favourable conditions. The new stable was in good shape, well ventilated and well lighted. Feed was scarce, but, in the case of ensilage, roots, straw and hay, of unusually good quality. Cattle came in rather low in flesh but, with normal amounts of the above feeds, soon improved and have seemed to require less meal or concentrated feed than usual to insure good results in the way of milk production.

The winter ration has been on the average about as follows:—

	Lbs.
Hay	5
Corn ensilage	30
Roots	10
Straw	4
Meal	7

The hay was mixed red clover and timothy. The corn silage was of good quality, rich in grain and well preserved.

The roots were mangels, sugar mangels, sugar beets and turnips. They were usually pulped and mixed with the ensilage.

The straw was of course oat, and was of extra good feeding quality, since there was a considerable percentage of green oats. It was cut and mixed with the pulped roots and ensilage.

The meal usually consisted of a mixture of 800 pounds bran, 300 pounds gluten and 200 pounds oil-cake meal.

The meal was scattered on the roughage mixture of roots, ensilage and cut straw after it was before the cattle. The hay given was fed uncut after the other material had been cleaned up.

Of course the amount of roughage fed depends on the appetite of the cow, the amount of meal is influenced rather by the amount of milk being produced by the cow in question.

Her meal ration is gradually increased after calving, until at three or four weeks in milk she is supposed to be on full feed. The amount of meal is judged by the milk produced. If she responds freely to increases in meal, she is fed the more liberally, usually up to that point where an increase in meal does not seem to induce a relatively liberal increase in milk flow. One pound of meal for four pounds of milk is liberal feeding; one pound of meal for three pounds of milk, to leave a profit, necessitates selling milk at a higher price than the average farmer may hope for. In this connection it may be observed that the quality or composition of the meal ration is usually an important factor affecting the milk yield. It is exceedingly important, however, to remember that palatability in the meal as well as in the roughage is an influence that is not infrequently underestimated. Variety in meals fed is advisable, but variety should mean a blending of meals, not a substitution of one for another at frequent intervals. To illustrate, it is much better to feed a mixture of bran, oats, barley, oil, meal, gluten, cotton seed meal, &c., than to feed any one of them for a time, to be subsequently replaced by some other.

Generally speaking, the meal ration for dairy cows should be rich in protein, palatable, easily digested and fairly finely ground, and blended to suit the roughage ration with which it is fed. Meals vary greatly as to composition and effect upon digestive organs of the cattle. While some are laxative, some are constipating in effect, and while some seem to develop appetite, others have the opposite effect.

INDIVIDUAL COW RECORDS.

The records which follow are rather lower than usual for the reasons already given that building operations interfered with the proper care of the herd. The butter is valued at 26 cents per pound. It was really sold at from 25 to 35 cents per pound.

Some of the cows suckled calves part of the time, hence did not make as good records as would otherwise have been the case.

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 1908, 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	20 00	per ton.
Gluten meal	28 00	"
Oil meal	32 00	"
Oats	25 00	"
Barley	22 00	"
Clover hay	7 00	"
Chaff	4 00	"
Roots and ensilage	2 00	"

In estimating the value of the product, 26 cents per pound is allowed for the butter and 20 cents per 100 pounds for the skim milk. The butter sells at from 25 to 35 cents per pound.

The Central Experimental Farm dairy herd records as given below, make only a moderate showing. No effort is being made just at present to get particularly large yields from the cattle, the aim being now to get some good breeding stock. As will be noted the pure-bred cows are being milked for rather shorter periods than usual. This is on account of their being bred to come in at as short intervals as possible.

Names of Cows.	Age.	Date of dropping last calf.	Number of days in milk.	Daily average yield in milk.	Total milk for period.	Per cent fat in milk.	Pounds butter produced in period.	Value of butter at 26 cts. per lb.	Value of skim milk at 20 cents per 100 lbs.	Total value of product.	Amount of meal eaten, valued at 1¼ cent per lb.	Amount of roots, ensilage eaten at $2 per ton.	Amount of hay, valued at $7 per ton.	Amount of straw, valued at 20 cents per cwt.	Months on pasture at $1 per month.	Total cost of feed for period.	Cost to produce 100 lbs. of milk.	Cost to produce 1 lb. butter, skim milk neglected.	Profit on 1 lb. of butter, skim milk neglected.	Profit on cow during period, labour neglected.
				Lbs.	Lbs.	%	Lbs.	$	$	$	Lbs.	Lbs.	Lbs.	Lbs.	Mos.	$	cts.	cts.	cts.	$
Marjorie..........(A.)	7	Jan. 22, '09	313	30·6	9,601	3·9	444·4	115 55	18 31	133 86	2,804	13,684	1,030	1,055	2·5	56 94	59·3	12·8	13·2	76 92
Illuminata 3rd.....(S.)	5	May 25, '08	312	30·1	9,401	3·4	376·4	97 86	18 04	115 90	2,454	11,411	772	932	2·5	49 14	52·2	13·0	13·0	66 76
Fortune d'Oka ...(C.)	12	" 9, '08	344	21·8	7,518	4·3	376·2	97 81	14 28	112 09	2,519	11,497	922	1,075	2·5	50 84	67 6	13·5	12·5	61 25
Inoquette........ (C.)	5	" 17, '09	330	21·2	7,001	4·5	374·7	97 42	13 25	110 67	2,515	11,407	922	1,075	2·5	50 70	72·4	13·5	12·5	59 97
Denty ....(A.)	10	Mar. 13, '09	277	27·0	7,495	4·0	350·6	91 15	14 29	105 44	2,422	11,810	912	1,075	2·5	49 93	66·0	14·0	12·0	55 51
Flavia............(A.)	7	Dec. 15, '07	365	21·2	7,745	3·7	351·0	91 26	14 78	106 04	2,610	11,528	922	1,075	2·5	51 52	65·5	14·6	11·4	54 52
Dolly...........(G.A.)	6	Mar. 26, '09	306	25·5	7,282	3·8	318·2	82 73	13 92	96 65	2,372	11,498	922	1,015	2·5	48 89	67·0	15·3	10·7	47 76
Alice...........(G.A.)	8	" 23, '08	365	20·8	7,614	3·6	325·0	84 50	14 57	99 07	2,643	10,428	922	1,075	2·5	51 32	67·3	15·8	10·2	47 75
Zamora..........(C.)	13	Feb. 16, '09	334	18·4	8,143	4·6	333·6	86 73	11 61	98 34	2,517	11,497	922	1,075	2·5	50 82	82·6	15·2	10·7	47 52
Queenie.........(G.G.)	11	Jan. 23, '09	305	13·1	3,995	6·4	300·0	78 00	7 39	85 39	1,480	11,618	938	1,097	2·5	38 10	95·6	12·3	13·7	47 29
Janet............ (S.)	9	Mar. 30, '08	306	21·3	6,525	4·4	336 4	87 46	12 37	99 23	2,614	13,444	922	1,111	2·5	54 05	83·0	16·0	10·0	45 78
Ottawa Itchen....(G.)	3	Nov. 17, '08	324	15·5	5,002	5·0	295·2	76 75	9 41	85 16	1,282	11,723	845	1,165	2·5	42 10	84·0	14·0	12·0	44 06
Deanie............(G.)	10	Jan. 1, '07	365	12·8	4,680	5·2	285·0	74 10	8 79	82 89	1,559	11,566	935	1,050	2·5	38 92	83·0	13·3	12·7	43 97
Alma ....(G.G.)	8	July 14, '08	336	16·4	5,506	4·7	302·0	78 52	10 40	88 92	2,146	11,607	922	1,075	2·5	46 29	84·0	15·3	10·7	42 63
Maggie...........(A.)	11	" 1, '08	294	21·8	6,421	4·4	277·3	72 09	12 17	84 26	2,013	11,497	922	1,075	2·5	44 53	69·0	12·5	13·5	39 73
Pearl. ....(G.)	8	Aug. 9, '08	232	16·5	3,814	5·0	226·0	68 76	7 17	75 93	1,731	8,464	636	792	2·5	36 40	95.4	16·0	10·0	39 53
Ottawa Spot .....(G.)	4	Jan. 14, '09	344	15·0	5,168	4·5	271·7	70 72	9 69	80 41	1,741	11,618	938	1,075	2·5	41 31	73·6	15·2	10·8	39 10
Dora .... (G.G.)	6	June 14, '08	264	15 0	3,993	5·4	254·0	66 04	7 47	73 51	1,668	8,654	648	813	2·5	35 88	90·0	14·0	12·0	37 63
Marjorie II.......(A.)	3	Sept. 12, '08	197	21·0	4,266	4·3	204·0	53 04	8 40	61 44	1,524	5,364	622	813	.... .	28 21	65·8	13·8	12·2	33 23
Itchen Lady......(G.)	11	Dec. 30, '08	263	17·0	4,485	4·7	246·3	64 05	8 48	72 53	1,726	11,845	948	960	2·5	40 15	89·5	16·3	9·7	32 98
Molly II......... (S.)	7	April 9, '08	304	20·4	6,224	3·8	276·7	71 76	11 89	83 65	2,535	13,438	922	987	2·5	52 81	84·8	19·0	7·0	30 84
Ottawa Lass.......(S.)	7	June 10, '08	309	19·4	5,990	3·8	269·4	70 04	11 44	81 48	2,436	12,830	922	981	2·5	50 96	85·0	19·0	7·0	30 52
Maggie V.........(A.)	3	" 12, '08	289	17·0	4,800	4·1	232·0	60 32	9 13	69 45	1,429	8,701	648	831	2·5	39 23	81·7	17·0	9·0	30 22
La Belle. ....(C.)	4	March 9, '09	306	17·0	5,225	4·4	273·2	71 03	9 90	80 93	7,511	11,553	922	1,075	2·5	50 85	97·3	18·4	7·6	30 08
Fannie.........(G.C.)	4	Jan. 15, '09	333	16·0	5,267	4·1	266·7	69 34	10 00	79 34	2,547	11,532	922	1,075	2·5	51 24	97·5	19·0	7·0	28 10
Whitie..........(G.S.)	5	Mar. 20, '08	2[illegible]5	21·2	5,847	3·6	248·0	69 28	11 19	75 67	2,406	11,364	772	955	2·5	48 54	83·0	19·5	6·5	27 13
Soncy of Nappan..(A.)	3	" 19, '09	3[illegible]8	15·1	4,958	3·8	216·7	56 34	9 41	65 75	1,620	11,617	938	1,075	2·5	39 78	82·0	18·2	7·8	26 07
Poupee ....(C.)	6	Feb. 2, '09	255	16·3	4,160	4·6	224·0	58 24	7 87	66 11	1,672	11,681	922	1,075	2·5	40 45	97·2	18·0	8·0	25 66
Ottawa Marchioness II (S).	4	Jan. 8, '09	333	13·6	4,572	3 7	214·0	55 64	8 71	64 35	1,641	12,140	938	1,075	2·5	40 57	89·0	19·0	7·0	23 78
Flavia II.........(A)	3	Oct. 16, '08	169	22·0	3,732	3·7	167·0	43 42	7 13	50 55	1,337	7,614	532	813	....	27 80	74·4	16·6	9·4	22 75
Denty III.........(A)	4	July 7, '08	324	14·5	4,695	4·2	231·5	60 19	8 92	69 11	2,168	11,498	922	1,075	2·5	46 47	99·0	20·0	6·0	22 64
Pea ly Prize.......(G)	4	Feb. 14, '09	297	15·0	3,695	5·0	215 4	56 00	6 96	62 96	1,736	11,547	938	1,154	2·5	41 34	112·0	19·0	7·0	21 62
Pearl's Redemption(G)	4	Dec. 27, '08	304	13·2	4,027	4·6	219·0	56 94	7 61	64 55	1,942	11,618	938	1,054	2·5	43 78	108·0	20·0	6·0	20 77

Bellflower........(GG)	10	June 18, '08	280	15·0	4,219	4·0	198·0	51 48	8 04	59 52	2,101	8,154	648	825	2·5	40 82	97·0	20·6	5·04	18 70
Duchesse II........(C)	4	Mar. 26, '09	239	16·8	3,824	4·1	185·0	48 10	7 39	55 49	1,799	11,367	922	1,053	2·5	41 68	109·0	22·0	4·0	13 81
Ruby..............(G)	11	Mar. 15, '09	223	13·5	3,026	4·9	174·5	45 37	5 75	51 12	1,473	11,606	934	1,050	2·5	37 87	120·0	24·0	2·0	13 25
Zaza..............(C)	3	Oct. 2, '08	182	14·3	2,167	4·4	137 0	35 62	4 96	40 58	1,405	7,614	532	813	......	28 66	109·0	20·9	5·1	11 92
Alma II.........(GG)	3	Oct. 26, '08	179	13·0	2,312	4.7	130·0	33 80	4 36	38 16	1,295	7,509	535	813	.....	27 48	118·0	21·1	4·9	10 68
Eva.............(GC)	6	July 26, '08	322	10.8	3,469	3·7	190·0	49 40	6 55	55 95	1,971	11,297	922	1,075	2·5	44 00	127·0	23·1	2·9	9 95
Jessie E...........(A)	8	Jan. 30, '09	60	19·0	1,162	3·7	53·0	13 75	2 21	15 96	236	2,449	177	403	......	6 81	52·5	13·0	13·0	9 15
Illuminata IV......(S)	3	Jan. 26, '09	60	24·0	1,432	4·7	63·0	16 38	2 73	19 11	532	2,844	177	392	....	10 15	70·0	16·0	10·0	8 96
Réjane II..........(C)	3	July 28, '08	243	11·3	2,734	4·8	155·0	40 30	5 15	45 45	1,759	8,464	636	813	2·5	36 80	134·0	23·7	2·3	8·65
Janet II...........(S)	4	June 10, '08	231	16·3	3,770	3·7	164·0	42 64	7 21	49 85	2,009	10,147	648	830	2·5	41 67	105·0	25·4	0·6	8 18
Ottawa Marchioness (S)	6	June 18, '08	309	13·2	4,106	4·0	191·0	49 66	7 87	57 53	2,414	12,810	922	1,074	2·5	50·82	123·0	26·5	0·5	6 71
Fortune d'Ottawa..(C)	2	Jan. 9, '09	60	23·5	1,410	3·7	65·0	16 90	2 69	19 59	668	3,385	243	561	......	13 70	97·0	21·0	5·0	5 89
Duchesse d'Ottawa.(C)	2	Oct. 10, '08	171	14·3	2,444	3·7	109·0	28 34	4 67	33 01	1,386	7,614	532	813	......	27 41	112·0	25·1	0·9	5 60
Duchess............(S)	4	May 28, '08	304	9·0	2,767	4·6	178·2	46 33	5 17	51 50	2,373	10,095	648	831	2·5	46 17	167·0	26·0	......	5 33
Gurta ....(A)	8	Jan. 3, '07	163	8·4	1,373	3·6	59·0	15 39	2 63	17 97	468	3,894	390	262	2·5	14 12	103·0	24·0	2·0	3 85
Fortune Précoce....(C)	2	Jan. 24, '09	66	17·6	1,164	4·0	49·0	12 74	2 23	14 97	536	2,793	201	469	.....	11 13	96.0	22·7	3.3	3 84

AYRSHIRES.

Marjorie..............	7	Jan. 22, '09	313	30·6	9,601	3·9	444·4	115 55	18 31	133 86	2,804	13,684	1,030	1,055	2·5	56 94	59·3	12·8	13·2	76 92
Denty..................	10	Mar. 13, '09	277	27·1	7,495	4·0	350·6	91 95	14 29	105 44	2,422	11,810	912	1,075	2·5	49 93	66·2	14·	12·	55 51
Flavia.................	7	Dec. 15, '07	365	21·2	7,745	3·8	351·0	91 26	14 78	106 04	2,610	11,528	922	1,075	2·5	51 52	66·5	14·6	11·4	54 52
Average......	8	....	318	26·3	8,280	3·9	382·0	99 58	15 79	115 11	2,612	12,340	954	1,068	2·5	52 79	64·0	13·8	12·2	62 31

CANADIANS.

Fortune..	12	May 9, '08	344	21·8	7,518	4·3	376·2	97 81	14 21	112 09	2,519	11,497	922	1,075	2·5	50 84	67·6	13·2	12·8	61 25
Inoquette.............	5	" 17, '08	330	21·2	7,001	4·5	374·7	97 42	13 25	110 67	2,515	11,407	922	1,075	2·5	50 70	72·4	13·5	12·5	59 97
Zamora	13	Feb. 16, '09	334	18·4	6,143	4·6	333·6	86 73	11 61	98 34	2,517	11,810	912	1,075	2·5	50 82	86·6	15·3	10·7	47 52
Average......	10	.. ..	336	20·4	6,887	4·4	3,615	93 98	13 02	107 03	2,517	11,571	918	1,075	2·5	50 78	75·5	14·0	12·0	56 24

GUERNSEYS.

Ottawa Itchen........	3	Nov. 17, '08	324	15·5	5,002	5·0	293·2	76 75	9 41	86 16	1,282	11,723	845	1,165	2·5	42 10	84·0	14·0	12·0	44 06
Deanie................	10	Jan. 1, '07	365	12·8	4,680	5·2	285·0	74 10	8 79	82 89	1,559	11,566	935	1,050	2·5	38 92	83·0	13·5	12·5	43 97
Pearl..................	8	Aug. 9, '08	232	16 5	3,814	5·0	226·0	68 76	7 17	75 93	1,731	8,464	636	792	2·5	36 40	95·4	16·0	10·0	39 53
Average	7	....	307	13·9	4,498	5·06	268·0	73 20	8 45	81 66	1,524	10,584	805	969	2·5	39 14	87·4	14·5	11·5	42 52

SHORTHORNS.

Names of Cows.	Age.	Date of dropping last calf.	Number of days in milk.	Daily average yield of milk.	Total milk for period.	Per cent fat in milk.	Pounds of butter produced in period.	Value of butter at 26 cents per lb.	Value of skim milk at 20 cents per 100 lbs.	Total value of product.	Amount of meal eaten at 1¼ cents per lb.	Amount of roots and ensilage eaten at $2 per ton.	Amount of hay eaten at $7 per ton.	Amount of straw at 20 cents per cwt.	Months on pasture at $1 per month.	Total cost of feed for period.	Cost to produce 100 lbs. milk.	Cost to produce 1 lb. butter, skim milk neglected.	Profit on 1 lb. butter, sk. milk neglected.	Profit on cow during period, labour neglected.
				lbs.	lbs.	%	lbs.	$ c.	$ c.	$ c.	lbs.	lbs.	lbs.	lbs.	mos.	$ c.	c.	c.	c.	$ c.
Illuminata..........	5	May 25, '08	312	30·1	9,401	3·4	376·4	97 86	18 04	115 90	2,454	11,411	772	932	2·5	49 14	52·2	13·0	13·0	66 76
Janet..............	9	Mar. 30, '08	306	21·3	6,525	4·4	336·4	87 46	12 37	99 83	2,614	13,444	922	1,111	2·5	54 05	83·0	16·0	10·0	45 78
Molly..............	7	Apl. 9, '08	304	20·4	6,224	3·8	276·0	71 76	11 [illegible]3	83 65	2,535	13,438	922	987	2·5	52 81	84·8	19·0	7·0	30 84
Average.....	7	....	307	23·9	7,383	3·9	329·6	85 69	14 08	99 79	2,534	12,764	872	1,010	2·5	52 00	73·3	16·0	10·0	47 82

THREE GRADES.

Names of Cows.	Age.	Date of dropping last calf.	Number of days in milk.	Daily average yield of milk.	Total milk for period.	Per cent fat in milk.	Pounds of butter produced in period.	Value of butter at 26 cents per lb.	Value of skim milk at 20 cents per 100 lbs.	Total value of product.	Amount of meal eaten at 1¼ cents per lb.	Amount of roots and ensilage eaten at $2 per ton.	Amount of hay eaten at $7 per ton.	Amount of straw at 20 cents per cwt.	Months on pasture at $1 per month.	Total cost of feed for period.	Cost to produce 100 lbs. milk.	Cost to produce 1 lb. butter, skim milk neglected.	Profit on 1 lb. butter, sk. milk neglected.	Profit on cow during period, labour neglected.
Dolly..............	6	Mar. 26, '09	306	25·5	7,282	3·7	318·2	82 73	13 92	96 65	2,372	11,498	922	1,015	2·5	48 89	67·0	15·3	10·7	47 76
Alice..............	8	" 23, '08	365	20·8	7,614	3·6	325·0	84 50	14 57	99 07	2,643	10,428	922	1,075	2·5	51 32	67·3	15·8	10·2	47 75
Queenie............	11	Jan. 23, '09	305	13·1	3,995	6·4	300·0	78 00	7 39	85 39	1,480	11,618	938	1,097	2·5	38 10	95·6	12·3	13·7	47 29
Average......	8	....	325	19·8	6,297	4·[illegible]	314·4	81 74	11 96	93 70	2,165	11,314	927	1,062	2·5	46 10	76·6	14·4	11·6	47 60

DAIRY COW RECORDS.

KEEPING RECORDS.

An increasingly large number of dairy farmers avail themselves of the offer made by this division to supply, free of cost, forms whereon to keep a record of the milk produced each day, or one day in each week, by each cow. This fact points to progress along right lines. It is only when one knows the individuals in one's herd that one can hope to improve the general quality of the herd.

The forms supplied are for week-long periods, as illustrated below, or for month-long periods, as may be preferred by the dairymen. In addition, forms for summarizing the month's work as well as forms whereon to enter up the year's record are sent on application.

DAILY 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 milk a simple spring balance may be secured for from one and a half to four 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 to J. H. Grisdale, Agriculturist, Central Experimental Farm, Ottawa, Ont.

THE DAIRY HERDS AT THE CENTRAL EXPERIMENTAL FARM.

THEIR ORIGIN, GROWTH AND USE.

At the Central Experimental Farm, Ottawa, are to be found at present four herds of pure-bred dairy cattle. They are Ayrshire, Guernsey, Canadian and Dairy Shorthorn. In addition a number of grades or cross-breds find room, bringing the total of dairy cattle up to 130 to 140 head. The present herds date back about eight years.

PREVIOUS HERDS.

For four or five years previous to the founding of the present herds, only grade cattle had been kept. These had been preceded by small herds of a few individuals each of several breeds, chiefly of a beef-producing character, as Aberdeen, Angus, Galloways, and Scotch Shorthorns, with a representative or two of Ayrshire, Jersey and Holstein breeds. Tuberculosis was responsible for the utter destruction of these various small herds. This insidious disease did, in fact, twice completely or almost completely, clean out the cattle barns. It is only since the stables were remodelled and improved as to lighting and ventilation in 1907, that it has been possible to completely eradicate all traces of this, the worst and almost unique disease against which the Canadian live stock man has to contend.

FOUNDATION STOCK.

The foundation stock of the Ayrshire, Guernsey and Dairy Shorthorn herds were purchased in Scotland, Guernsey and England, respectively, and no additions, save an occasional bull, have been made since the original importation in 1901. The French-Canadian herd foundation-stock was secured in the province of Quebec.

SELECTING THE BREEDS.

Since conditions were such as to preclude the possibility of keeping herds of all the more important classes of cattle, it was thought advisable to select one of the heavy milking breeds, Ayrshire or Holstein, one of the Channel Island breeds, Jersey or Guernsey, and one of the various so-called dual-purpose breeds. Dairy Shorthorn, Red Poll, Lincoln Red, &c. In addition, since we have in Canada a breed peculiar to this country, the French-Canadian, it was only fitting that a herd of this breed should find room on the Central Experimental Farm.

The alternative or choice of one from each of the groups of breeds mentioned, was made after a careful study of the various considerations which might be supposed to influence the choice of a farmer as to the breed he should fix upon under such peculiarities as to soil and climatic conditions as maintain upon this farm.

DISPOSITION OF NATURAL INCREASE.

The herds have been gradually enlarged to their present dimensions by keeping the best cow calves of each breed. The bull calves from the best cows are sold to farmers or farmers' clubs for breeding purposes.

WHY CATTLE ARE KEPT.

The reasons for keeping cattle on the Central Experimental Farm are several and important.

In the first place, farming in eastern Canada without live stock would be exceedingly difficult, and is, in fact, practically impossible.

Further, it is desired to show as great a revenue as possible from the 'farm' part of the Experimental Farm. As a means to this end, dairy cattle may be said to be indispensable in eastern Canada.

Again, it is necessary to have the Experimental Farm as interesting and instructive as possible. Live stock of various classes will certainly do more than anything else to add interest to the farm, for either the casual visitor or the owner.

It is probable, however, that the great need for experimental work in breeding, feeding and caring for the various classes of live stock, was the most important reason advanced for the upbuilding and maintaining of considerable herds of cattle here.

PAST EXPERIMENTAL WORK.

The lines of experimental work that have been carried on with dairy cattle up to date have been quite varied and important. A few might be enumerated as follows:—

(1) Experiments to determine the number of dairy cattle that might be carried to the acre of arable land on the average Canadian farm.

(2) Experiments in methods of feeding and caring for dairy cows.

(3) Experiments in ventilation of dairy barns.

(4) Experiments with various feeds, both roughage and concentrate, to determine their values as feeds for dairy cows.

(5) Experiments in milking, methods and hours of operation.

(6) Experiments to determine cost of production of milk and butter.

(7) Experiments in breeding pure-breds and grades.

(8) Comparative study of breeds as to economy of production, hardiness and fitness for Canadian conditions.

(9) The 'dual purpose' cow.

FUTURE EXPERIMENTAL WORK.

The work in the future will necessarily be along somewhat similar lines. This, however, will not in any way detract from its value, but rather render it more valuable since it is only by repeated experiments that we may hope to gain any really valuable information about anything in agriculture.

BEEF PRODUCTION.

Between 40 and 50 steers of various ages were fed for shorter or longer periods during the year. Some of the lines of experimental work followed were:—

1. Short-keep steers, cost of beef production therewith.
2. Value of some feeds for beef production.
3. Baby beef.

In most cases the common feeds were used, the most largely utilized being gluten meal, oil-cake meal, wheat-bran and corn. For roughage, clover hay, corn ensilage, roots (mangels and turnips) and some straw were as usual the regular feeds.

SHORT KEEP STEERS.

A bunch of nine steers, average weight 1,145 pounds October 8, 1908, were fed as indicated below, and left a very nice margin of profit, in spite of the high prices ruling for meal feeds of all kinds.

Three-year Olds—Lot No. 1.

Number of steers in lot..		8
First weight, gross, October 8, 1908..	lbs.	9,160
First weight, average, October 8, 1908..	"	1,145
Finished weight, gross, January 16, 1909..	"	11,375
Finished weight, average, January 16, 1909..	"	1,422
Total gain in 100 days..	"	2,215
Average gain per steer..	"	277
Daily gain per steer..	"	2·77
Daily gain per lot, 8 steers..	"	22·16
Gross cost of feed..		$125 30
Cost of 100 lbs. gain..		5 61
Cost of steers: 9,160 lbs. at $3.50 per 100 lbs..		343 50
Total cost to produce beef..		468 80
Sold 11,375 lbs. at $5.35 per 100 lbs., less 5 per cent..		578 17
Profit..		109 37
Net profit per steer..		13 67
Average buying price per steer..		42 94
Average selling price per steer..		72 27
Average increase in value..		27 33
Average cost of feed per steer..		15 66
Amount of meal eaten by lot of 8 steers..	lbs.	3,696
Amount of ensilage and roots..	"	41,384
Amount of hay..	"	2,920
Amount of straw eaten and for bedding..	"	10,928

Meal consumed consisted of bran, 1,136·8 lbs.; gluten, 2,256·8 lbs., and oil meal, 302·4 lbs.

FEEDING YEARLINGS.

In contrast with the above may be noted an experiment with a bunch of four yearlings purchased for $45 from a farmer near Ottawa, who found himself forced to sell on account of scarcity of feed. The price paid looked very small but proved to be high enough to allow of only a small profit after paying all expenses. Particulars follow:—

Lot No. 2.

Number of steers in lot..		4
First weight, gross, October 19, 1908..	lbs.	1,890
First weight, average, October 19, 1908..	"	472·5
Finished weight, gross, April 28, 1909..	"	3,540
Finished weight, average, April 28, 1909..	"	885
Total gain in 190 days..	"	1,650
Average gain per steer..	"	412·5
Daily gain per steer..	"	2·17
Daily gain per lot of 4 steers..	"	8·68
Gross cost of feed..		$ 88 60
Cost of 100 pounds gain..		5 37
Cost of steers..		45 00

Total cost to produce beef	$	133 60
Sold 3,540 pounds at $4.50 per 100 pounds, less 5 p.c.		151 33
Profit		17 73
Net profit per steer		4 43
Average buying price per steer		11 25
Average selling price per steer		37 83
Average increase in value		26 58
Average cost of feed per steer		22 15
Amount of meal eaten by lot of 4 steers	lbs.	3,528
Amount of ensilage and roots	"	34,628
Amount of hay	"	2,824

Meal, about equal parts gluten meal and bran.

CORN, GLUTEN MEAL AND OIL MEAL EXPERIMENT.

In the experiment reported below, it will be noted that bran enters quite largely into the meal ration in each case. In feeding such heavy meals as corn, gluten meal, oil-cake meal, cotton-seed meal, &c., it has been found advisable to use a certain amount of some light meal as an opener. In this case, bran has been so used. It will be noted that the mixture of gluten and oil meal did not do nearly so well as did either of the others. The steers, though quite as good quality if not superior to the corn-fed and oil-meal fed lots, did not make as good gains. It is possible that some other influence than the meal mixture fed should be held accountable for the small gains. No other cause could be observed.

Lot—Corn Fed.

Number of steers in lot		3
First weight, gross, Feb. 15, 1909	lbs.	2,770
First weight, average	"	923
Finished weight, gross, April 26, 1909	"	3,190
Finished weight, average	"	1,063
Total gain in 70 days	"	420
Average gain per steer	"	140
Daily gain per steer	"	2
Daily gain per lot 3 steers	"	6
Gross cost of feed	$	34 24
Cost of 100 pounds gain		8 15
Cost of steers, 2,770 pounds at $4 per 100 pounds, less 5 p.c.		105 28
Total cost to produce beef		139 52
Sold 3,190 pounds at $4.75 per 100 pounds, less 5 p.c.		143 92
Profit		4 40
Net profit per steer		1 47
Average buying price per steer		35 09
Average selling price per steer		47 99
Average increase in value		12 90
Average cost of feed per steer		11 41
Amount of meal eaten by lot of 3 steers	lbs.	1,386
Amount of ensilage and roots	"	8,820
Amount of hay	"	504
Amount of straw eaten and bedded	"	3,670

Meal consisted of bran, 346·5 pounds; ground corn, 1,030·5 pounds.

Lot—Oil Meal Fed.

Number of steers in lot		3
First weight, gross, February 15, 1909	lbs.	2,205
First weight, average	"	735
Finished weight, gross, April 26, 1909	"	2,650
Finished weight, average	"	883
Total gain in 70 days	"	445
Average gain per steer	"	148
Daily gain per steer	"	2·1
Daily gain per lot 3 steers	"	6·3
Gross cost of feed		$ 32 01
Cost of 100 lbs. gain		7 19
Cost of steers, 2,205 lbs. at $4 per 100 lbs., less 5 per cent.		83 80
Total cost to produce beef		115 81
Sold 2,650 lbs. at		119 60
Profit		3 79
Net profit per steer		1 26
Average buying price per steer		27 93
Average selling price per steer		39 87
Average increase in value		11 94
Average cost of feed per steer		10 67
Amount of meal eaten by lot of 3 steers	lbs.	1,176
Amount of ensilage and roots	"	7,350
Amount of hay	"	420
Amount of straw eaten and bedded	"	3,150

Meal consisted of bran, 546 lbs.; oil meal, 630 lbs.

Lot on Gluten and Oil Meal.

Number of steers in lot		3
First weight, gross, February 15, 1909	lbs.	2,510
First weight, average, February 15, 1909	"	837
Finished weight, gross, April 26, 1909	"	2,830
Finished weight, average	"	943
Total gain in 70 days	"	320
Average gain per steer	"	107
Daily gain per steer	"	1·53
Daily gain per lot 3 steers	"	4·59
Gross cost of feed		$ 31 68
Cost of 100 lbs. gain		9 90
Cost of steers, 2,510 lbs. at $4 per 100 lbs., less 5 per cent.		96 40
Total cost to produce beef		128 08
Sold 2,830 lbs. at $4.75 per 100 lbs., less 5 per cent.		127 72
Loss		36
Net loss per steer		12
Average buying price per steer		32 13
Average selling price per steer		42 57
Average increase in value		10 44
Average cost of feed per steer		10 56
Amount of meal eaten by lot of 3 steers	lbs.	1,050
Amount of ensilage and roots	"	8,550
Amount of hay	"	420
Amount of straw eaten and bedded	"	3,654

Meal consisted of bran, 122 lbs.; gluten, 693 lbs., and oil meal, 235 lbs.

BABY BEEF.

Some further work has been done in the production of beef from steers ready for the block at an early age.

Below follow reports upon two lots dropped in 1907.

STEER CALF EXPERIMENTS.

Limited Growing Ration Lot.

Lot 1, Dropped May, 1907.

Number of steers in lot		5
First weight, gross, March 31, 1908	lbs.	2,520
First weight, average	"	504
Finished weight, gross	"	4,935
Finished weight, average	"	987
Total gain in 393 days	"	2,415
Average gain per steer	"	483
Daily gain per steer	"	1·23
Daily gain per lot 5 steers	"	6·15
Gross cost of feed		$132 92
Cost of 100 lbs. gain		5 50
Cost of steers: Value March 31, 1908		100 00
Total cost to produce beef		232 92
Sold 4,935 lbs. at $4.75 per 100 lbs., less 5 per cent		222 72
Loss on lot		10 20
Loss per steer		2 04
Average valuation per steer		20 00
Average selling price per steer		44 54
Average increase in value		24 54
Average cost of feed for steer		26 58
Amount of meal eaten by 5 steers	lbs.	4,585
Amount of ensilage and roots	"	41,915
Amount of hay	"	3,535

Full fattening ration lot.

Lot 2—Dropped May, 1907.

Number of steers in lot		6
First weight, gross, April 1, 1908	lbs.	3,560
First weight, average	"	593·3
Finished weight, gross, Jan. 16, 1909	"	6,370
Finished weight, average	"	1,061·7
Total gain in 290 days	"	2,810
Average gain per steer	"	468·3
Daily gain per steer	"	1·61
Daily gain per lot 6 steers	"	9·66
Gross cost of feed		$ 169 25
Cost of 100 pounds gain		6 02
Cost of steers: cost up to March 31, 1908		140 39
Total cost to produce beef		309 64
Sold 6,370 pounds at $5.35 per 100 pounds		340 80
Profit		31 16
Net profit per steer		5 19
Average value, March 31, 1908		23 40

Average selling price per steer	$	56 80
Average increase in value		33 40
Average cost of feed per steer		43 90
Amount of meal eaten by lot of 6 steers	lbs.	7,192
Amount of ensilage and roots	"	59,823
Amount of hay	"	6,162

Meal eaten consisted of bran, 2298·5 pounds; gluten, 4204·5 pounds; oil meal, 185 pounds; corn, 504 pounds.

LIFE HISTORIES.

Below are summarized the experiments with calves dropped in 1907. All particulars from birth to block are given.

LIMITED GROWING RATION LOT.

Dropped, 1907.

Number of steers in lot		5
First weight, gross, May 1, 1907	lbs.	420
First weight, average	"	84
Finished weight, gross, April 28, 1909	"	4,935
Finished weight, average	"	987
Total gain in 729 days	"	4,515
Average gain per steer		903
Daily gain per steer	"	1·24
Daily gain per lot 5 steers	"	6·20
Gross cost of feed	"	$ 207 96
Cost of 100 pounds gain		4 66
Cost of steers, $5 each		25 00
Total cost to produce beef		232 96
Sold 4,935 pounds at $4.75 per 100 pounds, less 5 p.c.		222 72
Loss on lot		10 24
Loss per steer		2 05
Average buying price per steer		5 00
Average selling price per steer		44 54
Average increase in value		39 54
Average cost of feed per steer		41 59
Amount of meal eaten by lot of 5 steers	lbs.	6,735·7
Amount of ensilage and roots, mixed	"	63,055
Amount of roots	"	3,710
Amount of hay	"	6,565
Amount of straw eaten	"	1,120

Meal consisted of bran, 1,882·5 pounds; oil meal, 1,207 pounds; gluten meal, 2,928 pounds; oats, 563·2 pounds; corn, 155 pounds.

Full fattening ration lot.

Dropped, 1907.

Number of steers in lot		6
First weight, gross, May 1, 1907	lbs.	640
First weight, average	"	106
Finished weight, gross, Jan. 16, 1909	"	6,370
Finished weight, average	"	1,061·7
Total gain in 626 days	"	5,730

Average gain per steer	lbs.	955
Daily gain per steer	"	1·52
Daily gain per lot of steers		9·12
Gross cost of feed		$ 279 64
Cost of 100 pounds gain		4 88
Cost of steers, $5 each		30 00
Total cost to produce beef		309 64
Sold 6,370 pounds at $5.35 per 100 pounds		340 80
Profit on lot		31 16
Net profit per steer		5 19
Average buying price per steer		5 00
Average selling price per steer		56 80
Average increase in value		51 80
Average cost of feed for steer		46 60
Amount of meal eaten by lot of 6 steers	lbs.	11,201
Amount of ensilage	"	83,342
Amount of roots	"	10,796
Amount of hay	"	9,653
Amount of straw eaten	"	1,522
Amount of skim milk	"	9,828

Meal consisted of oats, 679 pounds; oil meal, 523 pounds; bran, 4,095 pounds; gluten, 5,043 pounds; corn, 861 pounds.

CALVES DROPPED IN 1908.

The calves secured in 1908 were not dropped till June, hence are about a month younger than usual at this date, and are accordingly somewhat lighter weights. Only one lot of five was secured.

STEER CALVES.

(Dropped June, 1908.)

Number of steers in lot		5
First weight, gross, June 15, 1908	lbs.	545
First weight, average	"	109
Finished weight, gross, March 31, 1909	"	2,475
Finished weight, average	"	495
Total gain in 290 days	"	1,980
Average gain per steer	"	396
Daily gain per steer	"	1·36
Daily gain per lot 5 steers	"	6·80
Gross cost of feed		$ 75 50
Cost of 100 lbs. gain		3 81
Cost of steers: $5 each		25 00
Total cost to produce beef		100 50
Average cost of feed per steer		15 10
Amount of meal eaten by lot of 5 steers	lbs.	2,080
Amount of ensilage and roots	"	15,753
Amount of hay	"	1,815
Amount of straw eaten and bedded	"	6,170
Amount skim milk	"	8,533
Amount whole milk	"	750

Meal consisted of bran, 607·1 lbs.; oats, 234·1 lbs.; oil meal, 499·2 lbs., and gluten meal, 739·6 lbs.

SWINE.

During the year 1908-9 a large number of pigs have been bred and fed. Feed prices have been high and pork prices rather low, but financial results have been fairly satisfactory.

FEEDING OLD BROOD SOWS.

The practice of wintering sows outside, with no protection save small single board cabins wherein to sleep, and feeding them very largely on roots and clover hay, has been continued, with very satisfactory results. A statement as to the kinds and amounts of feeds, fed a bunch of 27 brood sows, is submitted below.

The estimated cost of feeding sows is made up by charging the following prices for feeds:—

Bran	$20 00	per ton.
Roots	2 00	"
Shorts	20 00	"
Clover hay	7 00	"

COST OF WINTERING 27 BROOD SOWS.

Period.	No. of days.	Amount of feed consumed				Total cost of feed.	Cost per pig.	Cost per day.
		Bran.	Shorts.	Roots.	Clover Hay.			
		lbs.	lbs.	lbs.	lbs.	$	$	cts.
From Nov. 1 to Nov. 30, '08	30	1,400	460	*	....	25 35	93	3·1
From Nov. 30 to Dec. 31, '08	31	1,200	700	10,420	300	32 82	1 21	3·9
From Dec. 31, '08, to Jan. 31, '09	31	1,350	710	11,020	650	36 33	1 34	4·3
From Jan. 31, '09 to Feb. 28, '09	28	1,210	605	8,400	600	30 76	1 13	4·0
From Feb. 28 to March 31, '09	13	800	400	4,200	300	18 65	69	5·3

* Refuse, tops, etc., at $5.00.

Total number of days	133
Total cost of feed	$143 91
Average cost per pig	5 33
Average cost per pig per day	04

FEEDING YOUNG BROOD SOWS.

Old sows may usually be fed on cheap rough feeds as indicated above. Young sows, however, must receive a more liberal ration, and to a bunch of 25 young sows fed outside and sleeping in small cabins, as in the case of old sows, it was found necessary to feed rations considerably more liberal as to meal, in order to keep pigs in uniform, thrifty, growing condition.

FEEDING EXPERIMENTS.

A number of feeding experiments were conducted during the year. One is reported below. The aim of this experiment was to gain some idea as to the comparative value of gluten, Imperial (feed flour), and a mixture of oats, oil meal and Imperial, as meals to lend strength or weight to a finishing-off mixture. Incidentally it was attempted to gain some data as to the value of potatoes when added to such rations as are described below.

The whole feeding period was divided into three parts. This was done to permit of the study of the values of feeds, &c., when no disturbing influence such as the change from some other feed at first, or the variation in rate of grain due to satiety or finishing-off at the end.

The different feeds were valued as follows: Barley, $27 per ton; bran, $20 per ton; gluten, $28 per ton; Imperial (feed flour), $32 per ton; oats, $26 per ton; oil meal, $32 per ton, and small potatoes, $2 per ton.

16—6½

PIG FEEDING EXPERIMENT, 1908.

CHANGE PERIOD.

Number of pigs in pen.	Weight per pen at commencement.	Average weight per pig.	Weight per pen at end of period.	Average weight per pig.	Gain per pen in 14 days.	Average gain per pig.	Average gain per pig, per day.	Total amount of meal consumed.	Total amount of potatoes consumed.	Amount of meal for 1 lb. gain, live weight.	Amount of potatoes for 1 lb. gain, live weight.	Total cost of ration.	Cost of 1 lb. gain, live weight.	Ration.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts	Cts.	
2 Lots { 5..	511	102·2	613	122·6	102	20·4	1·45	300	300	2·94	2·94	3 96	3 88	200 barley; 200 bran; 100 gluten; potatoes.
5..	591	118·2	697	139·4	106	21·2	1·51	315	315	2·97	2·97	4 15	3·91	
Total, 10..	1,102	110·2	1,310	131·0	208	20·8	1·48	615	615	2·95	2·95	8 11	3·89	
2 Lots { 5..	592	118·4	683	136·6	91	18·2	1·30	315	......	3·46	......	3 84	4·21	200 barley; 200 bran; 100 gluten.
5..	527	105·4	622	124·4	95	19·0	1·35	315	.....	3·31	.....	3 84	4·04	
Total, 10..	1,119	111·9	1,305	130·5	186	18·6	1·32	630	...	3·38	...	7 68	4·12	
2 Lots { 5..	604	120·8	658	131·6	54	10·8	·77	237	237	4·38	4·38	3 22	5·96	200 barley; 200 bran; 100 Imperial; potatoes.
5..	407	81·4	465	93·0	58	11·6	·82	217	217	3·74	3·74	2 95	5·08	
Total, 10..	1,011	101·1	1,123	112·3	112	11·2	·80	454	454	4·05	4·05	6 17	5·50	
2 Lots { 5..	477	95·4	513	102·6	36	7·2	·51	213	......	5·91	......	2 68	7·44	200 barley; 200 bran; 100 Imperial.
5..	422	84·4	467	93·4	45	9·0	·64	203	.....	4·51	......	2 55	5·66	
Total, 10..	899	89·9	980	98·0	81	8·1	·57	416	....	5·13	......	5 23	6·45	
2 Lots { 5..	717	143·4	786	157·2	69	13·8	·98	315	315	4·56	4·56	4 40	6·37	300 barley; 200 bran; 100 oats; 100 Imperial; 50 oatmeal; potatoes.
5..	371	74·2	424	84·8	53	10·6	·75	210	210	3·96	3·96	2 94	5·54	
Total, 10..	1,088	108·8	1,210	121·0	122	12·2	·87	525	525	4·30	4·30	7 34	6·01	

PIG FEEDING EXPERIMENT.

MAIN PERIOD.

Number of pigs in pen.	Weight per pen at commencement of period.	Average weight per pig.	Weight per pen at end of period.	Average weight per pig.	Gain per pen in 42 days.	Average gain per pig in 42 days.	Average gain per pig per day.	Total amount of meal consumed.	Total amount of potatoes consumed.	Amount of meal for 1 lb. gain live weight.	Amount of potatoes for 1 lb. gain live weight.	Total cost of ration.	Cost of 1 lb. gain live weight.	Ration.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.	Cts.	
2 Lots { 5..	613	122·6	886	177·2	273	54·6	1·3	1042	1042	3·81	3·81	13 75	5·03	200 barley; 200 bran; 100 gluten; potatoes.
5..	697	139·4	991	198·2	294	58·8	1·4	1039	1039	3·53	3·53	13 70	4·65	
Total, 10..	1310	131·0	1877	187·7	567	56·7	1·35	2081	2081	3·67	3·67	27 45	4·84	
2 Lots { 5..	683	136·6	874	174·8	191	38·2	·90	1051	......	5·50	......	12 82	6·71	200 barley; 200 bran; 100 gluten.
5..	622	124·4	849	169·8	227	45·4	1·07	1047	.....	4·61	.....	12 77	5·62	
Total, 10..	1305	130·5	1723	172·3	418	41·8	·99	2098	.....	5·01	......	25 59	6·11	
2 Lots { 5..	658	131·6	960	192·0	302	60·4	1·43	955	955	3·16	3·16	12 98	4·29	200 barley; 200 bran; 100 Imperial; potatoes.
5..	465	93·	633	126·6	168	33·6	·80	636	636	3·78	3·78	8 64	5·14	
Total, 10..	1123	112·3	1593	159·3	470	47·0	1·11	1591	1591	3·38	3·38	21 62	4·60	
2 Lots { 5..	513	102·6	642	128·4	129	25·8	·61	738	......	5·72	......	9 29	7·20	200 barley; 200 bran; 100 Imperial.
5..	467	93·4	557	111·4	90	18·0	·42	725	..	8·05	.....	9 13	10·14	
Total, 10..	980	98·0	1199	119·9	219	21·9	·52	1463	....	6·68	......	18 42	8·41	
2 Lots { 5..	786	157·2	1110	222·0	324	64·8	1·54	1033	1033	3·18	3·18	14 45	4·45	300 barley; 200 bran; 100 oats; 100 Imperial; 50 oilmeal.
5..	424	84·8	594	118·8	170	34·0	·80	621	621	3·65	3·65	8 69	5·11	
Total, 10..	1210	121·0	1704	170·4	494	49·4	1·17	1654	1654	3·34	3·34	23 14	4·68	

In each case the potatoes were fed in proportion of equal parts by weight with meal.

PIG FEEDING EXPERIMENT, 1908.

FINISHING PERIOD, 7 DAYS.

Number of Pigs in pen.	Weight per pen at commencement.	Average weight per pig.	Weight per pen at end of period.	Average weight per pig.	Gain per pen in 7 days.	Average gain per pig.	Average gain per pig per day.	Total amount of meal consumed.	Total amount of potatoes consumed.	Amount of meal for 1 lb. gain live weight.	Amount of potatoes for 1 lb. gain live weight.	Total cost of Ration.	Cost for 1 lb. gain live weight.	Ration.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.	Cts.	
2 Lots {5.........	886	177·2	926	185·2	40	8·	1·14	180	180	4·5	4·5	2 52	6·3	
2 Lots {5.........	991	198·2	1,064	212·8	73	14·6	2·08	187	187	2·56	2·56	2 61	3·57	
Total, 10.........	1,877	187·7	1,990	199·0	113	11·3	1·61	367	367	3·24	3·24	5 13	4·53	
2 Lots {5.........	874	174·8	955	191·	81	16·2	2·31	187	187	2·30	2·30	2 61	3·22	
2 Lots {5.........	849	169·8	946	189·2	97	19·4	2·78	187	187	1·92	1·92	2 61	2·69	
Total, 10.........	1,723	172·3	1,901	190·1	178	17·8	2·56	374	374	2·10	2·10	5 22	2·93	
2 Lots {5.........	960	192·	1,047	209·4	87	17·4	2·48	189	189	2·17	2·17	2 64	3·03	
2 Lots {5.........	633	126·6	700	140·	67	13·4	1·91	138	138	2·05	2·05	1 93	2·88	300 barley, 200 bran, 100 oats, 100 Imperial, 50 oil meal. Potatoes equal parts by weight with meal.
Total, 10.........	1,593	159·3	1,747	174·7	154	15·4	2·20	327	327	2·12	2·12	4 57	2·96	
2 Lots {5.........	642	128·4	697	139·4	55	11·	1·57	167	167	3·03	3·03	2 33	4·23	
2 Lots {5.........	557	111·4	613	122·6	56	11·2	1·60	165	165	2·94	2·94	2 31	4·12	
Total, 10.........	1,199	119·9	1,310	131·0	111	11·1	1·58	332	332	2·99	2·99	4 64	4·18	
2 Lots {5.........	1,110	222·0	1,155	231·	45	9·	1·28	187	187	4·15	4·15	2 61	5·80	
2 Lots {5.........	594	118·8	654	130·8	60	12·	1·71	136	136	2·26	2·26	1 90	3·16	
Total, 10.........	1,704	170·4	1,809	180·9	105	10·5	1·50	323	323	3·07	3·07	4 51	4·29	

The great value of a change in diet, especially if of a palatable character and warmed up as in this case, is shown by a study of the following statement, prepared from the last table:—

FINISHING PERIOD STATEMENT.

Total number of pigs..		50
Total weight commencing..	lbs.	8,096
Average weight commencing..	"	161·9
Total weight finishing..	"	8,757
Average weight finishing..	"	175·1
Total gain in 7 days..	"	661
Average gain per pig..	"	13·2
Average gain per pig per day..	"	1·88
Total amount of meal..	"	1,723
Total amount of potatoes..	"	1,723
Total cost of food for 7 days..		$24 07
Cost of 100 lbs. gain live weight..		3 79

FINANCIAL STATEMENT.

Below are submitted inventories and returns from the various classes of live stock under my charge during the year April 1, 1908, to March 31, 1909.

Class.	April 1, 1908.		April 1, 1909.		Returns.	Gross returns made up of increase in value, value of products and value of animals sold.
	No.	Value.	No.	Value.	Value.	
		$ cts.		$ cts.	$ cts.	$ cts.
Horses..........	19	....	19	....	3,944 94	3,944 94
Breeding Cattle..........	95	12,125 00	123	14,615 00	4,497 39	6,987 39
Steers..........	43	2,005 00	30	950 00	3,729 23	2,673 63
Sheep..........	42	584 00	31	690 00	105 30	211 30
Swine..........	199	2,426 00	130	2,617 00	2,744 47	2,935 47
Total..........	396	17,140 00	328	18,872 00	15,021 33	16,752 73

SUMMARY OF LIVE STOCK OPERATIONS.

Returns.

Gross returns from animals of all classes, including value of products, values of services and increases in value of young stock..	$16,752 73
Manure, 1,400 tons at $1 per ton..	1,400 00
Total..	$18,152 73

Expenditure—Value of food consumed.

Meal, grain, &c..	$ 5,840 09
Hay at $7 per ton..	1,228 39
Roots and ensilage at $2 per ton..	1,339 76
Whole milk, 25,305 pounds at $1 per cwt..	253 05
Skim milk, 58,390 pounds at 20 cents per cwt..	116 78
Straw, 140 tons at $6 per ton..	840 00
Total cost of feed and straw..	$ 9,618 07

Cost of labour in connection with care of horses, cattle, sheep and swine:—

Herdsman	$ 720 00	
One man	600 00	
Three men at $528	1,584 00	
Two men at $500	1,000 00	
Extra help, teaming, &c	230 00	
		4,134 00
Total expenditure		13,752 07
Balance		4,401 66
Less cost of steers and new stock purchased, 1908-9		680 50
Net balance		3,721 16

SUMMARY OF FARMING AND LIVE STOCK OPERATIONS ON 200-ACRE FARM, 1908.

Returns.

Total value of returns from fields	$ 3,615 93
Total value of returns from live stock	18,152 73
Total returns	21,768 66

Expenditure.

Total cost of field operations	$ 2,891 00
Total cost of live stock operations	13,752 07
Expended, buying stock	680 50
Total expenditure	$ 17,323 57
Balance	$ 4,445 09

COMPARATIVE Statement of Crops on '200 Acre Farm,' from 1899 to 1908 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	....	....	....	....	" " "
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	" "	3	" " ..	Season unfavourable for grain and corn, good for hay and roots.
1905........	66	111,932	59	258	47	971½	14 and aftermath.	100	5	All cattle ensilage fed.	4	Clover, rape, mixed crop, pease, roots.	Season favourable for hay, corn and roots, too wet for grain on mucky land.
1906........	69	125,516	62	140	48	774½	14	105	5	" " ..	3	" " ..	Very bad season. Meadows winter killed. Summer too dry.
1907........	61	102,494	73	227	46	704	13–75	110	5	" " ..	3	" " ..	Bad hay year. Grain fair. Corn and roots poor.
1908........	61	63,003	62	175	49	670	14	120	5	" " ..	3	" " ..	Very bad year for all classes of crops. Too dry.

Of the area indicated as having been used as pasture for swine in 1895, 3 acres yielded a crop of green feed for soiling cattle before being given over to swine. Cattle were pastured on roads where possible. A small rough field not included in '200 Acre Farm' is used as partial pasture and a run for about 20 head of young stock. These cattle receive ensilage or other succulent food every day, and meal at the rate of about 1½ lbs. each per day part of the time.

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 return of each year valued accordingly.

Fixing prices as follows:—Grain, $1 per 100 pounds; roots and ensilage, $2 per ton; hay, $7 per ton; summering cattle, $8 per season; and an area used as pasture for 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; $5,714.32 in 1905; $4,669.16 in 1906; $4,931.94 in 1907, and $4,631.33 in 1908.

Prices for all kinds of forage in 1908 were so very high that, had market prices been allowed for the crop of 1908, the total value would have been much higher.

REMARKS ON ROTATION EXPERIMENTS.

The true farmer will ever have two objects in view when managing his farm: to so manage as to gradually but surely increase the margin of profit and, at the same time, render his farm more productive. Many factors will necessarily unite to produce such desirable results, but of one feature we may be certain, there will be followed on such a farmer's farm a regular rotation of crops, for no other single practice in farm management can compare with this in importance. The rotation or rotations adopted will, of course, depend upon the line of farming followed, and to some extent upon the character of the soil and the physical peculiarities of the farm as a unit, but a rotation there will be.

Crop rotation means a certain succession of crops which regularly repeats itself each time the course is run. It really means further, that the crops follow each other in such order as to insure each having such supplies of plant food of such a character as to aid in securing good returns from each particular crop.

Hence, in arranging a rotation, it is very necessary to have some knowledge of the food requirements of different crops and to know something of the values of the residues from the different crops included. Certain forage crops such as corn, roots, potatoes and hay require an immense amount of food for stem, leaf and roof production—that is an abundance of nitrates, as is found in clover or other sod turned down, and in well-manured lands. Other crops, such as cereals, can get along best with a lighter supply of nitrates but need more phosphates, hence do well after some forage crop has taken up the superabundance of free nitrates found after sod. It is evident, therefore, that a good rotation will include (1) meadow or pasture, (2) roots or corn, and (3) some cereal crop.

Various combinations of these three classes are possible, and the natural aim of experimental work with rotations will be to determine (1), the comparative values of the rotations as soil improvers, and (2) their relative suitability for different lines of farming.

Five or six years' experience with a rotation of five years' duration showed such remarkable results here, that in 1904 it was decided to begin an experiment that would include a variety of rotations.

ROTATION 'A.'

First year.—Land ploughed in August, well worked, ribbed in October, seeded next spring to oats, and 10 pounds clover sown per acre, allowed to grow one year and turned under as fertilizer for corn.

Second year.—Corn. Manure applied in winter or spring. Shallow ploughed, corn planted.

Third year.—Grain seeded down, 8 pounds red clover, 2 pounds alsike, 10 to 12 pounds timothy per acre.

Fourth year.—Clover hay, two crops expected.

Fifth year.—Timothy hay.

ROTATION 'B.'

First year.—Grain, land ploughed previous autumn. Seeded down, 10 pounds red clover and 2 pounds alsike per acre.

Second year.—Clover hay, two crops expected.

Third year.—Corn, manured in winter, 20 to 25 tons per acre. Spring ploughed.

Fourth year.—Grain, seeded down red clover 10 pounds, alsike 2 pounds per acre. Land fall-ploughed after corn, very shallow furrow.

Fifth year.—Clover hay, two crops. Late fall ploughed.

ROTATION 'E.'

First year.—Manured and handled as 'A.'

Second year.—Oats seeded down, 8 pounds red clover, 8 pounds alfalfa, 2 pounds alsike, 8 pounds timothy per acre.

Third year.—Pasture. Cattle.

ROTATION 'Z.'

First year.—Manure 12 to 15 tons per acre applied winter, shallow ploughed in spring, well worked and planted to corn.

Second year.—Oats seeded down, 8 pounds red clover, 2 pounds alsike, 8 pounds Alfa fa and 8 pounds timothy per acre.

Third year.—Clover hay, two crops expected.

ROTATION 'S.'

Shallow ploughing, deep cultivation by means of stiff tooth cultivator or subsoiler.

First year.—Roots. Plough August, 4 inches deep, manure 15 to 20 tons per acre, work at intervals, ridge up in fall, sow to roots in spring.

Second year.—Grain seeded down, 10 pounds red clover, 12 pounds timothy per acre.

Third year.—Clover hay.

Fourth year.—Timothy.

ROTATION 'D.'

Deep ploughing. Manure applied 15 to 20 tons. Land ploughed late autumn 7 inches deep. Roots next spring.

Second, third and fourth year.—Same as 'S.'

ROTATION 'H.'

First year.—Manured in fall and manure ploughed in, well worked, sown to roots next spring.

Second year.—Different grain mixtures suitable for feeding green. Different grass seed mixtures suitable for pasture and soiling next year.

Third year.—Pasture. Swine.

ROTATION 'T.'

Sheep pasture.

Crops just as in 'S,' save that various mixtures of grain and grass seeds are used to test their value for sheep feeding and pasturing.

Four other rotations were tried for some time. They included no hoed crops, however. and had to be discontinued as it was found impracticable to keep the land free from weeds.

RETURNS PER ACRE.

To compare results under such varied crop and cultural conditions is a rather difficult matter. The plan adopted has been to place an arbitrary and uniform valuation on all products and on pasturing various classes of stock. Following this plan the returns per acre have been about as follows, the average of four years' work:—

Rotation 'A.'

Average value of crop per acre, per annum.. .. .. $24 95

Rotation 'B.'

Average value of crop per acre, per annum.. .. .. 25 23

Rotation 'E.'

Average value of crop per acre, per annum.. .. .. 21 84

Rotation 'Z.'

Average value of crop per acre, per annum.. .. .. 26 44

Rotation 'S.'

Average value of crop per acre, per annum.. .. .. 28 10

Rotation 'D.'

Average value of crop per acre, per annum.. .. .. 28 05

Rotation 'H.'

Average value of crop per acre, per annum.. .. .. 28 78

Rotation 'T.'

Average value of crop per acre, per annum.. .. .. 20 95

PROFITS PER ACRE

The values placed on products were, roots or silage stored, $2 per ton; hay, $7 per ton; grain, $1 per 100 pounds; oat straw, $4 per ton; pasturing cows, $1 per month. Sheep and swine pastured, one cent per day.

In estimating cost of operation, labour is charged at prices paid, machinery is put at 30 cents per acre, rent at $3 per acre and manure at $3 per acre.

Net profits after paying all expenses were as follows per acre, the average of four years:—

'A,' net profit per acre..	$ 9 76
'B,' " "	9 56
'E,' " "	6 20
'Z,' " "	10 30
'S,' " "	7 59
'D,' " "	7 43
'H,' " "	6 77
'T,' " "	3 48

VALUES OF DIFFERENT ROTATIONS.

The averages used are for four years. A study of the various rotations would lead one to remark upon them briefly as follows:—

Rotation 'A.'—This rotation has been in use here for 10 years and has proven to be most excellent where carefully followed and cultural operations well performed. Where all land was under cultivation, it would be found necessary to devote a certain area to soiling crops. It might be extended to six years by leaving down to pasture for two years instead of one.

Rotation 'B.' This rotation has been fairly successful here, but for certain reasons not easily enumerated, I do not feel as though I could either criticise or praise as yet and feel sure of my ground.

Rotation 'E.' This rotation would not be suitable for the average farmer, but might suit the man who had to buy rough forage.

Rotation 'Z.'—This would be a most excellent rotation to put into practice where sufficient rough land was available to serve as pasture. It is the rotation that would most likely supply the greatest amount of forage of the very best description for dairying or beef production. It is better suited for heavy than for light soils.

Rotation 'S.' This is a rotation that has been in use for a number of years on the Agricultural College Farm at Guelph, where it has given satisfactory results. It is possibly open to the criticism of having too small a proportion of land under grain. Where live stock is, however, the mainstay, this is a very minor fault. The turning of a shallow furrow when ploughing sod has been found to be good practice here when preparing for grain or corn. If preparing for roots, the regular plough with sub-soiler is to be advised.

Rotation 'D.' This rotation is the same as rotation 'S' so far as crops are concerned. The results so far obtained show no advantage in favour of either shallow ploughing and deep cultivation or deep ploughing.

Rotation 'H.' The area devoted to pigs (some 10 acres) where this rotation is followed has given very satisfactory returns, and would, I feel confident, prove profitable to any who tried it.

Rotation 'T.'—Sheep. The returns from this rotation are not strictly comparable with those from the others since many side-experiments materially affect the results. It has, however, proven very satisfactory for this class of stock.

As already stated, the rotation experiments have been under way for four years now. Three out of the four years have been what might be called 'lean years' in the Ottawa Valley, hence these rotations can hardly be said to have yet shown what they are capable of doing in the way of influencing crop production.

The few facts given above are, however, strictly comparable each with the others, excepting possibly 'T' or sheep, where some rather disturbing conditions have been introduced.

ROTATION EXPERIMENT.

The experiment to determine the values of different rotations as discussed above is being followed up, and below the detailed report of the labour on each plot, and the return therefrom, will be found some brief notes on each field and on the rotation as a whole.

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 ploughing, clover hay, timothy hay, roots, grain.

Rotation 'D.' Four years, deep ploughing, 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.

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 'B,' 25 tons would be applied, as 'B' is a five-year rotation. Since manure must vary slightly in quantity each year, $3 per annum per acre is charged in each rotation.

COMPARATIVE VALUES OF ROTATIONS ON STOCK FARMS.

Supposing the average animal of the bovine species to consume 2,000 pounds per annum, which, valued at prices given above, would amount to $37, a rough idea of the relative value for stockmen of the different rotations may be arrived at.

ROTATION

Lot.	Location.	Description of Soil. Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in Acres.	Crops. 1907.	1908.	Rent and Manure.	Seed, Twine and use of Machinery.
		p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	Ac.			$ cts.	$ cts.
A 1..	W.S. 3.....	30	45	....	....	25	....	....	9·96	Grain	Hay........	59 76	12 95
A 2..	L.S. 1......	30	65	5	....	....	.. .	....	8·90	Corn.....	Grain	53 40	13 60
A 3..	A.S.14.....	10	15	20	20	15	.. .	20	10·20	Hay........	Hay........	61 20	13 26
A 4..	W.P.G.S.1. F.S. 1.	70	20	10	....	....	....	....	9·15	Grain	Corn..... ...	54 90	14 64
A 5..	F.S. 3.	....	35	30	10	15	10	....	9·63	Hay........	Grain	57 78	14 68
	Aggregate...........								47·84			287 04	69 14
	Average per acre...........								1.00			6 00	1 44
	Average for four years..................								....			6 00	1 59

ROTATION

B 1........	W.S. 4.....	5	35	5	50	5	....	....	10 00	Grain	Hay........	60 00	12 88
B 2.......	L.S. 2......	20	70	....	5	5	....	....	8 82	Corn........	Grain......	52 92	13 63
B 3.......	A.S. 15....	20	60	5	....	15	....	....	10 20	Grain	Hay........	61 20	13 26
B 4........	W.P.G.S.2.	20	60	15	....	5	....	....	9 15	Hay........	Corn........	54 90	17 69
B 5..	F.S.2.......	....	30	30	40	....	....	....	9 93	Hay........	Grain...	59 58	15 31
	Aggregate.................								48 10			288 60	72 77
	Average per acre....								1 00			6 00	1 51
	Average for four years..................								......			6 00	1 52

Rotation 'A.'

This rotation of five years' duration includes grain, hay (two years), grain and corn or roots, in the order named. The grain crop mentioned first comes after corn. With the first crop of grain is sown 10 pounds red clover, one pound alsike and 10 pounds timothy per acre. The field is left in hay for two years, then in August of the second year it is ploughed and cultivated at intervals till October, when it is ridged up and left till next spring. Oats are sown on this field, and with them red clover seed at the rate of 10 pounds per acre. This clover is allowed to grow for something over a year, or until corn-seeding time the following spring, when it is turned under with a shallow furrow along with the manure that will have been applied during the winter. After the corn has been harvested, the land is ploughed shallow and left till the next spring.

The crops on this rotation have not been very satisfactory this year. On 'A1' a crop of hay was grown. On 'A2' the crop grown was oats. The summer being very dry, the crop was light. 'A3' was under hay and gave a fair crop. The season being very dry, only one crop was harvested off each hay field. 'A4' was under corn and gave a very light crop on account of dry weather; a large part of 'A4' is sandy soil. 'A5' gave a very light crop of grain, due entirely to lack of moisture.

‘A’

Items of Expense in Raising Crop in 1908.								Particulars of Crop in 1908.						
Manual Labour.		Horse Labour.												
Hours Manual Labour.	Cost of Manual Labour.	Hours with Single Horse.	Hours with Team.	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 1908.
Hrs.	$ cts.	Hrs	Hrs	$ cts.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.	$ cts.	$ cts.
82	13 66	7	54	17 85	.....	104 32	210 47	.. ...	....	60,810	....	212 83	21 46	10 99
21½	3 58	2	95	29 03	5 68	103 26	11 84	10,760	11,612	....	....	130 83	14 70	2 86
102	17 00	4	30	10 00	......	101 46	9 95		......	52,640	....	184 33	18 26	8 31
147	24 50	9	121½	39 57	.. ...	224 87	24 56	......	....	....	269,730	269 73	29 48	4 92
20	3 33	2	199½	63 74	4 24	143 77	14 92	7,218	9,182	....	*16,000	114 54	11 89	3 03
372½	61 97	24	500	160 19	9 92	677 68	......	17,978	20,794	113,450	285,730	912 56	95 79	30 11
7·7	1 29	0·5	10·4	3 37	20	14 10	.....	376	434	2,371	5,972	19 07	2 00	63
16·9	2 59	5·88	9·48	4 45	26	14 94	......	595	845	2,452	6,288	23 48	.....	... ...

‘B’

73½	12 24	10	30½	11 65	......	96 77	9 68	......	......	46,980	....	164 50	16 45	6 77
20	3 33	2	80½	28 37	5 51	103 76	11 75	9,375	9,645	....	....	113 04	12 80	1 05
70½	11 75	14	41½	15 95	......	102 16	10 01	......	......	62,080	......	217 28	21 30	11 29
365	60 83	15	276½	86 76	......	222 18	24 28	......	......	....	237,110	237 11	25 91	1 63
19	3 17	2	176½	56 39	. ..	134 45	13 54	7,674	10,496	....	*6,000	106 72	10 74	2 80
548	91 32	43	605½	199 12	5 51	659 32	.....	17,049	20,141	109,060	243,110	838 65	87 20	23 54
11·3	1 90	89	1259	4 12	11	13 70	......	354	418	2,267	5,054	17 43	1 81	49
17·[illegible]	2 75	6·5	8·8	4 48	·29	15 14	......	576	1,007	2,534	5,759	23 28	......	....

**Green Feed.

Rotation ‘B.’

This rotation of five years’ duration includes grain, hay and corn or roots in the order named, the first crop of grain following a crop of corn or roots. Red clover 10 pounds, alsike 1 pound and timothy 5 pounds, is sown with the grain each time grain is sown. When grain follows hay, the land is ploughed in the early fall. When corn follows hay the land is ploughed in the spring, the spring growth of grass and clover being ploughed in along with the manure which will have been applied during the preceding winter.

The crops on this rotation were rather unsatisfactory. A large part of ‘B1’ consists of black muck, and hay, did not do well thereon this year. On ‘B2’ the grain suffered from the dry summer. Off ‘B3’ was harvested a good crop of mixed hay. ‘B4’ gave a small crop of corn on account of dry weather. The quality was excellent. ‘B5’ gave a very light crop of grain.

ROTATION

Lot.	Location.	Description of Soil. Sand.	Sandy loam.	Clayed loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in acres.	Crops. 1907.	Crops. 1908.	Rent and manure.	Seed, twine and use of machinery.
		p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	Ac.			$ cts.	$ cts.
D. 1	E. G. P. S. 2	20	80	....	....	....	....	....	2	Roots	Grain	12·00	3·08
D. 2	E. G. P. S. 4	20	80	....	....	....	....	....	2	Grain	Hay	12·00	·60
D. 3	E. G. P. S. 6	30	70	....	....	....	....	....	2	Hay	"	12·00	2·10
D. 4	E. G. P. S. 8	60	40	....	....	....	....	....	2	"	Roots	12·00	2·60
	Aggregate								8	....	....	48·00	8·38
	Average per acre in 1908								1	....	....	6·00	1 04
	Average for four years								....	....	....	6·00	1·19

ROTATION

Lot.	Location.	Sand.	Sandy loam.	Clayed loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in acres.	1907.	1908.	Rent and manure.	Seed, twine and use of machinery.
S. 1	E. G. P. S. 1	20	80	....	....	....	....	....	2	Roots	Grain	12·00	3·08
S. 2	E. G. P. S. 3	20	80	....	....	....	....	....	2	Grain	Hay	12·00	1·10
S. 3	E. G. P. S. 5	30	70	....	....	....	....	....	2	Hay	"	12·00	2·10
S. 4	E. G. P. S. 7	60	40	....	....	....	....	....	2	"	Roots	12·00	2·60
	Aggregate								8	....	....	48·00	8·88
	Average per acre in 1908								1	....	....	6·00	1·11
	Average for four years								....	....	....	6·00	1·21

Rotation 'D.'

(Deep Ploughing.)

This rotation is of four years' duration, and includes grain, two-years' hay, roots.

The grain crop follows roots, the root land being ploughed to a depth of about seven inches, after the roots are harvested in the fall. With the grain is sown 10 pounds red clover, 1 pound alsike 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. In the second hay year, two crops are cut if possible, and the land ploughed in August with a deep seven-inch furrow.

'D2' and 'D3': These two plots were under hay this year; they gave fairly good crops. 'D4': This plot like its fellow 'S4,' was under roots. The mangel seed came up well, but only a small crop was harvested on account of extreme drought.

'D1': This plot was under oats.

Owing to the very dry season the root crop on 'D4' shows a loss on work, &c.

'D.'

Items of Expense in Raising Crop in 1908.								Particulars of Crop in 1908.						
Manual labour.		Horse labour.												
Hours.	Cost of Manual labour.	Hours with single horse.	Hours with team.	Value of horse labour.	Threshing.	Total cost.	Cost for one Acre.	Grain.	Straw.	Hay.	Roots and Ensilage.	Total value.	Value of Crop per Acre.	Profit per Acre in 1908.
Hrs.	$ cts.	Hrs	Hrs	$ cts.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.	$ cts.	$ cts.
6	1·00	1	19⅓	8·73	1·38	26·44	13·22	2,356	2,674	....	....	28·90	14·45	1·23
19	3·17	3	9	3·45	......	20·72	10·36	......	... ..	10,360	....	36·26	18·13	7·77
17	2·83	1½	5	1·88	......	18·81	9·40	......	......	10,820	....	37·80	18·90	9·50
143½	21·53	20	70½	26·15	......	62·28	31·14	.. ..	....	....	59,810	59·81	29·90	*1·24
185½	28·53	25½	103⅚	40·21	1·38	128 25	......	2,356	2,674	21,180	59,810	162·77	81·38	.. ...
23	3·56	3	13	5·02	·17	16·03	.....	269	335	2,647	7,476	20·34	10·17	.....
37·7	6·71	6 9	10·7	5·26	·19	19·46	......	727	599	3,150	10,041	26·12	.. ..	......

* Loss.

'S.'

6	1·00	1	27½	8·98	1·32	25·06	12·53	2,245	2,585	....	....	27·62	13·81	·57
19	3·16	2½	9	3·32	......	20·58	10·29	.....	......	11,470	....	40·05	20·03	9·74
17	28·3	1½	5	1 87	......	18·80	9.40	......	......	10,945	....	38·50	19·25	9·85
149½	22·42	20	67½	25·25	......	62·27	31·14	......	......	......	55,500	55·50	27·75	*3·38
191½	29·41	25	109	49·42	1·32	126·71	.....	2,245	2,585	22,415	55,500	161·67	80·84	
24	3·67	3	13	6·17	·17	15·84	......	280	323	2,802	6,937	20·21	10·00	
45·7	6·74	8	10 6	5·47	·19	19·38	......	675	602	3,189	9,985	26·14		

Rotation 'S.'

(Shallow Ploughing.)

This rotation is four years' duration, and includes grain, two-years' hay, roots.

The grain crop follows roots, the root-land being ploughed (or cultivated) to a depth of about four inches after the roots are harvested in the fall. With the grain is sown 10 pounds red clover, 1 pound alsike 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. In the second hay year, two crops are cut if possible, and the land ploughed in August with a shallow four-inch furrow. If manure is applied before ploughing, a subsoiler should be attached to the plough to loosen up the subsoil to a depth of 8 or 9 inches. If manure is not applied, this end is attained by means of a strong deep-reaching cultivator after the sod has rotted in the fall, or the next spring.

'S2' and 'S3': These two plots were under hay this year. They gave fairly good crops.

'S4' like its fellow 'D4' was under roots. The mangel seed came up well, but only a small crop was harvested on account of drought.

'S1': This plot was under oats.

Owing to the very dry season the root crop on 'S4' shows a loss on work, &c.

ROTATION

Lot.	Location.	Description of Soil. Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in acres.	Crops. 1907.	1908.	Rent and Manure.	Seed-twine and use of machinery.
		p. c.	p. c.	p. c.	y. c.	p. c.	p. c.	p. c.	Ac.	1907.	1908.	$ cts.	$ cts.
E. 1.......	H. S. 1.....	40	40	....	15	5	....	....	14·00	Corn........	Grain.......	84 00	21 56
E. 2.......	L. S. 4.....	10	60	....	20	....	....	....	13·75	Pasture.....	Corn.......	82 50	21 27
E. 3.......	Moon......	30	60	5	....	....	....	....	14·00	Grain......	Pasture....	84 00	25 57
	Aggregate...........................								41·75	....	....	250 50	68 40
	Average per acre......................								1	....	....	6 00	1 64
	Average for four year....................								......	....	....	6 00	1 86

ROTATION

Z. 1.......	W. S. 2.....	40	40	...	....	15	5	....	6·00	Corn.......	Grain.......	36 00	9 36
Z. 2.......	L. S. 3	10	60	10	....	20	....	....	5·81	Hay..	Corn.......	34 86	9 45
Z. 3.......	Obs. S......	10	60	20	10	...	....	....	4·2	Grain.....	Hay.......	25 20	5 45
	Aggregate...........................								16·01	....	....	96 06	24 26
	Average per acre......................								1	....	....	6 00	1 51
	Average for four years..................								......	....	....	6 00	1 82

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 pounds red clover, 1 pound alsike clover, 5 pounds alfalfa and 5 pounds 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 'Z3.' 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. It was expected that the corn crop after the pasture would in a measure make up for the difference in favour of the no-pasture rotation 'Z,' but the returns are on the whole a good deal short of those from 'Z.'

Corn follows the pasture. Manure is applied during the fall and winter and turned under with the growth of clover and grass in the spring. Crops were all light in 1908.

'E.'

Items of Expense in Raising Crop in 1908.								Particulars of Crop in 1908.						
Manual labour.		Horse labour.												
No. of Hours.	Cost of Manual Labour.	Hours with Single Horse.	Hours with Team.	Value of Horse Labour.	Threshing.	Total Cost.	Cost for one acre.	Grain.	Straw.	Hay.	Roots and Ensilage.	Total Value.	Value of Crop per Acre.	Profit per Acre in 1908.
Hrs.	$ cts.	Hrs	Hrs	$ cts.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.	$ cts.	$ cts.
44	7 33	3½	135	46 65	10 24	170 78	12 19	17,421	23,529	....	....	221 25	15 80	3 61
407	67 82	60	343	122 67	......	294 26	21 40	......	... .	....	357,49	357 43	25 95	4 57
.....	.....	....	.. .	....	......	109 57	7 83	..	......	....	....	100 00	7 15	* 67
451	75 15	63½	478	589 32	10 24	574 61	.. ..	17,421	23,529	....	357,430	678 68	48 90	......
10·79	1 79	1·52	11·44	14 11	24	13 76	......	417	565	....	81,563	16 25	1 17	......
17·53	1 88	3·44	9 3	6 79	37	15 18	......	539	785	....	8,176	20 44	.. .	......

* Loss.

'Z.'

19	3 16	2	62	21 23	3 50	73 75	12 21	5,954	7,246	....	....	74 02	12 34	13
210	35 00	10	135	41 67	......	123 48	21 24	......	......	....	156,210	156 21	26 88	5 64
11	1 65	4	7	3 10	......	44 55	10 61	. ....	.....	22,360	.. ....	....	78 26	8 02
240	39 81	16	204	66 00	3 50	241 28	......	5,954	7,246	22,360	156,210	230 23	117 48	13 79
1·49	2 49	·99	12·7	4 16	21	15 07	......	372	452	1,396	9,757	14 38	7 33	86
53	2 97	....	7·9	3 79	18	12 35	.....	485	766	2,038	9,689	23 42	......	7 94

Rotation 'Z.'

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

Corn comes after the clover hay. The manure is applied during the fall or during the winter and spring, and the clover allowed to grow up through it, so facilitating the turning under the whole mass of manure and spring growth and late fall growth of clover, a few days before the corn is to be sown. The furrow turned is quite shallow, about five inches deep, and the land is then disc-harrowed, and the corn sown in rows 42 inches apart. It receives, later, the usual cultivation and care.

Grain follows corn, the land having been ploughed in the fall. With the grain there is sown 10 pounds red clover, 1 pound alsike and 5 pounds timothy seed. The hay is cut twice, and the last aftermath allowed to grow up to be turned under the next spring for corn. Such a rotation would be particularly valuable to a farmer having sufficient rough land for pasture, or to one desirous of keeping as many cattle as possible on the land at his disposal, supposing him willing to grow roots and corn. Crops all light in 1908.

ROTATION

Lot.	Location.	Description of Soil. Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in acres.	Crops. 1907.	1908.	Rent and manure.	Seed, twine and use of machinery.
		p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	Ac.			$ cts.	$ cts.
H. 1.......	H. S. 1.....	30	40	20	10	....	....	....	3·35	Pasture.....	Roots	20 10	2 50
H. 2.......	H. S. 2.....	25	45	20	10	....	....	....	3·15	Roots	Oat hay	18 90	4 09
H. 3..... .	H. S. 3.....	10	20	50	20	....	....	...	2·85	Oat hay	Pasture.....	17 10	2 85
		Aggregate.................							9·35	....	....	56 10	9 44
		Average per acre in 1908....							1·00	....	....	6 00	1 00
		Average for four years......							.....	....	....	6 00	1 00

ROTATION

Lot.	Location.	Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in acres.	1907.	1908.	Rent and manure.	Seed, twine and use of machinery.
T. 1.......	S. S. 1......	10	90	....	....	....	....	....	1·51	Pasture.....	Roots	9 06	1 98
T. 2.......	S. S. 2......	15	85	....	....	....	....	....	2·44	Hay & past'e	Hay........	14 64	3 19
T. 3......	S. S. 3......	....	100	....	....	....	....	....	3·27	Green crop & mangels	Hay & past'e	19 62	4 25
T. 4......	S. S. 4......	15	85	....	....	....	....	....	3·50	Oat& pea h'y	Hay..	21 00	14 00
		Aggregate.................							10·72	....	....	64 32	23 42
		Average per acre in 1908....							1·00	....	....	6 00	2 18
		Average for four years......							.....	....	....	6 00	1 44

Rotation 'H.'

(Hog-Farm.)

This rotation is of three years' duration, and includes roots, soiling crop and pasture in the order named. The land is ploughed late in the fall after it has been manured. It is disked the next spring and the roots sown on ridges. The roots receive the usual cultivation and are of varied character, including mangels, sugar mangels, sugar beets and turnips, devoted to pork production for the most part, the surplus being sold to cattle and the returns invested in meal for pig feeding.

The soiling-crop field is sown with various crops suitable for feeding to pigs. What is over and above the amount possible of consumption by pigs is charged to the cattle at $2 per ton and the returns used to purchase meal for pork production.

The pasture area is divided into several parts, the seed being sown, as far as possible, at the same time as the soiling crops the previous year, and not allowed to be eaten too close the first fall, although any good growth is not wasted.

'H1': This field was this year under roots, mangels, sugar beets and sugar mangels. Crop was very light.

'H2': This crop was in oat hay.

'H3': This plot was used for pasture.

'H.'

Items of Expense in Raising Crop in 1908.								Particulars of Crop in 1908.						
Manual Labour.		Horse Labour.												
Number of Hours.	Cost of Manual Labour.	Hours with Single Horse.	Hours with Team.	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 1908.
Hrs.	$ cts.	Hrs	Hrs	$ cts.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.	$ cts.	$ cts.
261	39 15	59	94	42 95	.....	104 70	31 25	....	......	....	80,720	80 80	24 11	*7 14
10	1 67	1	30	10 93	......	35 59	11 30	......	.... .	....	63,000	63 00	20 00	8 70
.... ..	.....	....	....	......	.....	19 95	7 00	....	.....	....	....	42 75	15 00	8 00
271	40 82	60	124	53 88	... ..	160 24	......	......	......	....	146,720	186 55	59 11	.... ..
29	4 36	6	13·2	5 76	.....	17 35	......	.. ...	......	....	15,659	19 95	6 00	....
44·3	6 79	6·21	9·2	4 41	....	17 53	......	84	166	840	18,762	26 27	......	....

* Loss.

'T.'

Number of Hours.	Cost of Manual Labour.	Hours with Single Horse.	Hours with Team.	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 1908.
165	24 75	38	67	29 60	......	60 84	39 76	......	......	....	60,250	60 50	39 53	* 23
24	4 00	4	8½	3 55	.....	25 38	10 40	.....	.....	12,025	....	42 09	17 25	6 85
20	3 33	2½	50	15 62	......	42 82	13 09	.....	......	4,100	....	44 35	13 55	47
6	1 00	2½	5	2 12	......	31 00	8 85	......	.....	15,925	... .	55 72	15 92	7 07
215	33 08	47	130½	49 89	.....	160 04	......	....	......	32,050	60,250	202 66	86 25	14 62
20	3 08	4·3	12·2	4 65	......	14 93	....	......	......	2,989	5,620	18 90	8 04	....
32	4 69	6·1	8·9	4 18	... ..	16 10	......	. ....	424	1,825	9,051	20 43	......	....

* Loss.

Rotation 'T.'

(Sheep Farm.

This rotation of four years' duration includes roots, grain, hay and pasture.

The area devoted to sheep farming is rather limited: about 10·72 acres. This area is not included in the '200-acre farm.' The whole field has been, for several years, 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.

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 ploughed in the fall.

Grain follows on 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, Brome grass (*Bromus inermis*) and timothy are the clovers and grasses used.

The crops on this rotation were very light this year.

CROPS OUTSIDE THE ROTATION EXPERIMENTS.

Besides the crops and fields reported upon below, there were grown upon the '200-acre farm' 4 acres of mangels and 8 acres of corn. A statement of the financial side of this 12 acres of crops is as follows:—

Cost to operate 12 acres	$162 87
Value of product, 242,560 pounds at $2 per ton	242 56
Profit	79 69

SEED GRAIN SELECTION.

An experiment to compare the values of seed oats (Banner) coming from regular field crops and those coming from the hand-selected seed plots, was carried on in 1908. A four-acre field was divided lengthwise into 16 plots of ¼ acre each and sown as below. The yield in pounds of clean grain is indicated in the first column. Seed was sown May 6, 1908, and harvested August 11.

RESULTS FROM SELECTED OAT SEED, 1908.

Plot.	Yield, lbs.	Source of Seed.	
1	224	C. E. F. seed.	Heads hand-picked, fanned and grain hand selected.
2	230	" "	Main crop 1907, fanned only.
3	273	" "	Regular run as sold, fanned only.
4	281	" "	Heads hand-picked and fanned only.
5	290	" "	Heads hand-picked and hand selected.
6	299	" "	Regular run as sold, fanned only.
7	329	" "	Same as No. 1.
8	337	" "	"
9	319	" "	"
10	325	" "	"
11	328	" "	Regular run as sold, fanned only.
12	331	Boyce "	From hand selected seed plot.
13	344	Dow Bros' "	From hand selected seed plot.
14	285	C. E. F. "	Regular run as sold, fanned only.
15	255	" "	Main crop 1907, fanned only.
16	187	" "	Same as No. 1.

All sown May 6. Cut August 11.

REPORT OF THE HORTICULTURIST.

(W. T. MACOUN.)

MARCH 31, 1909.

Dr. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the Twenty-second Annual Report of the Horticultural Division.

While all the experiments conducted in 1908-9 are not referred to in this report, there will be found the results of those which it is thought desirable to publish at this time. There is also contained in this report records of other matters pertaining to the work of this Division.

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

W. T. MACOUN,
Horticulturist.

CHARACTER OF SEASON.

Since the year 1898 a record has been kept in the Horticultural Division of the first day when the frost was out of the ground sufficiently and the ground dry enough to dig in the nursery at the Central Experimental Farm. The record is as follows: 1898, April 12; 1899, April 18; 1900, April 19; 1901, April 8; 1902, March 31; 1903, March 23; 1904, April 11; 1905, April 13; 1906, April 16; 1907, April 16; 1908, April 17. The average date for the eleven years is thus April 11. Leaving out the two exceptionally early dates in 1902 and 1903, the average date for the remaining nine years is April 15.

On April 9, 1908, there was still about a foot of snow on the level, but by the 15th it was all gone except in the drifts, and the frost was out of the ground. April was a cool month, the highest temperature being 66·5° F. on the 26th, and the lowest 5·5° F. on the 4th. The early part of May was cool and vegetation was very backward, but during the latter part of the month the weather was quite warm, the temperature being 86·8° F. on the 26th, and with abundance of rain the growth was rapid. The last spring frost recorded was on May 2, when the temperature was 30·8° F. There was noticeably less frosts than usual in the spring of 1908. By June 13 rain was needed, the grass being burnt in places. The strawberry crop began to show need of rain on the 22nd, and was considerably injured by the drought. The raspberries, which followed, were also much injured. From the latter part of June until October 24 there was never enough rain. There were some very hot days in June and July, the temperature rising to 92° F. on June 8, and 96° F. on July 30. There was heavy rain on July 21, which improved vegetation temporarily, but by August 1 rain was again badly needed. August was very dry. The highest temperature was on the 31st, when it was 90° F. By the middle of September the drought was so severe that ornamental trees lost some of their foliage and apples were dropping badly. The atmosphere was very smoky from extensive bush fires. The dropping of leaves and fruit became worse towards the end of the month. The first frost to kill tender plants was on September 30, although the thermometer at the Farm recorded only 34° F. The highest temperature in September was 95·8° F. on the 1st. The drought was broken by heavy rains on October 24. The highest temperature in October was 80·6° F. on the 17th, and the lowest, 27° F. on the 10th. The autumn was warm and dry, and there being no very severe frosts even throughout October, the season was very favourable for the ripening of grapes. Apples, however, matured prematurely and were not as good as usual. Snow fell on November 14, and was increased to about nine inches in depth by the 20th, but this was gone by the 27th, and there was no frost in the ground at that date. November was an open month and the weather and soil good for late ploughing. The weather became cold on December 1, and winter may be said to have set in on that date. By the 4th there was sleighing again. There were no very cold days during the winter, the lowest temperature being on January 13, when it was 18° F. below zero. The weather was very changeable, with frequent snowfalls. There were six thaws during the months of December, January and February. There was a good covering of snow all winter, notwithstanding the mild spells and little or no frost in the ground. On January 23 there was heavy rain, freezing as it fell, and trees and shrubs became thickly coated with ice. Many branches of ornamental and forest trees were broken, but few fruit trees were injured. The weather in March was very changeable, both rain and snow falling during the month. On the 31st there was still about a foot of snow on the ground.

FRUIT AND VEGETABLE CROPS.

The crop of apples was less than a medium one in Ontario and Quebec in 1908, and the premature ripening of the fruit, owing to the warm, dry weather, injured the keeping quality of it. The crop of pears was light except in southern Ontario, where it was a little above medium. The crop of early peaches was a medium one on the whole, and the quality good. Late peaches were a light crop. Plums were a light crop on the whole. The crop of cherries was medium to good in quantity, but the size below medium on account of the dry weather. There was an abundant and well ripened crop of grapes, very free of disease. Bush fruits were a good crop in southwestern Ontario, but in eastern Ontario and Quebec the crops were below medium on account of drought.

Strawberries were also plentiful in southwestern Ontario, but the crop was much reduced in eastern Ontario and Quebec by the drought.

At Ottawa there was a medium crop of apples, practically free of spot, but with more codling moth than usual, though the percentage of fruit affected was not large. The fruit ripened prematurely owing to the drought and heat. There was a medium crop of Americana and Nigra plums, and a few varieties of the European plums were well loaded. A few varieties of cherries bore medium crops, but on the whole the crop was light. The season was very favourable for the ripening of grapes, and while there have been larger crops in previous years there was in 1908 a medium crop of well matured fruit. Although the raspberries wintered well the crop was much reduced by the dry weather, making the yield below medium. Gooseberries and currants were a medium crop. Strawberries wintered well and promised a good crop, but the dry weather caused the yield of this fruit to be below medium also.

In the eastern part of Ontario, including the Central Experimental Farm, Ottawa, and in the province of Quebec, vegetables suffered somewhat from the severe drought of 1908. Potatoes, especially, were very light, and almost a total failure in some sections. Tomatoes ripened well in 1908 and the crop on the whole was good.

MEETINGS ATTENDED, PLACES VISITED, AND ADDRESSES GIVEN.

Every year some of the Horticulturist's time is spent in attending meetings of fruit, flower and vegetable growers, and in most cases delivering addresses at them. During the past year the following meetings were attended and addresses given:—

The annual meeting of the Ontario Fruit Growers' Association, Toronto, November 11, 1908; address, 'New fruits.' Annual meeting of the Ontario Horticultural Association, Toronto, November 11, 1908; address, 'Perennial borders.' Annual meeting of the Ontario Vegetable Growers' Association, Toronto, November 12, 1908; 'Irrigation and its effect on the growth of small fruits and vegetables.' Annual meeting of the Quebec Pomological Society, Macdonald College, Quebec, December 2 and 3, 1908; 'Some results in plant breeding.' Annual meeting of Fruit Growers' Association of Prince Edward Island, Charlottetown, P.E.I., December 8 and 9, 1908; 'Hardy varieties of fruits,' 'Top grafting in relationship to hardiness,' 'Judging fruit at exhibitions.' Annual meeting of Nova Scotia Fruit Growers' Association, Middleton, N.S., December 14, 15 and 16, 1908; 'The life history of an apple tree,' 'Judging fruit.' Annual meeting of New Brunswick Fruit Growers' Association, January 14 and 15, 1909; 'Hardy varieties of fruits,' 'Small fruits.'

In addition to these regular meetings, the short courses in horticulture at three of the agricultural colleges were attended and addresses given. At the Agricultural College, Truro, N.S., January 11, 12 and 13, 1909; 'Special methods for special conditions,' 'Ten forms of winter injury,' 'Strawberry culture.'

Ontario Agricultural College, Guelph, Ont., January 28 and 29, 1909; 'Propagation of fruit trees and other plants,' 'Judging fruits,' 'Pruning,' 'Top-working.'

Macdonald College, Que., February 9-11, 1909; 'Cultivation and care of a young orchard,' 'Management and care of a bearing orchard,' 'Improvement of plants,' 'Packages and marketing,' 'Ornamental trees and shrubs.'

From July 6 to 17, 1908, I was in attendance at the Graduate School of Agriculture at Cornell University, Ithaca, N.Y., and listened to between forty and fifty lectures on subjects pertaining to agricultural and horticultural science and practice, from which I obtained much useful information and inspiration to greater effort. On August 30 and 31, and September 1 and 2, I was with the Scottish Agricultural Commission at Niagara Falls, St. Catharines, Beamsville, Grimsby, Winona and Toronto, giving what information I could regarding the fruit districts and fruit growing in Canada.

ACKNOWLEDGMENTS.

It is possible, once a year, through the annual report, to make public acknowledgment of the aid given to me in my work by those who, in various capacities, are connected with the Horticultural Division, and I desire to refer especially at this time to Mr. J. F. Watson, secretary; Mr. H. Holz, foreman; Mr. T. Horn, foreman in the Arboretum and Botanic Garden; and Mr. Horace Reid, who keeps many of the fruit and vegetable records; all of whom have done their work well. The other men engaged in the work of the Horticultural Division have been faithful, willing and industrious.

I desire also to express my appreciation of the help given to me by horticulturists throughout Canada and the United States at all times when asked for.

DONATIONS.

The following list of plants, seeds, &c., donated to the Horticultural Division during the past year is published as an acknowledgment of the same and to constitute a record. Many valuable and interesting things have been donated to the Central

Experimental Farm during the past twenty-two years, some of which have been decided acquisitions:—

Sender.	Donation.
Aumiot. A., Anse à Arnas, France	Potatoes, 34 varieties.
Alexander, A., Hamilton, Ont.	Seed of Papaver umbrosum. Plants of Phlox.
Benson, Thos., Edmonton, Alta.	Potato seedling, Queen of Thanet, Queen of the North.
Botanic Gardens, Durban, Natal.	Collection of seeds.
Botanic Garden, Adelaide, Australia.	Collection of seeds.
Brand, W. H., Jordan Station, Ont.	Target Brand fungicide oil.
Chambers, Wm., Carnavon, Ont.	Scions of No. 1 and No. 2. Seedling apples.
Clarke, M. S.	New variety of potato.
Crow, J. W., O. A. C., Guelph, Ont.	Scions of Coos River Beauty Apple.
Dahl, Carl G., Atvidaberg, Den, Sweden.	Scions.
D'Arcy, Mrs. D., Sheenboro, Que.	Cuttings black currants.
Farwell, W. E., Orillia, Ont.	Seedling potatoes.
Gellatly, D., Gellatly, B.C.	Seeds of Crack Proof tomato.
Hodgson, G. D. Hudson, Que.	Scions of seedling apple and crab apple.
Herb, M., Naples, Italy.	Seeds of 5 varieties onions.
Johnston, Asa A., Cowansville, Que.	Scions Kinkead apple.
Little, Prof. E. E., Ames, Ia., U.S.	Buds of Angouleme and Timme cherries. Trees.
Leonard, E. K., Paradise, N.S.	Scions of apples.
Long, H. W., Milkish, N.B.	Sealsfoot potato.
Marks, John R., Clifton, P.E.I.	Scions of Golden Crown apple
Mode, D. G., Vankleek Hill, Ont.	Scions of late keeping apple.
MacDougall, Dr. D. T., Carnegie Institution, Tucson, Arizona, U.S.	Seeds of Œnothera Lamarkiana, and mutants.
McLennan, J. A., Lancaster, Ont.	Scions, No. 1 and No. 2, apples.
Niagara Sprayer Company, Middleport, N.Y., U.S.	Two samples Niagara Brand Concentrated Lime-Sulphur; ten gallons Lime-Sulphur Solution.
Phinney, Wm. S., Melvern Square, N.S.	Scions, Cox's Orange Pippin.
Peart, H. S., Jordan Harbour, Ont.	Canned goods.
Royal Botanic Gardens Silpur, near Calcutta, India.	Collection of seeds.
Porter, Mrs. R., Parry Harbour, Ont.	Potatoes.
Randall, J. de W., Niagara, Ont.	Figs.
Reid, Thos., Montreal, Que.	McDougall's Fruit Tree Wash and Insecticide.
Roeske, F. W., Ottawa, Ont.	Scions of seedling plums.
Rogers, J., Tilsonburg, Ont.	Potato, Rutling Rose.
Rowan, T., Macgregor, Man.	Scions, Willard plum.
Stevenson, E. B., Guelph, Ont.	12 plants King Edward Strawberry.
Smith, A. W., Beachville, Ont.	Potatoes, No. 1 and No. 2.
Smith, T., Shirley Falls, Ont.	Wonderful potato.
Smith, P. E., Roxham, Que.	Onion seed.
Schwerdtfeger, R., Morrisburg, Ont.	Scions of seedling apple.
Vroom, C. N., St. Stephen, N.B.	Scions of crab apple.
Wagner, L., Branch la Have, N.S.	Wagner Potato.
Wilson, F. W. Port Hope, Ont.	Scions of Choate apple.
Wilson, J. Lockie, Toronto, Ont.	Onion seeds.
Witzell, E., College Point, L.I., U.S.	Potatoes.

SEEDLING FRUITS OF CANADIAN ORIGIN RECEIVED FOR EXAMINATION IN 1907-8.

The number of seedlings sent in for examination in 1907-8 was not quite so great as during the previous year, but some very good seedlings were received and descriptions made of them. All originators of fruits in Canada are invited to send in specimens of promising fruits to the Horticulturist in order that they may be described and a record made of them. Some of the seedlings which have already been received are so promising that they may in time take the place of the present commercial varieties. There are new kinds fruiting every year, and it is important that their merits should be generally known as soon as possible.

Following are descriptions of those received during the past year. Full descriptions are published of the most promising and only partial descriptions of those not likely to prove valuable:—

SEEDLING FRUITS RECEIVED FOR EXAMINATION IN 1907-8.

Record Number.	Province.	Name and Address of Grower or Sender.	Description of Fruit.
			APPLES.
423	New Brunswick.	J. W. Stephenson, Fredericton.	'Burton.' See full description.
427	" ..	Henry Wilmot, Fredericton.	'Belmont.' See full description.
428	" ..	Dudley Currie, Masinquac.	See full description.
429	" ..	C. F. McLean, Upper Sheffield.	'Smith Pippin.' See full description.
430	Quebec.....	G. P. Hitchcock, Massawippi.	See full description.
431	"	Jules Lagace, Fraserville.	Below medium size, roundish to oblate; greenish yellow, washed with red on sunny side; subacid with a pleasant but not high flavour; quality above medium; season early to mid-winter; not large enough nor good enough in quality.
432	Ontario....	E. E. Middleton, Newcastle.	Above medium size, oblong, angular; yellow, well washed and splashed with crimson; subacid, not high flavour; quality good; season probably early to late winter.
433	"	Geo. Binnie, Bunessan...	Medium size, roundish; greenish yellow washed with pinkish red on sunny side; subacid with pleasant flavour; quality above medium to good; season mid to late winter; not quite good enough.
434	"	R. A. Marrison, Cataraqui.	'Frontenac.' Above medium size, roundish; yellow well washed attractive crimson; subacid with a pleasant but not high flavour; quality above medium to good; season evidently early to late winter; not quite good enough in quality.
435	"	T. H. Wootton, Williams Corners.	'Crown.' See full description.
436	"	C. L. Stephens, Orillia...	Below medium size, oblate; yellow well washed and splashed with crimson; subacid, pleasant flavour; quality good; season evidently early to mid winter. Has not as much flavour as either Fameuse or McIntosh.
437	"	T. M. Hipwell, Oro.....	Above medium size, roundish conical, angular; yellow well washed with bright crimson; subacid, pleasant flavour; quality above medium; season mid to late winter. Not good enough in quality.
438	"	F. Birdsall, Birdsall....	'No. 1.' Large, roundish, angular; yellow well washed with crimson; mildly subacid and with a rather peculiar flavour; quality above medium; season evidently December to mid or late winter. Not sufficiently promising.
439	"	F. Birdsall, Birdsall....	'No 2.' Medium size, yellow, splashed and washed with purplish red; quality evidently good but past condition; season evidently autumn to early winter.
440	"	H. N. Grant, Newtonbrook.	See full description.
441	"	R. Schwerdtfeger, Morrisburg.	'Red Cheek Dutch.' Medium size, roundish; pale yellow, almost white, washed with bright red on sunny side; acid with little flavour; quality medium; season mid October probably through November. Not promising.
442	British Columbia.	W. J. Green, Kaslo.	'Elvin.' Above medium size, roundish, greenish yellow, washed and splashed with deep purplish red; mildly subacid with a pleasant flavour; quality good; season evidently mid to late winter. Not sufficiently attractive.
443	" ..	J. H. Cockle, Kaslo.....	Large, roundish, slightly tapering and slightly angular; pale green well washed with deep crimson; briskly subacid, with little flavour; quality medium to above medium; season evidently November; not good enough in quality.
			PLUMS.
444	Ontario.....	Jos. Rowley, Cummings Bridge.	'Rowley.' See full description.
445	"	Wm. Judge, Orangeville	See full description.
446	"	" " ..	See full description.
447	British Columbia.	Jas. Tarry, Tarry's......	See full description.
			CHERRY.
448	" ..	A. P. Anstad, Traill....	See full description.

426. Burton Apple.—Above medium size; roundish to oblate; cavity narrow, medium depth, russeted; stem short, moderately stout; basin open, medium depth, slightly wrinkled; calyx quite open; yellow well washed with attractive crimson; predominant colour crimson; dots few, yellow, indistinct; skin thick, tough; core small; flesh dull white, rather coarse, firm, moderately juicy; subacid, sprightly, pleasant but not high flavour; quality above medium to good; season mid to late winter. A handsome apple and a promising New Brunswick seedling. Seed obtained from Nova Scotia by Mr. McLean; fruit obtained from J. W. Stephenson, Fredericton.

427. Belmont Apple.—Medium size, roundish, angular; cavity deep, medium width, russeted, mostly on one side; stem short, moderately stout; basin medium depth and width, wrinkled; calyx open; yellow with a slight reddish blush on sunny side; dots obscure; skin moderately thick, moderately tender; core medium; flesh dull white, tender, fine grained, juicy; briskly subacid, pleasant but not high flavour; quality above medium to good; season mid to late winter. Tree said to have been planted by the French about 100 years ago. Grown on farm of Henry Wilmot, Fredericton, N.B., and named Belmont after his farm. Received from Henry Wilmot, Fredericton, N.B.

428. Currie, Dudley, Masinquac, N.B., seedling from.—Above medium size; roundish, conic; cavity medium depth and width, russeted at base; stem short, moderately stout; dots few, yellow, distinct; basin open, shallow, wrinkled; yellow well washed and splashed with bright crimson; skin thick, moderately tough; core medium; flesh yellowish, firm, moderately juicy; subacid, pleasant but not high flavour; quality above medium to good; season mid to late winter. A promising seedling. Tree growing along a line fence without cultivation. Fruit sent by Wm. H. Moore, Scotch Lake, N.B., but grown by Dudley Currie.

429. Smith Pippin.—Medium size; roundish; cavity medium depth and width, russeted; stem short, moderately stout; basin open, deep, nearly smooth, sometimes lipped; calyx open; yellowish green with a red blush on sunny side; predominant colour yellowish green; dots moderately numerous, gray, distinct; skin moderately thick, moderately tender; flesh yellowish, crisp, tender, juicy; core small, closed; flavour pleasant to mildly subacid; quality good; season evidently mid to late winter. Specimens received from C. F. McLean, Upper Sheffield, N.B.

430. Hitchcock, G. P., Massawippi, Que., seedling from.—Large; roundish; cavity deep, medium width, russeted; stem short, stout; basin deep medium width, slightly wrinkled; calyx open; yellow or greenish yellow; predominant colour yellow; seeds medium; dots numerous, gray, conspicuous; skin moderately thick, tough; flesh white, tender, crisp, juicy; core medium; subacid, pleasant flavour; good quality; season mid to late winter. A seedling grown without care. A pleasant dessert apple. Would be quite promising if red. Specimens received from G. H. Hitchcock.

435. Crown.—Medium size; roundish conic; cavity deep, medium width, russeted; stem short to medium, stout; basin deep, medium width; calyx partly open; yellow well washed with crimson; predominant colour crimson; seeds medium size, deep brown, numerous; dots few, small, yellow, indistinct; skin moderately thick, moderately tender; flesh markedly yellow, crisp, tender, juicy; core medium size; subacid, sprightly, good flavour, somewhat like Northern Spy; good quality; season evidently mid to late winter.

Has grown up under a Northern Spy tree. Evidently a seedling of Northern Spy. Promising, although yellow flesh is not very attractive. Said to be higher coloured than Northern Spy, but is not so good in quality.

Specimens received from T. H. Wootton, Wellman's Corners, Ont.

440. Grant, H. N., Newtonbrook, Ont., seedling from.—Above medium size; roundish, conic; cavity open, medium depth; stem short, stout; basin medium width,

shallow, wrinkled; calyx partly open; yellow with a trace of pink on sunny side; dots numerous, green, indistinct; skin moderately thick, moderately tender; flesh yellowish, tender, juicy; core medium; subacid, pleasant flavour; quality good; season Nevember, probably to January.

A good dessert apple, but not specially attractive in outward appearance.

444. Plum—Joseph. Seedling from Joseph Rowley, sr., Cummings Bridge, Ont. —Form oval, flattened; very large; cavity shallow, medium width; suture a distinct line, not depressed; apex rounded almost pointed; yellow more or less washed and mottled with attractive red; dots numerous, yellow, distinct; bloom medium; skin moderately thick, moderately tender; flesh yellow, juicy; stone above medium size, oval, almost free; flavour sweet, rich, good; quality very good for an Americana plum.

An American plum of the largest size. Attractive in appearance and one of the best in quality. Very promising.

Came up in Mr. Rowley's garden in 1904. Bore in 1907 one plum. In 1908 two dozen plums. Measures 1½ inches around base 1908. No American plum trees near, but may have grown from a pit of American plum. September 24, 1908.

445. Plum Seedling from Wm. Judge, Orangeville, Ont.—Form goose egg shape; medium to above in size, 2 by 1⅝ inches; cavity shallow, medium width; suture a distinct line, not depressed; apex rounded; yellow tinged with green; dots numerous, indistinct; small, pale yellow; bloom whitish; skin moderately thick, tough; flesh greenish yellow, juicy; stone medium size, long, cling; sweet, rich flavour, quality good.

A plum somewhat between Yellow Egg and Coe's Golden Drop in shape. Promising.

446. Plum Seedling from Wm. Judge, Orangeville, Ont.—Form oval, slightly flattened at ends; size medium, about size of Lombard, 1½ to 1⅝ inches; cavity medium depth and width; suture a distinct line, very slightly depressed; apex slightly indented; dark purplish lilac; dots yellow, numerous, prominent; bluish bloom; skin thin but tough; flesh yellowish, moderately juicy, rather firm; stone medium size, roundish, cling; sweet, rich flavour. Quality good.

Much like Lombard in outward appearance but darker in colour and is of better flavour than Lombard. A promising plum if better than Lombard. Domestica group.

447. Plum Seedling from Jas. Tarry, Tarry's, B.C.—Form oval, slightly longer on one side than the other; size above medium to large, 1½ to 2 inches; cavity medium depth and width; stem medium length, slender; suture a distinct line, slightly depressed; apex flattened, slightly indented; dark purple almost black with a blue bloom; dots few, grey, indistinct; blue bloom, medium to heavy; skin thin, tough; flesh greenish yellow, juicy; stone above medium size, oval, cling; sweet, good flavour; quality good.

A promising plum; not very rich, but of good quality and of good size. Domestica group.

448. Cherry Seedling from Austad Emil, Trail, B.C.—Fruit large; heart shaped; cavity medium depth and width; stem long, 1¾ to 2 inches, slender; apex indented; suture an indistinct line; dark red or blackish showing brighter red through; dots obscure; skin moderately thick, tender; flesh dull red, meaty, juicy; stone medium size, cling; sweet, pleasant flavour; quality good; season evidently late July.

Seed planted in 1898 by A. P. Austad, Trail, B.C. A good cherry; evidently a Bigarreau.

NEW OR LITTLE KNOWN APPLES IN THE PROVINCES OF ONTARIO AND QUEBEC.

A great many named varieties of apples fruit every year in the orchards at the Central Experimental Farm, and from time to time descriptions are published in the annual report of those which it is thought would benefit and interest fruit growers in Canada. Following are descriptions of a few of these varieties:—

Crimson Beauty.—Below medium size; roundish to oblate; cavity deep, open; stem long, slender; basin open, deep to medium; calyx closed; yellow well washed and splashed with bright red; dots obscure; skin thin, tender; flesh white tinged with red, moderately juicy; core medium; acid; medium quality; season evidently mid August.

Taken from an orchard on the old Sharpe Farm, Woodstock, N.B., and called Crimson Beauty by the late Mr. Sharpe. Said to be in all the fruit stores in Woodstock. Specimens received from E. D. Smith, Winona, Ont. Procured at Woodstock, N.B.

Dodd.—Above medium size; oblong; cavity shallow, medium width; stem short, stout, sometimes lipped; basin medium depth and width, almost smooth; calyx open; yellow, splashed and streaked with bright crimson; dots obscure; skin moderately thick, tender; flesh white, crisp, tender, juicy; core medium; subacid, pleasant flavour; quality good; season mid winter.

An apple of the Gravenstein type which appears to do well on Prince Edward Island. A good apple.

Specimens received from A. McRae, Pownall, P.E.I.

Dyer (Pomme Royale).—Medium to above medium in size; oblate; cavity medium to deep, medium width; stem medium length, moderately stout; basin deep, medium width; calyx closed; greenish yellow often with a faint bronzy blush; dots numerous, grey, distinct; skin moderately thick, very tender; flesh white, tender, melting, juicy; core medium; seeds rattle; subacid, spicy, high, pear-like flavour; best quality; season late September to mid October.

One of the best flavoured apples of its season.

La Salle.—Medium to above medium size; roundish to almost oblong, slightly angular; cavity medium depth, medium width to open; stem short to medium, stout; basin deep, open, slightly wrinkled; calyx open; greenish yellow, splashed and washed with rather dull red mostly on sunny side; dots obscure; skin moderately thick, tough; flesh dull white, tender, juicy; core rather large; subacid, not high flavour; above medium quality; season evidently mid to late winter.

Originated on the Fraser farm, Lachine, P.Q. Was called Macdonald for a few years by one of the nursery firms.

Pensaukee Russet.—Above medium size; oblate conical; slightly angular; cavity open, medium depth; stem medium length, stout; basin medium depth and width, smooth; calyx partly open; greenish yellow, heavily russeted, with a red blush on sunny side; dots obscure; skin moderately thick, tender; flesh yellow, firm, juicy; core rather small to medium; briskly subacid, pleasant flavour; good quality; season mid to late winter.

A handsome russet apple which may prove useful. Larger than Golden Russet, and tree seems hardier.

Rufus.—Medium size; roundish conical; cavity narrow, shallow to medium, russeted; stem short, slender; basin narrow, medium depth, wrinkled; calyx partly open or closed; yellow well washed with crimson; dots moderately numerous, yellow, rather indistinct; skin moderately thick, moderately tender; flesh white with traces of red, tender, moderately juicy to juicy; core medium; subacid, pleasant not high flavour; above medium to good in quality; season December and through the winter.

An attractive looking apple of the Fameuse type. A promising apple for this district.

Specimens received from Miss Joan Matheson, Perth, Ont.

Trenton.—Medium to above medium size; roundish conical; cavity deep, medium width, russeted; stem medium length, slender; basin open, medium depth, wrinkled; calyx open; yellow, washed and splashed with deep rather dull red; dots obscure; bloom pink; skin moderately thick, tender; flesh yellowish, rather coarse, crisp, breaking, tender, moderately juicy; core above medium; subacid, pleasant flavour; good quality; season late September to early October.

Not as attractive looking an apple as Wealthy, nor as long a keeper. Season just before Wealthy here, and may be useful on this account. Originated by P. C. Dempsey, Albury, Ont. A cross between Northern Spy and Golden Russet.

APPLES ORIGINATED IN THE HORTICULTURAL DIVISION, CENTRAL EXPERIMENTAL FARM, OTTAWA.

There were 249 varieties of seedling apples fruited in the Horticultural Division in 1908 that had never fruited before, making a total of 434 with those which had fruited since 1903, when the first tree of the seedlings planted in 1900 bore fruit. There were quite a number of good varieties among those which fruited in 1908, but only five were named. The descriptions of these follow. Since publishing descriptions of the Junco and Eric apples in the Report for 1907-8, it has been found that these varieties had already been described under other names, hence the names and descriptions of Junco and Eric are cancelled.

Cromer (Swayzie Seedling).—Above medium size; roundish, angular; cavity medium depth and width; stem short, stout; basin medium depth and width, slightly wrinkled; calyx open; green, thinly washed with pinkish red over most of surface; dots few, grey, distinct; skin thick, tough; flesh yellowish, firm, crisp, moderately juicy; subacid, pleasant, spicy flavour; quality good to very good; season late winter.

Does not resemble Swayzie except somewhat in spicy flavour. Of Ribston type.

Danville (Lawver Seedling).—Above medium size; conical to oblong conical; cavity medium depth and width, russeted; stem short, moderately stout, basin open, deep, almost smooth; calyx open; greenish yellow well washed with deep crimson; dots few, yellow, distinct; skin moderately thick, moderately tough; flesh yellowish, tender, juicy; core medium; subacid, sprightly, pleasant flavour; good quality; season late November, probably to late winter.

Resembles Lawver a little in colour and in smoothness of skin. Flesh is tender and of somewhat same character as Lawver. Seed not so large as Lawver.

Melba (McIntosh Seedling).—Large; roundish, slightly angular; cavity medium depth and width; stem short, stout; basin deep, medium width, wrinkled; calyx open; pale yellow well washed and splashed with bright crimson; dots few, white, indistinct; bloom slight, bluish; skin moderately thick, moderately tough; flesh white, tender, crisp, juicy, perfumed; core medium; briskly subacid, pleasant, slightly aromatic flavour; good quality; season early to mid September.

A handsome apple of good quality. Resembles McIntosh somewhat about cavity, also in character of flesh and perfume and in aromatic flavour. May prove useful as following Duchess.

Pinto (Wealthy Seedling).—Above medium size; oblate; cavity deep, medium width; stem short, slender; basin deep, medium width, wrinkled; calyx closed; pale greenish yellow washed and splashed with dull orange red; dots few, small, yellow, distinct; skin thick, tough; flesh yellowish, tender, juicy; core medium; briskly subacid, pleasant, aromatic flavour; good quality; season late October, probably through November.

A good deal like Wealthy in flesh, also suggestive of Wagener. Later than Wealthy. Promising.

Radnor (Swayzie Seedling).—Above medium to large; roundish, slightly angular; conic; cavity medium depth and width, russeted; stem short, stout; basin deep, medium width, wrinkled; calyx open; greenish yellow to yellow with a faint bronzy pink blush; dots moderately numerous on sunny side, green, distinct; skin thick, moderately tender; flesh dull white or yellowish, crisp, juicy, a little coarse; core medium; subacid, spicy, high flavour; good quality; season evidently November and later. A promising apple on account of size, flavour and firmness.

CHARACTERISTICS OF WEALTHY APPLE SEEDLINGS.

The Wealthy apple is such a well known variety in North America and has proved itself so generally desirable, that it is thought it will prove useful and interesting to record at this time some of the characteristics of seedlings of the Wealthy fruited at the Central Experimental Farm, Ottawa, Canada.

In the year 1898 seed was saved from Wealthy fruit grown at Ottawa. No special selection was made of the fruit, though seed was not taken from poor or small fruit. The male parent or parents being unknown; but as the Wealthy trees grew near trees of the Duchess of Oldenburg it is probable that in some cases the Wealthy was pollenized by that variety, although from the fact that the Wealthy is self-fertile it is likely that a large proportion of the flowers were self-fertilized.

The seeds were sown in the autumn of 1898. They germinated the following spring, and the trees were set out in nursery rows in the spring of 1899. In the spring of 1901 and 1902 there were 153 in all of the best trees planted out. Most of these were planted 15 feet apart, but about one-third of them were planted 10 feet apart. Of the 153 trees set out only 11 have died or been winter killed, and there have been some severe winters since they were planted. Of the 142 remaining trees, 98 have fruited, and it is interesting to note when these trees began to bear. One tree fruited in 1903, five years after sowing the seed; one tree fruited in 1904, 19 in 1905, 22 in 1906, 11 in 1907 and 44 in 1908. Of these 98 seedlings, 93 have been described; descriptions having been made of good and bad alike. It is from the data available on our description blanks that the following results have been tabulated.

Some of the outstanding characteristics of these Wealthy seedlings are: First, the hardiness of the trees, most of them appearing to be equal or superior to Wealthy in hardiness; second, their early bearing habit; third, their great productiveness; fourth, the very large proportion of seedlings bearing marketable fruit; fifth, the general resemblance to Wealthy in a large proportion of the seedlings, particularly in colour and the rounded, regular outline of the fruit and character of flesh.

While fuller descriptions were taken, the characteristics given here refer only to size, form, colour, acidity, quality, season and degree of resemblance to Wealthy. All the descriptions were made by the writer, hence, as near as possible, the same standard was followed throughout, but even so, the descriptions of the characteristics dealt with may not always be true, as one's opinion in regard to acidity or flavour, for instance, may vary somewhat from one year to another. With the majority of the seedlings, however, the description taken one season has been confirmed or altered in a second season, and sometimes in a third season, in order that it might be as accurate as possible.

The fruit of the Wealthy itself as grown at Ottawa may be described as medium to almost large on young trees; roundish; yellow well splashed and washed and sometimes completely covered with crimson; flesh yellowish, sometimes tinged with red, crisp, tender, juicy, briskly subacid with a pleasant aromatic flavour; quality good to very good; season late September, October and November.

In the following table are given the percentages of different characteristics, based on the descriptions of 93 seedlings:—

CHARACTERISTICS OF NINETY-THREE WEALTHY APPLE SEEDLINGS.

Size—	Per cent
Small	6·45
(Distinctly crablike, 5·37.)	
Below medium	16·12
Medium	40·86
Above medium	26·88
Large	9·67
	99·98

Wealthy is medium to almost large.

Form—	Per cent.
Oblate	30·01
Roundish	64·62
Conical	2·15
Oblong	3·22
	100·00

Wealthy is roundish

Colour—	Per cent.
Green or yellow	0·00
Splashed or washed with crimson and red	79·56
" " pink or pinkish red	5·37
" " orange or orange red	15·05
	99·98
Percentage dull red	21·50

Wealthy is yellow, splashed and washed with crimson.

Acidity—	Per cent.
Sweet	16·12
Mildly subacid	1·07
Subacid	34·40
Briskly subacid	38·70
Acid	9·67
	99·96

Wealthy is briskly subacid.

Quality—	Per cent.
Below medium	4·30
Medium	30·10
Above medium	46·23
Good	19·35
	99·98

Wealthy is good to very good.

Season—	Per cent.
August-mid September	27·95
Mid September-October	30·10
October-November	23·65
December-February	8·60
December-April	9·67
	99·97

Wealthy is in season late September, October and November.

Resemblance to Wealthy, more or less—	Per cent.
In outward appearance	62·22
In flesh	45·55
In flavour	14·44
No resemblance	22·58
(Percentage in this case based on 90 seedlings.)	

Marked resemblance to Wealthy—	Per cent.
In appearance	21·11
In flesh	14·44
In flavour	3·33
In appearance and flesh	11·11
In appearance, flesh and flavour	2·22(*)
(Percentage in this case based on 90 seedlings.)	

(* Same season as Wealthy.. .. .. 1·11
Later season than Wealthy.. .. .. 1·11)

There are some interesting facts brought out in this table. Although Wealthy is said to have been grown from 'cherry crab seed' only 5·37 per cent of the seedlings, or 6 out of the 93 described, was distinctly crablike. The fact that 93½ per cent of the seedlings was large enough to be marketable is worthy of note. It is remarkable that not one of the seedlings was entirely green or yellow, all having more or less red. It is interesting to note that over 15 per cent was orange or orange red in colour. In this connection it may be stated that quite a number of the seedlings had the peculiar flavour of Sops of Wine or Haas, which are of this colour, and while the Sops of Wine or Haas were in the same orchard with the Wealthy trees they were a considerable distance away. It will be noticed that over 16 per cent of the apples was sweet, while only one per cent was mildly subacid. There was over 65 per cent of the seedlings above medium and better in quality, which is a remarkably large proportion, we think. Over 23 per cent of the seedlings was about the same season as Wealthy, and over 18 per cent later, which is encouraging in the breeding of hardy winter apples. The large proportion of apples which bear more or less resemblance to Wealthy is worthy of note.

INDIVIDUALITY OF APPLE TREES AS SHOWN IN THE ORCHARDS AT THE CENTRAL EXPERIMENTAL FARM, OTTAWA.

There is a growing interest in the individuality of plants, and breeders of fruits are now paying considerable attention to this interesting subject. Since the year 1898 records have been kept of the yields from each apple tree in the orchards at the Central Experimental Farm. These records show that there has been a marked difference in the yields of trees of the same variety planted in the same year and in about the same kind of soil. In some cases there have been only a few trees of a variety for comparison, but the difference in yield even between two trees has been very marked. There is as yet little data to show whether these characteristics will continue in trees propagated from them, but young trees are now growing at the Experimental Farm propagated from the best and the poorest yielders, and some useful information may be obtained in the future. A few trees have also been top grafted.

The following tables will show the marked differences in yields between trees of the same age planted at the same time:—

APPLES, WEALTHY—Planted 1896—Yield in Gallons.

Tree.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	Total Yield, 1899-1908.
1	1·0	2·25	2·75	15·0	......	17·0	1·0	15·0	....	17·0	71
2	2·0	·5	2·5	12·0	......	14·0	8·0	2·75	Dead.	......	41·75
3	1·75	12·0	2·25	8·0	......	6·5	7·0	Dead.	....	......	37·5
4	9·0	2.25	15·5	20·5	27·0	1·0	28·0	1·5	25·0	24·5	154·25
5	7·5	6.5	7·75	23·0	7·5	23·0	13·0	14·0	....	14·5	116·75
6	3·25	6.5	3·5	24·0	......	17·5	5·0	11·5	....	9·5	80·75
7	7·5	1.0	10·0	19·0	16·0	......	19·0	......	1·5	6·5	80·5
8	......	8.5	·5	21·5	......	10·0	5·0	3·5	3·5	6·0	58·5
9	......	11·25	·25	27·5	......	21·0	20·0	2·25	5·0	8·5	95·75
10	1·0	12·25	......	30·0	......	17·5	8·0	1·75	10·0	4·75	85·25
11	1·25	11·25	......	21·5	......	31·0	10·0	18·5	....	11·5	105·0
12	......	7·5	......	18·5	2·0	13·5	13·5	2·5	Removed.	......	57·5
13	4·25	6·25	4·5	20·0	0·5	20·5	19·0	1·25	3·0	4·75	84·0
14	2·5	5·5	0·5	34·0	......	17·0	8·0	14·0	0·5	13·0	95·0
15	......	2·25	3·5	21·5	8–5	31·5	16·0	25·0	....	15·5	123·75
16	3·0	2·25	4·0	22·5	4·5	16·5	23·5	1·75	14·0	12·5	104·5
17	......	2·0	1·0	22·5	......	8·5	16·0	......	7·5	1·5	59·0

APPLES, McMAHAN WHITE—Planted 1888—Yield in Gallons.

Tree.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	Total Yield, 1898-1908.
1	62·0	......	83·0	2·0	147·0	1·5	141·0	40·0	124·0	11·0	142	753·5
2	42·0	1·0	6·0	12·5	98·0	23·0	116·0	30·0	114·0	17·0	120·0	579·5
3	32·0	29·0	49·0	18·0	55·0	63·5	56·0	108	9·0	84·0	12·0	515·5
4	35·0	......	34·5	4·0	63·0	34·0	67·0	69·0	49·0	31·0	73·0	459·5
5	......	37·5	55·0	49·0	......	61·0	......	98·0	......	54·0	......	354·5
6	29·0	4·5	46·0	0·5	69·5	43·0	72·0	96·0	75·0	52·0	81·0	568·5
7	0·5	9·5	19·5	4·0	19·0	39·5	14·0	37·0	......	20·0	......	163·0
8	7·0	9·0	27·0	9·0	53·0	15·5	54·0	35·5	64·0	21·0	96·0	391·0

APPLES, McINTOSH RED—Planted 1890—Yield in Gallons.

Tree.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	Total Yield, 1898-1908.
1	17·5	26·0	37·0	6·5	71·5	94·0	12·0	109·0	3·0	109·0	16·0	501·5
2	1·0	9·5	10·5	1·0	37·5	31·0	6·0	72·0	6·0	23·0	33·0	230·5

APPLES, PATTEN GREENING—Planted 1892—Yield in Gallons.

Tree.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	Total Yield, 1898-1908.
1	27·0	2·0	35·0	1·5	71·0	15·0	84·0	34·0	92·0	3·0	138·0	502·5
2	2·0	6·0	14·0	19·0	24·0	55·5	7·5	66·0	......	82·0	......	276·0
3	2·0	31·0	1·5	40·5	22·0	67·0	26·0	69·0	0·5	71·0	6·0	336·5
4	13·0	......	6·5	......	12·0	15·0	45·0	45·0	13·0	48·0	12·0	209·5
5	1·0	......	19·0	0·5	17·5	21·0	54·0	75·0	0·5	74·0	......	262·5

PLUMS.

Owing to the failure of the European and Japanese plums to produce fruit except in favourable seasons over a large part of Ontario and the province of Quebec, more attention is now being paid to the improved varieties of native and Americana plums, but not nearly as much interest is being shown in them yet as they deserve. The native wild plum, *Prunus nigra,* is represented by such varieties as Aitkin, Cheney, and Odegard, although these were originated in the United States. While not as high in flavour as some of the varieties of *Prunus americana,* the trees of the native varieties are much tougher than the Americanas, and do not break down as easily, the breaking of the trees in winter being a great weakness in some of the best varieties of the Americana plums. The thick, tough skin of most of the Americana varieties is the chief drawback to their more general use as canned fruit, but by removing the skin by steaming before canning this objection may be overcome. The varieties of Nigra plums have thinner skin than the Americana and are better for canning on this account. The native plums in eastern Ontario are, however, usually badly affected with the spot or blight of the native plum—*Cladosporium carpophilum*—but by thorough spraying with Bordeaux mixture this can be controlled.

Among the varieties on the market the following, in order of ripening, are among the best:—

Americana and Nigra Plums.—Aitkin, Bixby, Mankato, Cheney, Wolf, Admiral Schley, Brackett, Hawkeye, Stoddard. The Omaha, a plum of hybrid origin, is very promising.

GRAPES.

The season of 1908 was one of the most favourable for grapes that has been experienced during the past twenty-one years, and during the dry, warm autumn the grapes ripened well, 118 varieties having matured. The crop was, however, not so heavy as in 1907, although there was a fair amount of fruit.

One seedling of unknown parentage, but of decided merit, fruited this year. It has been called MacTavish.

MacTavish.—Ripe September 23, 1908. Bunch below medium to small, broad, very compact, rarely slightly shouldered. Fruit medium size, roundish, pale green, slightly tinged with purple when exposed to sun; skin thick, tough; pulp tender but does not separate readily from seeds, which are rather large and usually three to a fruit; juicy, sweet, good flavour, slightly foxy. Quality good to very good. Productive. Owing to its earliness and good quality this should prove a useful grape in the north.

BUSH FRUITS.

Although the raspberries wintered well during 1907-8 and gave promise of a good crop of fruit, it was reduced below medium by the extreme drought of July. The gooseberry crop was also below medium. The mildew did not affect the English varieties as much as usual. The crop of currants was but a medium one. The older plantation set out in 1899 was rooted up in 1908 after the fruiting season was over. As the bulletin on bush fruits was so recently published no details are given in regard to varieties in this report.

STRAWBERRIES.

There is no fruit of which there are so many new kinds offered for sale each year as the strawberry, and as it takes several seasons to determine whether a variety is a valuable addition or not there is always a large number of sorts under test at the Experimental Farm. In 1908 there were 207 kinds in the experimental plots.

There was a very severe drought during the strawberry season of 1908, and the crop from this cause was much reduced both in size of fruit and in total yield. The effect of the drought was much more apparent on some varieties than on others. A record was made of those which showed the greatest resistance to drought by holding fruit of good size longest. As the early varieties had matured a large part of their fruit before the drought affected the plants very much, the following kinds which were most resistant when the drought was greatest are for the most part medium and late:—

Armstrong, Barton's Eclipse, Beidler, Big Bobs, Buster, Commonwealth, Clyde, Daniel Boone, Dora, E. H. Ekey, Gandy, Giant, Gibson, Glen Mary, Governor Rollins, Great Ruby, Greenville, Hatch Experiment Station, Hood River, Hero, Joe, Luxury, Miller, Mrs. Cleveland, Mrs. Fisher, Mrs. Miller, Murray, Nettie, New Dominion, New Globe, Parson's Beauty, Pennell, Pocomoke, Ridgeway, Robbie, Ruby, Scarlet Ball, Seedling from C. H. Smith, Yarmouth, N.S., Stevens' Late Champion, Sunnyside, Tennessee Prolific, Uncle Jim and Williams.

Of these varieties the most productive are Barton's Eclipse, Big Bobs, Buster, Daniel Boone, Dora, Glen Mary, Greenville, Pocomoke, Tennessee Prolific and Williams.

There were few promising new named sorts fruited in 1908, none of them being promising enough to make it likely that they will take the place of the varieties which have been recommended for the past few years.

Some very promising seedlings of the Bubach and Wm. Belt strawberries originated at the Central Experimental Farm are being thoroughly tested and compared with the varieties above mentioned.

VEGETABLES.

The tests with vegetables continue to be an important part of the work of the Horticultural Division. Varieties have been very thoroughly tested, and each year the new kinds are compared with those which have been found to be the best of the older ones. Several lines of work are in progress with a view to finding out the value of selection in raising home-grown vegetable seeds. The results of selecting the tomato are given in this report. The potato is such an important crop that each year considerable space is devoted to that vegetable in this report.

It has been found that the 'List of best vegetables for farmers,' published from time to time in the annual report is much appreciated. It was published last in the report for 1906, and is reprinted again with the few changes deemed necessary.

FARMERS' LIST OF BEST VEGETABLES.

The results of variety tests of vegetables for the past eighteen years are summarized in the following table, where a list is given of the varieties of each kind of vegetable which are considered the best to plant.

Asparagus.—Conover's Colossal is the best all round variety, but this is more subject to rust than Palmetto or Argenteuil.

Beans.—Round Pod Kidney Wax, Keeney's Rustless Golden Wax or Wardwell's Kidney Wax, for early crop; Early Refugee for medium; and Refugee or 1,000 to 1, for late crop, are the most satisfactory dwarf varieties. Asparagus, Lazy Wife and Old Homestead are three of the best pole varieties.

Beets.—Egyptian Turnip, Meteor and Eclipse are three of the best.

Borecole or Kale.—Dwarf Green Curled Scotch is the best.

Broccoli.—White Cape.

Brussels Sprouts.—Improved Dwarf is the most satisfactory.

Cabbage.—Early Jersey Wakefield (early), Succession (medium), Late Flat Dutch, Houser, Drumhead Savoy (late), Red Dutch (red), is a select list of the best varieties of cabbage. For extra early use, Paris Market is desirable, being a week earlier than Early Jersey Wakefield.

Cauliflowers.—Early Dwarf Erfurt and Early Snowball.

Carrots.—Chantenay is one of the best, but if a good extra early sort is required the Early Scarlet Horn can be planted with advantage. It is a small variety.

Celery.—Golden Self-Blanching (Paris Golden Yellow), Improved White Plume (early), Perfection Heartwell, Triumph, Winter Queen, French's Success, London Red (late), are among the best.

Corn.—Early Fordhook, Early Cory (early), Crosby's Early, Golden Bantam, Henderson's Metropolitan (second early), Perry's Hybrid, Stabler's Early, Early Evergreen, and Black Mexican (medium), Stowell's Evergreen, Country Gentleman (late). In planting, the Country Gentleman should not be omitted, as it lengthens the season very considerably and is of fine quality. Golden Bantam is the best second early for home use.

Cucumbers.—Peerless White Spine or White Spine, Cool and Crisp, and Giant Pera are three of the most satisfactory slicing varieties. Boston Pickling and Chicago Pickling are good pickling sorts.

Egg Plant.—New York Improved and Long Purple succeed best.

Lettuce.—Black Seeded Simpson, The Morse (early curled); Iceberg, New York, Giant Crystal Head, Crisp as Ice, and Improved Hanson (curled cabbage); Improved Salamander (cabbage); Trianon and Paris (Cos lettuce).

Melons, Musk.—Long Island Beauty, Hackensack and Montreal Market, of the Nutmeg type; Surprise, Emerald Gem and Paul Rose, of the yellow fleshed types, are all good.

Melons, Water.—Cole's Early, Salzer's Earliest, Ice Cream, Phinney's Early are good early water melons.

Onions.—Yellow Globe Danvers and Large Red Wethersfield are two of the best onions in cultivation.

Parsnips.—Hollow Crown and Dobbie's Selected are both good sorts.

Parsley.—Double Curled is as good as any.

Peppers.—Cayenne, Chili and Cardinal are three of the best.

Pease.—Gregory's Surprise, Thos. Laxton, Gradus, American Wonder, Premium Gem (early); McLean's Advancer, Nott's New Perfection, Heroine (medium). None of these are tall growing varieties. Stratagem, Juno (dwarf), Telephone (late). Excelsior (Sutton's) is a promising second early sort.

Potatoes.—Extra early: Rochester Rose, Early Ohio, Early Andes (pink), Bovee (pink and white), Burpee's Extra Early, Eureka Extra Early, Early Petoskey (white). Early: Early White Prize, Irish Cobbler (white), Vick's Extra Early (pink and white). Main crop: Carman No. 1 (white), Dooley (white), Vermont Gold Coin (white), Money Maker (white), Burnaby Mammoth (pink and white).

Radishes.—Early: Scarlet White-tipped Turnip, Rosy Gem, French Breakfast, Red Rocket (red), Icicle (white). Late: White Strasburg, Long White Vienna. Winter: Long Black Spanish, Chinese Rose-coloured.

Rhubarb.—Linnaeus, Victoria.

Salsify.—Long White, Sandwich Island.

Spinach.—Victoria, Thickleaved.

Squash.—Early: White Bush Scalloped, Summer Crook Neck. Late: Delicious, Hubbard.

Tomatoes.—Early: Sparks' Earliana, Chalk's Early Jewel, Dominion Day. Main crop: Brinton's Best, Trophy, Matchless (scarlet), Burpee's Climax, Autocrat, Livingston's Globe (purplish pink).

There are many varieties of tomatoes which are almost equal in excellence and productiveness.

Turnips.—Early; Extra Early Milan, Red Top Strap Leaf.

Swedes.—Champion Purple Top, Skirving's Improved.

POTATOES.

The year 1908 marked the third season in succession which has been unfavourable to the potato crop. There was never enough moisture for the potatoes from the middle of June until the vines died, notwithstanding thorough cultivation. A severe attack of thrips, which it seemed impossible to control satisfactorily, also checked the growth of the vines. The vitality of the seed, which must have been considerably lowered by the previous dry seasons and premature ripening, doubtless also had an unfavourable effect on the crop. While the yields were not large, the tubers which formed were clean, and most of them of good marketable size.

The potatoes in the uniform test plots were planted on May 21 in sandy loam soil which had been manured the year previously for corn. The ground was thoroughly prepared by ploughing and harrowing, after which the drills were opened 30 inches apart with the double mould board plough. Sixty-six sets of each variety, having at least three good eyes, made by cutting the potatoes, were dropped one foot apart in the rows. These sets were covered with the hoe. The land was harrowed just as the potatoes began to come up, to kill weeds. Thorough cultivation was given at intervals until the vines of most varieties covered the ground, practically level cultivation being adopted, there being but a little soil drawn towards the plants. The vines were sprayed with Bordeaux mixture six times and Paris green was used to destroy the potato beetles. The potatoes were dug on October 5. There was very little scab or rot. A much larger number of varieties than usual were tested in the uniform plots this year, 154 sorts being grown. Tables follow of the twelve varieties which have averaged highest in yield for the last five seasons, and the thirty most productive sorts in 1908.

TWELVE Most Productive Varieties of Potatoes; Average of Five Years, 1904-8.

Number.	Name of Variety.	Number of Years under Test.	Season.	Colour.	Quality.	Average Yield per acre, 1904-1908. Bush.	Lbs.
1	Dooley	8	Medium	White	Good	268	24
2	Carman No. 1 (new stock)	5	Medium late	"	"	267	31
3	Vermont Gold Coin	6	"	"	"	263	7
4	Rural Blush	20	Late	Pink and reddish	"	263	7
5	Morgan Seedling	6	Medium	Pink and white	"	256	58
6	Holborn Abundance	20	Late	White	Medium	245	31
7	Sabean's Elephant	14	"	"	Good	239	22
8	Canadian Beauty	11	Medium	Pink and white	"	233	12
9	Vick's Extra Early	16	Early	"	"	230	7
10	Quick Crop	6	"	"	"	226	36
11	Crine's Lightning	7	"	Pink with red eye	"	226	36
12	Burnaby Mammoth	11	Medium	Pink and white	"	224	50

POTATOES—Test of Varieties—Thirty Most Productive Varieties in Uniform Plots, 1908.

Number.	Name of Variety.	Quality.	Total Yield per Acre.		Yield per Acre, Marketable.		Yield per Acre, Unmarketable.		Colour.
			Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	
1	Extra Early Hero		325	24	303	24	24	..	Pink.
2	Woodbury's White Rose		316	48	281	36	35	12	White.
3	From T. Rowan, McGregor, Man.		308	..	290	24	17	36	"
4	King Edward (Wilson's)	Good	275	..	226	36	48	24	"
5	Early Harvester White		275	..	264	..	11	..	"
6	Nebraska	Good	270	36	261	48	8	48	"
7	New Early Standard		266	12	253	..	13	12	"
8	Early Petoskey		261	48	235	24	26	24	"
9	White Beauty		255	12	233	12	22	..	"
10	Planet		255	12	244	12	11	..	"
11	White Giant		253	..	244	12	8	48	"
12	Pinnacle Beauty	Medium	253	..	239	48	13	12	Pink or reddish.
13	Snow		250	48	237	36	13	12	White.
14	Perfection		250	48	220	..	30	48	"
15	Johnson's No. 2		244	12	233	12	11	..	"
16	Improved Early Ohio		235	24	220	..	15	24	Pink.
17	Barkley's Seedling	Medium	231	..	173	48	57	12	"
18	Hick's Jubilee	"	220	..	200	12	19	48	White.
19	Star of the East	Good	215	36	195	48	19	48	Pale pink.
20	New Reliance	"	213	24	180	24	33	..	Pink.
21	White Ohio		212	12	209	..	13	12	White.
22	Sutton's Sion House		200	12	167	12	33	..	"
23	Sutton's Prolific	Good	198	..	158	24	39	36	"
24	Dalmeny Beauty	"	193	36	151	48	41	48	"
25	Sirdar		193	36	167	12	26	24	"
26	Solanum Commersonii Violet		189	12	171	36	17	36	Violet.
27	Prince Albert		182	36	176	..	6	36	White.
28	Sir John Llwellyn		182	36	158	24	24	12	"
29	Dewey	Medium	182	36	171	36	11	..	"
30	Immigrant	Good	176	..	158	24	17	36	"

SMALLER PLOTS OF POTATOES.

The number of varieties grown in plots smaller than the uniform test plots in 1908 was 119. Of these only the ten most productive are given.

POTATOES—Yields from Smaller Plots—Ten Most Productive Varieties—Thirty-three Sets Planted.

Number.	Name of Variety.	Total Yield per Acre.		Yield per Acre Marketable.		Yield per Acre, Unmarketable.	
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
1	Montcalm	391	36	338	48	52	48
2	Vulcan	325	36	299	12	26	24
3	The Cottar	303	36	277	12	26	24
4	King of Michigan	294	48	281	36	13	12
5	Noxall	290	24	286	..	4	24
6	Ireland	255	12	220	..	35	12
7	Dewey Rose	246	24	206	48	39	36
8	Orphans	202	24	193	36	8	48
9	Clyde	202	24	189	12	13	12
10	Ramona	198	..	136	24	61	36

Photo by F. T. Shutt.
Lilacs in the Arboretum, Central Experimental Farm, Ottawa, Ont.

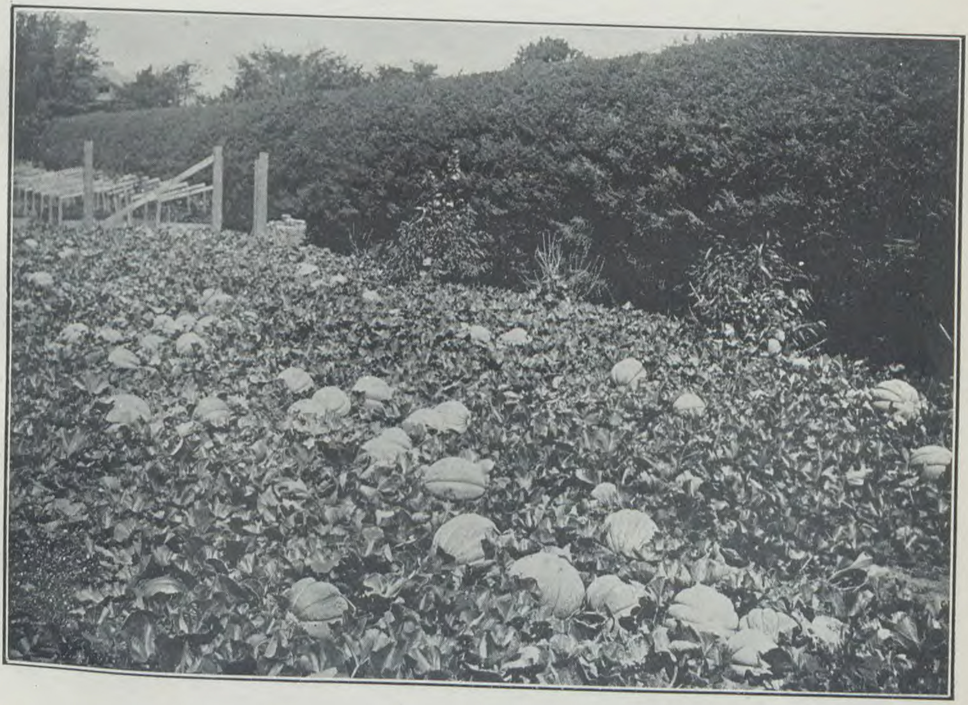


Photo by F. T. Shutt.
Muskmelon Plantation at Central Experimental Farm, Ottawa, Ont.

POTATOES—CHANGE OF SEED.

The seasons of 1906, 1907 and 1908 were three of the most unfavourable for potatoes that have been experienced in twenty-one years at the Central Experimental Farm. Varieties which had been grown from the same stock year after year for seventeen years showed no signs of deteriorating in vigour before 1906. The best potatoes had been used each year for seed, and the continued selection had evidently prevented deterioration. The season of 1906 was, however, very dry, and varieties which had been yielding at the rate of over three hundred bushels per acre in some cases gave scarcely half as much. The growth of the tubers had been stopped prematurely by the dry weather. These tubers were used for seed in 1907, and another unfavourable season, combined with the poor seed, resulted in another poor crop. The crop of potatoes was again small in 1908, but the tubers which formed were most of them well developed when dug.

The crop of potatoes had been so poor in 1906, and the prospects for a good crop in 1907 from the tubers not being thought favourable, it was considered desirable to compare the results with imported seed. Accordingly, small quantities of tubers of six well known varieties of potatoes were procured from the Experimental Farm, Nappan, N.S. As the best of the home-grown seed had been used in other experiments before this imported seed was planted the results obtained that year are not considered reliable, but it may be said that the average yield from the imported varieties was almost twice as great as from the home-grown seed of the same sorts. In 1908 it was possible to make a fairer comparison, and the best seed from the imported stock of the year before was compared with the best seed of the home-grown stock. The results given in the following table show that the extra vigour and productiveness of the imported stock were still maintained to a marked degree.

Name of Variety.	Seed from Nappan, N.S., 1907.						C. E. F. Seed, 1907.					
	Total Yield per Acre, C.E.F., 1908.		Yield per Acre, Marketable, C.E.F., 1908.		Yield per Acre, Unmarketable, C.E.F., 1908.		Total Yield per Acre, C.E.F., 1908.		Yield per Acre, Marketable, C.E.F., 1908.		Yield per Acre, Unmarketable, C.E.F., 1908.	
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Late Puritan	343	12	332	12	11	..	118	48	110	..	8	48
Rochester Rose	281	36	242	..	39	36	96	48	88	..	8	48
Early White Prize	272	48	261	48	11	..	123	12	96	48	26	24
Vick's Extra Early	213	24	195	48	17	36	156	12	127	36	28	36
Money Maker	213	24	191	24	22	..	118	48	114	24	4	24
Carman No. 1	193	36	182	36	11	..	103	24	99	..	4	24
Average	253	..	234	18	18	42	119	32	105	58	13	34
Average difference in favour of Nappan seed	133	28	128	20	5	8						

It has been found in Great Britain and Ireland that seed potatoes from the south of England, where the season is comparatively hot and dry, do not produce nearly as good crops as the Irish and Scotch seed grown in cooler and moister climates, and it is becoming a common practice for English growers to use either Scotch or Irish seed. While it is evident from the results at the Central Experimental Farm that potatoes do not soon run out if the seed is carefully selected each year, and that providing there is no great reduction in vigour, as has been the case during the past three seasons here, large yields may be obtained from Ontario grown seed. The results obtained in Great Britain and the results obtained from Nappan seed would indicate that at least every few years it would be profitable for Ontario growers to import seed from the Maritime Provinces or from the cooler and moister parts of Ontario and Quebec, providing known productive varieties could be obtained.

POTATOES—COMPARISON OF SPROUTED, CELLAR-STORED AND COLD STORAGE POTATOES.

It has been the practice of many market gardeners to sprout their seed potatoes, as they have found that by sprouting them they will have new potatoes sooner. The sprouting of potatoes is a well known practice also in Great Britain and Europe, both early and late varieties being found to benefit by it, both in earliness and productiveness. A comparison was made in 1908 with an early and medium late variety at the Experimental Farm, the varieties used being Rochester Rose, early; and Carman No. 1, medium late. Part of the tubers were spread out in a light room from April 1 until May 16 before planting. At the time of planting there were short, stout green sprouts on the tubers. Part of the tubers were kept in the potato cellar, where the temperature rose to between 50 and 60 degrees F. before planting time, by which time the sprouts were beginning to grow. The remainder of the tubers were kept in cold storage at a temperature of 40, and were quite dormant when planted. The tubers were planted whole in rows two and one-half feet apart and one foot apart in the rows on May 16. They were kept thoroughly cultivated throughout the season, the rows being but slightly ridged.

In the following table the results are given, which show an advantage in yield in favour of the sprouted seed. A still greater advantage was shown in the greater earliness of the crop from the sprouted seed. The extremely dry season caused all the yields to be very small.

Name of Variety	Sprouted.						Stored in Cellar.						Cold Storage.					
	Total Yield per acre.		Yield per acre Marketable.		Yield per acre Unmarketable.		Total Yield per acre.		Yield per acre, Marketable.		Yield per acre, Unmarketable.		Total Yield per acre.		Yield per acre, Marketable.		Yield per acre, Unmarketable.	
	Bus.	lbs.	Bus.	lbs.	Bus.	lbs.	Bus.	lbs.	Bus.	lbs.	Bus.	lbs.	Bus.	lbs.	Bus.	lbs.	Bus.	lbs.
Rochester Rose.	198	..	162	48	35	12	180	24	145	12	35	12	180	24	162	48	17	36
Carman No. 1...	154	..	140	48	13	12	136	24	118	48	17	36	110	..	105	36	4	24
Average	176	..	151	48	24	12	158	24	132	.	26	24	145	12	134	12	11	..

TOMATOES.

CHANGES MADE BY SELECTION.

In the year 1901 seed was saved of the earliest ripe fruit of the Sparks Earliana tomato, grown at the Central Experimental Farm. Selection from the earliest tomato was continued each year until 1904, when several selections were made from the plants of that year. One selection was a single tomato from the plant giving the largest crop of early and most uniform fruit in 1904; another selection of a single tomato was made from the plant giving the largest and most uniform crop, regardless of earliness, in 1904; and a third selection was made of the earliest fruit from the plants in the experiment in 1904, regardless of which plant it came from. A similar selection has been kept up each year since, the seed being taken from the first good tomato produced on the individual plants giving the crop most like that desired, and the other selection of the earliest ripe fruit from the plot or field of plants under experiment. The results have become so marked that it is thought desirable to publish them to show what can be accomplished by the market gardener, seedsman or plant breeder in the selection of tomatoes. The experiment is being continued with the object of learning whether after several years' selection certain strains from the different selections will remain more constant than others.

In the following tables the records are given of twenty-five plants from each selection, taken as they came in the plantation.

SELECTION from One Plant for Uniformity and Productiveness.

Date of First Ripe Fruit.	Fruit Ripe to August 18, 1908.		Total Yield of Ripe Fruit, 1908.		Number of Asterisks, Representing Degrees of Uniformity.
1908.	Lbs.	Ozs.	Lbs.	Ozs.	
Aug. 18	0	5	17	13	13
" 18	0	3	15	11	11
" 18	1	4	14	4	12
" 18	0	12	13	0	12
" 18	0	4	14	0	10
" 18	0	5	14	5	10
" 18	1	8	15	12	11
" 18	0	14	13	6	11
" 25	0	0	16	6	9
" 24	0	0	16	4	9
" 15	0	8	19	0	11
" 17	1	4	25	4	9
" 18	0	6	13	8½	6
" 25	0	0	19	8	7
" 15	0	14	14	14	11
" 4	2	14	20	14	12
July 23	1	6	16	2	11
" 23	0	9	18	9	11
Aug. 14	0	7	12	15	13
" 14	0	8	12	12	13
July 27	1	1	14	1	13
Aug. 18	0	10	14	6	8
" 25	0	0	13	2	9
July 28	0	11½	15	7½	8
Aug. 16	1	8	14	10	12
Total	18	1½	395	14	262
Average, Aug. 14	..	11·56	15	13·36	12·4

SELECTION from One Plant for Uniformity and Largest Crop of Early Fruit.

Date of First Ripe Fruit.	Fruit Ripe to August 18, 1908.		Total Yield of Ripe Fruit, 1908.		Number of Asterisks, Representing Degrees of Uniformity.
1908.	Lbs.	Ozs.	Lbs.	Ozs.	
July 25	2	3	10	7	13
" 27	1	1	12	13	11
" 18	1	4	10	0	17
" 27	1	4	10	9	14
" 28	1	0½	17	0½	18
" 29	1	7	15	11½	16
" 22	0	10	12	7	13
" 22	2	4	11	9	14
Aug. 4	1	3	11	7	14
July 22	0	5	10	13	12
" 24	0	8	10	4	12
" 23	1	3	10	2½	14
Aug. 4	0	7	14	3	13
" 4	0	3	15	15	14
July 27	0	10	13	6	9
Aug. 4	0	13	9	13	13
July 25	2	1	17	1	17
" 23	0	11½	16	11½	15
" 27	1	13	20	5	11
Aug. 4	0	3	14	7	10
July 27	1	0½	15	0½	12
" 25	1	10	11	2	18
" 23	0	8½	11	8½	10
" 27	0	4½	15	12½	8
" 23	1	11½	10	5½	11
Total	26	7	328	14	329
Average, July 26	1	0·92	13	2·48	13·16

SELECTION from Field for Earliest Ripe Fruit.

Date of First Ripe Fruit.	Fruit Ripe to August 18. 1908.		Total Yield of Ripe Fruit. 1908.		Number of Asterisks, Representing Degrees of Uniformity.
1908.	Lbs.	Ozs.	Lbs.	Ozs.	
July 27	1	12½	17	4½	16
" 28	1	13	10	6	15
" 25	0	6	12	2	10
" 31	0	11½	10	15½	12
Aug. 17	0	9	9	7	13
July 25	1	11½	10	7½	15
Aug. 4	1	8	11	10	14
July 30	1	8½	18	12½	18
Aug. 16	1	2	20	2	12
July 27	1	14	16	2	11
" 30	3	1	22	5	15
" 27	0	11	13	15	12
" 27	0	14	15	14	13
Aug. 4	1	8½	15	2½	14
July 22	0	14	9	10	10
Aug. 17	1	0	11	8	11
July 27	2	7	15	3	11
Aug. 4	1	5½	14	9½	13
July 28	0	13	11	10	13
" 28	1	1	10	7	9
Aug. 18	0	4½	9	14½	12
July 25	1	3½	10	13½	12
" 29	1	0½	8	6½	14
" 25	1	9	10	11	12
" 30	1	4	12	0	16
Total	32	0½	329	6½	323
Average, August 1	1	4·48	13	2·8	12·92

It will be seen from the above tables that in a selection from individual plants each year the selection for earliness has resulted in plants which bear ripe fruit nineteen days earlier than the plants from the selection which has been made for productiveness, whereas, on the other hand, the plants from the selection for earliness and uniformity without regard to productiveness, yielded 20·42 per cent less than the plants selected for productiveness, but the amount of ripe fruit up to August 18 was 46·11 per cent greater in the selection for earliness than that for productiveness.

Comparing the selection for earliness from the individual plant each year with that where the selection was made from the first ripe fruit in the plot or field, it will be seen that the average date of first ripe fruit is five days earlier where the selection was made from the individual plant, although by August 18 the yield of fruit was somewhat more from the field selection. The total yields were almost the same. At each picking of tomatoes the relative uniformity of the crop was gauged by the eye, three, two, one, and no asterisks being given according to the uniformity of the fruit. While this method could not give perfectly accurate results, it should be fairly reliable. The selection for uniformity for several years has not so far shown as marked results as the selection for earliness. No check plots of unselected plants have been used in this experiment.

SPRAYING.

Spraying to control insect pests and fungous diseases is now a regular practice with the best fruit growers, but there is still a large proportion of the men that grow fruit who, if they spray at all, do not do it systematically. If the results from spraying to control the Apple Spot and some other diseases were as self-evident every year as spraying to kill the San José scale and potato beetle there would be no difficulty in persuading fruit growers of the importance of spraying, but sometimes when spot does not happen to be troublesome those who do not spray may have as clean fruit as he who does. But the experience of the most successful fruit growers is that it does not pay to take chances, and that the best results follow, taking one year with another, when spraying is done regularly every year.

EXPERIMENTS IN SPRAYING, 1908, TO CONTROL GOOSEBERRY MILDEW.

As good results were said to have been obtained elsewhere from the use of the lime sulphur wash in controlling gooseberry mildew, a number of varieties of English gooseberries usually more or less affected with the disease were sprayed in 1908 with the lime-sulphur wash made here in the proportion of 12 lbs. sulphur, 12 lbs. lime and 40 gallons water, and the Niagara Brand lime-sulphur wash. The V-I Fluid was also tried. In most cases five bushes of each variety were sprayed, leaving one bush of each unsprayed. The bushes were sprayed on May 1, 1908, with the home-made lime-sulphur wash when the leaves of most varieties were showing green and beginning to expand. A second spraying was made with this wash on May 2, as it rained within an hour after the first spraying. The Niagara Brand lime-sulphur and V-I Fluid were both used on May 2. There was not nearly as much mildew in 1908 as usual, but this was evidently not due to the spraying, as no difference in the amount of mildew could be seen on the sprayed and unsprayed bushes, when notes were taken on June 6 and also just before picking. As there was little mildew this year, even on unsprayed bushes, no conclusions could be drawn from these experiments as to the value of the lime-sulphur washes in controlling gooseberry mildew.

TO CONTROL APHIS.

Several mixtures were used in 1908 for aphis on apple trees, this insect being very troublesome in 1908, appearing in great numbers on the young trees. Eighteen young apple trees, in most cases, were sprayed with each mixture on July 28, with the following results:—

Flour Emulsion (5 lbs. flour, 4½ gallons kerosene, 36 gallons water):—

July 29.—Aphis almost all dead on a few leaves and a considerable number dead on many leaves.

McDougall's Insecticide and Fungicide Wash (½ pint to 5 gallons water):—

July 29.—Aphis almost all dead on many leaves.

V-2 Fluid (latest brand):—

July 29.—A considerable number of aphis killed but not so many as with some other insecticides. The V-2 Fluid used was not the one originally received, but an improved mixture received from the company later.

Niagara Brand Lime-Sulphur Wash (1 gallon to 50 gallons water):—

July 29.—Few, if any, aphis were killed.

Target Brand Fungicide (1 gallon to 100 gallons water):—

July 29.—A considerable number of aphis were killed. It was not claimed that this mixture would kill aphis.

Whale Oil Soap (1 lb. to 6 gallons water):—

July 29.—Most of the aphis were killed where hit. Eight trees sprayed in this case.

Of the mixtures used, the Whale Oil Soap and McDougall's Insecticide gave the best results, both apparently killing what aphis were hit. It is very difficult to destroy all aphis at one application; indeed, it is almost impossible to spray them all with the mixture when the leaves are curled.

DISEASES OF THE NATIVE PLUM (*PRUNUS NIGRA*).

Diseases of fruit were not as troublesome in 1908 as in some years, doubtless owing to the warm, dry season. There are, however, two diseases to which attention should be drawn, as they have proved so injurious to the native plum (*Prunus nigra*), and have in many places in eastern Ontario and Quebec ruined the crops of that fruit, which, where the European varieties of plums cannot be grown, is of considerable importance to settlers over a wide area of country.

Spot or Blight of the Native Plum (*Cladosporium carpophilum* V. Thumen).—The almost complete absence of native plums during recent years in the Ottawa district and elsewhere in Eastern Ontario and the province of Quebec, is due in a large measure or almost entirely to the disease known as blight. The fruit forms and reaches more than half its size, but colours prematurely. When affected by the disease it shrivels and falls to the ground without ripening. If the fruit is examined when half grown or later, small pale green or yellow patches will be noticed. These gradually enlarge until finally they are about half an inch in diameter, at which time the blotches are darker in colour, of more irregular outline and are raised on the skin. The Americana plums are not, as a rule, seriously affected with this disease, which is principally confined to the Nigra varieties.

Remedy.—This fungus is nearly related to the apple spot, and can be satisfactorily treated in much the same way. The trees should be sprayed with Bordeaux mixture just after the blossoms fall, again two weeks later, and a third time two weeks after the second application. It is also advisable to spray a fourth time with ammoniacal copper carbonate just when the fruit is beginning to colour. The native varieties ripen early, and if the ordinary Bordeaux mixture were applied the last time, the fruit might remain stained. The ammoniacal copper carbonate does not leave a noticeable stain on the fruit. This remedy has been very satisfactorily used by one grower in particular near Ottawa, who has thus been able to grow native plums very profitably, and at the Experimental Farm spraying with Bordeaux mixture has kept the disease under perfect control. The Americana varieties may be top grafted on the native ones, with the result that there will be less disease as the former are not as much affected as the native. All other plum trees not looked after or bearing poor fruit should be burned; also all fruit which is diseased.

Plum Pockets (*Exoascus pruni* Fckl.).—The disease known as plum pockets has been recently very injurious to the native plum (*Prunus nigra*), the entire crop of fruit in many cases being ruined by this disease. The mycelium of the disease which causes the pockets is able to live for more than a year in the tree, and although the pockets may not be produced one year the disease may be in the tree, and if conditions are favourable the next year the tree may be covered with them. It is thus not necessary for the disease to start from spores every year. The fruit is affected soon after the tree has blossomed, and is indicated by the unnatural swelling and bladder-like appearance of the fruit and by its unusual yellow colour. There is no stone in fruit affected by this disease. When the spores of the disease which has been working inside the fruit appear on the surface they give the pockets a grey appearance. Later on the pockets turn almost black and fall to the ground. The leaves and twigs are also noticeably affected with this disease, the former becoming curled and unhealthy looking and the twigs swelling unnaturally. There is no known thoroughly tested remedy for this disease, but as it is closely related to the peach leaf-curl, which is controlled by early spraying with Bordeaux mixture (4 lbs. bluestone, 4 lbs. lime and

40 gallons water), it is quite likely that the plum pockets may be prevented by its use also. The most important spraying would appear to be just before the flower buds open, and as soon as the petals fall. It may be said that in the orchard at the Experimental Farm, where the trees are thoroughly sprayed every year, there has been no plum pocket, and in another orchard of native plums near Ottawa which is well sprayed each year there are few plum pockets; whereas, in the vicinity trees along the roadside have been badly affected. In addition to spraying, it is recommended to cut back the trees which are affected, thus removing the diseased twigs; also to pick off the pockets as soon as they appear.

FOREST BELTS.

The work in the forest belts at present consists mainly in recording the height and diameter of the different kinds of trees, of preventing some of the more valuable species from being smothered in the mixed plantations by the faster growing species, and by lopping off branches and the removing of dead and fallen trees. The last table showing the height and diameter of the trees was published in the report for 1906. The table which follows shows the growth up to the autumn of 1908. Owing to the dry weather of the past two seasons the increase in height and diameter of most kinds of trees has been small.

Growth of Trees in the Forest Belts at the Central Experimental Farm, Ottawa.

Name of Species.	Character of Soil.	When planted.	Distance apart.	Age or height when planted.	Average height 1907.		Average height 1908.		Average diameter 4 ft. 6 in. from ground, 1908.
			Feet.	Years.	ft.	in.	ft.	in.	Inches.
Black Walnut—Juglans nigra	Low sandy loam	1888	5 x 5	1	14	1	14	2	2 3/8
" "	"	1888	10 x 10	1	10	5	10	7	2
" "	Sandy loam with small stones	1889	5 x 5	2	21	1	21	4	3 5/8
" "	" "	1889	10 x 10	2	15	7	15	8	3 3/8
" "	Clay loam	1888	10 x 5	1	21	8	21	11	3 5/8
Butternut—Juglans cinerea	Low sandy loam	1889	5 x 5	1	12	4	12	4	2 1/8
" "	"	1888	10 x 10	1	11	5	11	5	2
Silver—leaved Maple—Acer dasycarpum	Light sandy loam	1889	5 x 5	3	32	9	33		3 3/8
" "	"	1889	10 x 10	3	26	3	26	4	4 1/4
Canoe Birch—Betula papyrifera	"	1889	5 x 5	3	36	3	36	6	4 1/8
" "	"	1889	10 x 10	3	39	1	39	6	5 7/8
Yellow Birch—Betula lutea	"	1889	5 x 5	3	26	7	27	6	3 1/8
" "	"	1889	10 x 10	3	29	3	30	6	4 3/4
White Elm—Ulmus americana	Sandy loam	1889	5 x 5	3	21	6	21	6	2 5/8
" "	"	1889	10 x 10	3	25	3	25	9	4 5/8
Black Ash—Fraxinus sambucifolia	Black muck	1889	5 x 5	2	25		27	1	2 3/4
Green Ash—Fraxinus viridis	"	1889	5 x 5	3	30	2	31	2	3 2/3
" "	Low sandy loam	1889	10 x 10	3	24	5	24	9	4 1/4
Red Ash—Fraxinus pubescens	Black muck	1889	5 x 5	2	33	5	34	4	4
" "	Light sandy loam	1889	10 x 10	2	26	3	27	3	3 5/8
White Ash—Fraxinus americana	Black muck	1889	5 x 5	3	30	6	31	1	2 7/8
" "	Light sandy loam	1889	10 x 10	3	31	8	32	5	4 1/8
Black Cherry—Prunus serotina	Light sandy loam and gravel	1889	5 x 5	3	26		26	3	3 1/8
" "	" "	1889	10 x 10	3	36	3	37	4	5 1/8
Box Elder—Acer Negundo	Light sandy loam	1889	5 x 5	2	27	2	27	7	3 3/8
Scotch Pine—Pinus sylvestris	Sandy loam with gravel	1888	5 x 5	18 in.	31		32		4
" "	" "	1888	10 x 10	18 "	27	10	28	11	5 3/4
" "	Low sandy loam with gravel	1888	5 x 5	18 "	29	11	30	4	3 5/8
" "	Low sandy loam	1888	10 x 10	18 "	26		26	11	6 1/2
" "	Light sandy loam	1888	10 x 5	18 "	33	7	34	10	8 7/8
" "	Clay loam	1888	10 x 5	18 "	27	6	28	4	6 5/8
" "	Light sandy loam and gravel	1888	10 x 5	18 "	30		32		7 1/2
" "	" "	1887	3 x 3	9 "	33	7	34	10	8 7/8
Austrian Pine—Pinus austriaca	Light sandy loam	1889	5 x 5	18 "	25	1	29	4	5 1/4
" "	"	1889	10 x 10	18 "	27		28	5	7 1/8
" "	"	1888	10 x 5	15 "	26	6	28	1	6 3/8
" "	Clay loam	1888	10 x 5	15 "	27	3	28	4	6 1/4

16—9

Austrian Pine—Pinus austriaca	Light sandy loam and gravel	1888	10 x 5	15 "	29	1	29	7	$6\frac{7}{8}$
" "	" "	1887	3 x 3	15 "	27	5	28	7	$3\frac{7}{8}$
White Spruce—Picea alba	Light sandy loam	1889	5 x 5	15 "	17	7	17	11	$2\frac{7}{8}$
"	"	1889	10 x 10	15 "	20	3	21		$4\frac{1}{4}$
Norway Spruce—Picea excelsa	"	1889	5 x 5	18 "	25		26	7	$3\frac{7}{8}$
" "	"	1889	10 x 10	18 "	28	8	30	2	$5\frac{1}{2}$
" "	"	1888	10 x 5	15 "	34	10	36	7	6
" "	Clay loam	1888	10 x 5	15 "	36	8	38		$7\frac{1}{8}$
American Arbor—vitæ—Thuya occidentalis	Low sandy loam and black muck	1889	5 x 5	18 "	21	2	21	11	$3\frac{5}{8}$
" "	Low sandy loam	1889	10 x 10	18 "	19	10	20	7	$3\frac{5}{8}$
European Larch—Larix europaea	"	1888	5 x 5	2 ft.	34	1	34	8	$4\frac{1}{8}$
" "	"	1888	10 x 10	2 "	33	4	33	10	$5\frac{5}{8}$
White Pine—Pinus Strobus	Light sandy loam with gravel	1889	5 x 5	8 to 10 in.	32	11	33	5	$4\frac{3}{8}$
" "	" "	1889	10 x 10	8 to 10 "	31	1	31	9	$7\frac{1}{4}$

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.

The additions to the Arboretum and Botanic Garden in 1908, while not very numerous were mainly of valuable species and varieties. In addition to the plants raised from seed at the Central Experimental Farm and the plants obtained from nurserymen, a good collection received from the Arnold Arboretum in the autumn of 1907 was planted out in the spring of 1908. In this collection was a large number of species of Cratægus, which with the many kinds received in previous years from the Arnold Arboretum makes the number of species under test of this interesting genus very large. The total number of trees and shrubs added in 1908 was 326, comprised of 276 species and varieties, making a total of 3,280 species and varieties, represented by 4,978 specimens, living in the Arboretum in the autumn of 1908. The number of species and varieties of herbaceous perennials added was 198, making a total of 2,068 alive in the border in the autumn of 1908.

The winter of 1907-8 did not apparently cause more than the average amount of injury. The summer season was very dry, and the plants in the herbaceous border suffered badly from the drought, the growth not being nearly as strong as usual.

During the past year a bulletin on herbaceous perennials was published by the writer under the title 'List of Herbaceous Perennials Tested in the Arboretum and Botanic Garden, Central Experimental Farm, Ottawa, Canada, with Descriptions of Flowers and other Notes.' In this bulletin are recorded the names of 2,116 species and varieties of herbaceous perennials tested at the Central Experimental Farm during the past twenty years, with descriptions of a large proportion of them, including their relative hardiness, time of blooming, height to which the plants grow and colour of the flowers. Asterisks are also used to indicate their relative value from an ornamental standpoint. Lists of the best sorts are given. The information contained in this bulletin represents many years' work. While a general distribution of this bulletin was not made, it will be sent free to any one applying for it.

ORNAMENTAL TREES.

There have been numerous inquiries from correspondents for information in regard to the best hardy ornamental trees and shrubs. To meet these inquiries there was published in the writer's annual report for 1897 a list of one hundred of the best, with short descriptions of each. A part of this list was revised and republished in the annual report for 1906 as 'A List of Best Thirty Hardy Ornamental Flowering Shrubs.' Other lists, however, have been published since 1897, such as 'Some Good Low Growing Flowering Shrubs,' in the report for 1899; 'A List of the Best Lilacs,' in 1901; and 'A List of Deciduous Trees, Shrubs and Climbers with attractive Foliage, Bark and Fruit,' in 1903.

It is thought desirable to now publish 'A List of the Best Twenty-five Ornamental Deciduous Trees,' and 'A List of the Best Twenty-five Ornamental Evergreen Trees.' For the most part these are the same as were given in the list of 1897, with some revisions and changes. The heights of the trees given in this list are not in all cases the maximum height which these trees may reach, but are sufficiently accurate to be used as a guide when planting.

LIST OF BEST TWENTY-FIVE HARDY ORNAMENTAL DECIDUOUS TREES.

1. *Acer dasycarpum laciniatum.*—Wier's cut-leaved maple (Canada), height 40 to 50 feet. This is a cut-leaved variety of the native silver-leaved maple, which originated in Europe, and is a very quick growing, robust tree, with large, deeply cut leaves, and pendulous branches. It requires plenty of space to appear to the best advantage.

2. *Acer platanoides.*—Norway maple (Europe). Height 30 to 50 feet. The Norway maple is one of the hardiest of ornamental trees. The dark green leaves appear before those of our native hard maple and fall from two to three weeks later in the autumn, but do not assume such a brilliant colour, the leaves having different shades of yellow. When in flower this tree is also quite attractive.

3. *Acer platanoides Schwedleri.*—Schwedler's Norway maple. One of the best ornamental trees. The leaves are large, and in the early part of the summer are of a bright, purplish red, becoming duller as the season advances, and finally losing the purplish tinge. The variety Reitenbachii, while not having so attractive foliage, retains the purplish tinge throughout the summer.

4. *Acer saccharinum.*—Hard, or sugar maple (Canada). Height 50 to 70 feet. The hard maple needs no description. Its clean, clear cut, green leaves, almost free from insect pests, handsome form, delicately and highly tinted leaves in autumn, recommend it as one of the best of hardy trees.

5. *Acer tataricum Ginnala.*—Ginnalian maple (Amurland). Height 10 to 20 feet. The deeply cut, pretty leaves of this little maple make it ornamental throughout the summer, and in the autumn it rivals all other maples in the variety and brilliancy of its colouring.

6. *Aesculus Hippocastanum.*—Horse chestnut (Mountains of southeastern Europe). The horse chestnut is well known. At Ottawa all specimens have not proven hardy, but if procured from northern grown stock they should do well. This tree is very ornamental when in full leaf and flower.

7. *Alnus glutinosa imperialis.*—Imperial cut-leaved alder (Europe). Height 20 to 30 feet. The cut-leaved alder is a very distinct and graceful tree with deeply cut fern-like leaves and pendulous branches.

8. *Betula alba laciniata pendula.*—European cut-leaved birch (Europe). Height 30 to 50 feet. One of the most graceful and hardy of all ornamental trees. The pendulous branches, finely cut foliage and elegant form of this birch make it very desirable. After it has been twenty years planted at Ottawa the top begins to die back and the trees become unshapely During recent years it has been affected with borers.

9. *Catalpa Kaempferi.*—Japanese catalpa (Japan). Height 30 feet. In bloom second week of July. Flowers yellow spotted with purple, and smaller than those of the hardy catalpa. The leaves are purple veined. This is the hardiest catalpa grown here.

10. *Catalpa speciosa.*—Hardy catalpa (United States). Height 30 to 40 feet. In bloom fourth week of June. Flowers large, white, spotted with purple and yellow. This tree is very handsome when the flowers are in bloom. The leaves are large and heart-shaped. The seed pods which form during the latter part of the summer become more than one foot in length. The whole tree is very tropical looking. To ensure hardiness, trees should be obtained from northern grown stock, as but few specimens have proved hardy at Ottawa. Tea's hybrid catalpa, while not quite so handsome is about as hardy or hardier.

11. *Cercidiphyllum japonicum.*—Katsura tree (Japan). Height 30 to 50 feet. The pyramidal shape and delicate heart-shaped leaves of this tree make it very attractive and ornamental. It is closely related to the magnolia family but is quite hardy at Ottawa.

12. *Crataegus Crus-galli.*—Cockspur thorn (Ontario). Height 15 to 25 feet. In bloom second week of June. Flowers white, tinged with pink. The leaves of this tree are very ornamental, being thick, smooth and very shiny.

13. *Elaeagnus angustifolia.*—Russian olive (South Europe, Orient). Height 15 to 20 feet. In bloom third week of June. Flowers small, yellow, very sweet scented. This is a very ornamental tree with narrow silvery leaves and is perfectly hardy.

14. *Ginkgo biloba.*—Maiden-hair tree (China). Height 20 to 60 feet. This odd looking tree is a deciduous conifer with peculiar fan-shaped leaves. It is rather a slow grower but eventually reaches a good size.

15. *Larix europæa.*—European larch (Europe). Height 60 to 80 feet. This tree is more graceful than our native tamarac, and will succeed on a greater diversity of soils.

16. *Larix leptolepis.*—Japanese larch (Japan). The Japanese larch is as large and is a more attractive tree at Ottawa when young than the European species, and promises to be one of the best ornamental trees.

17. *Platanus occidentalis.*—Button-wood (Ontario). Height 50 to 60 feet. A very handsome and striking native tree with large, deeply cut foliage. Its chief drawback is the lateness in leafing out in spring.

18. *Prunus Grayana.*—(Japan). Some of the species of cherries are very ornamental when in bloom, and this is one of the best. The tree is very hardy and grows at least from twenty-five to thirty feet high. During the latter part of May this species is covered with racemes of white flowers, and is a decidedly ornamental object at that time. The tree is moderately upright in habit and of good shape, and remains ornamental throughout the summer. Two other good hardy cherries are *Prunus Padus Albertsii* and *Prunus Maackii.*

19. *Pyrus Aucuparia.*—European mountain ash, rowan tree (Europe). Height 20 to 30 feet. In bloom fourth week of May. Flowers white, borne in large clusters. This is a very graceful lawn tree, remaining ornamental throughout the winter, when it is covered with its scarlet fruit. The American species is also very good. It is a smaller, more compact tree, flowering about one week later than the European.

20. *Pyrus baccata.*—Siberian crab (Siberia). Height 15 to 20 feet. In bloom third week of May. Flowers white, tinged with bright pink. This compact little tree bears such a profusion of flowers in spring that it is one of the most ornamental at that time, and later in the summer when the highly coloured fruit hangs thickly among the leaves it is again very handsome. This is one of the hardiest trees grown here

Most of the crabapples make good ornamental trees.

21. *Pyrus coronaria fl, pl.*—(Bechtel's flowering crab.) This is a charming, double flowering variety of the native crabapple which blooms during the fourth week of May. The flowers are large, semi-double and of a delicate shade of flesh-pink. They have a very delightful fragrance much resembling that of violets. This tree will probably not grow more than fifteen or twenty feet in height.

22. *Crataegus coccinea.*—Scarlet fruited hawthorn (Canada). Tree. Height 10 to 20 feet. In bloom fourth week of May. Flowers white, borne in great profusion. This valuable native tree is ornamental in spring, summer and autumn. The flowers are pretty, the leaves dark and shiny, and the fruit bright red and very showy.

23. *Quercus rubra.*—Red oak (Canada). A large, handsome tree, with very glossy leaves which turn red in autumn and at that time render it very ornamental. The leaves stay on the tree until winter. The red oak is the most rapid growing oak which has been tested. The golden leaved red oak (*Quercus rubra aurea*) is one of the best hardy yellow leaved trees.

24. *Syringa japonica.*—Japanese or Tree Lilac (Japan). Height 15 to 20 feet. In bloom fourth week of June and first week of July. Flowers creamy white, without lilac perfume, borne in very large panicles. This is the latest blooming lilac tested here, being more than one month later than the common species, and being tall and of tree-like habit is very noticeable. The species known as *S. amurensis* resembles this very much.

25. *Salix pentandra (S. laurifolia).*—Laurel-leaved willow (Europe). Height 20 to 30 feet. The leaves of this willow are deep green and very shiny. When given room to develop symmetrically it makes a very handsome specimen on the ornamental grounds.

LIST OF BEST TWENTY-FIVE HARDY EVERGREENS.

1. *Abies concolor.*—White fir (Colorado). Height 30 to 60 feet. This is a very beautiful and striking species with large, flat, glaucous green leaves. Young trees of this species should be obtained from northern grown stock.

2. *Cupressus ericoides.*—Heath-like retinospora (Japan). Height 2 feet. This is a very pretty dwarf evergreen, with fine, soft, delicate green foliage, which becomes of an attractive purplish tinge in winter. In exposed places the leaves of this little shrub are sometimes injured by winter.

3. *Cupressus pisifera filifera.*—(Japan.) This is a very distinct and beautiful variety of retinospora, with drooping branches and slender thread-like pendulous branchlets. This is the best retinospora tested at the Experimental Farm, where one specimen is now nine feet high.

4. *Cupressus pisifera plumosa.*—(Japan.) A compact tree, and very ornamental when young. Its branchlets are somewhat feathery in form. This tree is sometimes injured by winter and occasionally killed outright.

5. *Cupressus pisifera plumosa aurea.*—(Japan.) One of the most beautiful golden leaved evergreen shrubs in cultivation. It is of compact form and holds its colour well. It also is liable to be injured by winter.

6. *Juniperus communis fastigiata.*—Irish juniper (Europe). Height 4 to 8 feet. The Irish juniper is an erect, compact form of *Juniperus communis* with light green foliage, silvery beneath. It makes a very attractive shrub on the lawn. The tips are usually injured by winter, which affects its appearance for a time in spring.

7. *Juniperus Sabina tamariscifolia.*—Tamarisk-leaved savin (Europe). Height 1 to 2 feet. This is a low growing variety with widely spread trailing branches and attractive foliage.

8. *Pinus Laricio nigricans (P. austriaca).*—Austrian pine (Austria). Height 30 to 60 feet. A very handsome pine with dark green rigid leaves and upright branches. This is a very compact growing species and one of the most beautiful.

9. *Pinus montana Mughus.*—Dwarf mountain pine (Mountains of Central Europe). Height 2 to 10 feet. This is a very ornamental, dwarf, compact pine. Its height varies considerably, some specimens being quite dwarf and others attaining a height of about 10 feet.

10. *Pinus ponderosa.*—Heavy wooded or bull pine (British Columbia). Height 50 to 80 feet. The bull pine is one of the most handsome species. The long, glaucous green leaves, sometimes twisted into peculiar forms, and its erect habit give it a very majestic appearance.

11. *Pinus resinosa.*—Red pine (Canada). Height 40 to 60 feet. Not unlike the Austrian pine when young, but becoming less stiff in form as it becomes larger. The leaves are also much softer than those of the Austrian pine.

12. *Pinus sylvestris.*—Scotch pine (Europe). Height 40 to 60 feet. A very rapid growing pine with bluish green leaves. It is not so shapely as some of the other species, but grows well in nearly all kinds of drained soils.

13. *Pinus Strobus.*—White pine (Canada). Height 50 to 75 feet. The white pine is better known as a timber tree in Canada than as an ornamental tree, but when it branches from near the ground, and has sufficient space to develop symmetrically, it becomes one of the most graceful evergreens grown. The leaves, which preserve their colour well in winter, are a very lively green.

14. *Picea alba.*—White spruce (Canada). Height 30 to 50 feet. A very beautiful native species with glaucous green leaves and rather rigid branches, but making a fine ornamental tree.

15. *Picea alcockiana.*—Alcock's spruce (Japan). Height 40 to 60 feet. This is a very ornamental Japanese species, and quite distinct from all others. The dark green of the upper part of the leaves, and the bluish silvery green of the lower surface, make it very attractive.

16. *Picea excelsa.*—Norway spruce (Europe). Height 50 to 75 feet. The Norway spruce is one of the most popular evergreens planted, being a very rapid grower, of graceful form, and doing well on a great variety of soils.

17. *Picea pungens glauca.*—Rocky mountain blue spruce (Western United States). Height 40 to 60 feet. A very beautiful species with steely blue coloured leaves. One of the most ornamental trees. It is a slow grower and takes some years before it attains much height. As this tree varies in colour from green to blue in individual specimens, in procuring young trees the blue variety should be ordered.

18. *Pseudotsuga Douglasii.*—Douglas fir (British Columbia). Height 50 to 75 feet. The Douglas fir is a very majestic and handsome tree, with foliage dark green above and silvery beneath. The seed or young trees should be obtained from as far north as possible, or high up on the mountains, as otherwise it is not likely to prove hardy.

19. *Taxus cuspidata.*—Japanese yew (Japan). The Japanese yew has proved perfectly hardy so far at Ottawa, and is a decided acquisition to the list of desirable evergreens. It is of more upright habit than the Canadian yew and has attractive dark green foliage.

20. *Thuya occidentalis aurea Douglasii.*—Douglas' golden arbor-vitæ (United States). This is a very beautiful form with bright golden coloured foliage and upright habit.

21. *Thuya occidentalis compacta.*—Compact arbor-vitæ (United States). A dwarf compact variety with bright green foliage.

22. *Thuya occidentalis Ellwangeriana.*—Ellwanger's arbor-vitæ (United States). This is a fine, compact, dwarf, vigorous variety with slender leaves and branches.

23. *Thuya occidentalis Hoveii.*—Hovey's arbor-vitæ (United States). This is one of the finest and most desirable varieties. The leaves are bright green and the branches flat and parallel, giving the shrub a very remarkable and attractive appearance.

24. *Thuya occidentalis pyramidalis.*—Pyramidal arbor-vitæ (United States). The pyramidal arbor-vitæ is a very compact upright grower, and its columnar form makes it one of the most conspicuous objects on the grounds.

25. *Thuya occidentalis wareana* (*T. occ. Sibirica*).—Siberian arbor-vitæ (Europe). The Siberian arbor-vitæ is a well known compact form with deep green, blunt leaves, which keep their colour well in winter.

LILACS.

The many varieties of lilacs now offered for sale make it confusing for the average person to know which kinds to purchase. In the Arboretum at the Central Experimental Farm there is now a collection of 177 species and varieties, 148 of which are forms of the common lilac (*Syringa vulgaris.*) A list of twenty-five of the best of these, with descriptions of the flowers, is given below in order to aid those who desire to have the most beautiful of them. Many of the varieties are so nearly equal in merit that it is difficult to choose among them, and opinions differ with different persons as to the relative beauty of each. The single flowered varieties appeal to some persons, while by others those with double flowers are more admired, while still others may like those with twisted or curled petals.

In preparing the list given below the aim has been to have in it as great a range of colour as possible, and also to have the different types represented.

While the varieties of the common lilac are the most beautiful, there are some very fine hardy species which bloom after the others are over. These include in order of blooming, *Syringa Bretschneideri, Syringa Josikæa, Syringa villosa, Syringa amurensis,* and *Syringa japonica,* bringing the blooming period to the month of July.

SINGLE VARIETIES.

Alba Grandiflora and Marie Legraye.—Panicles large, moderately loose; flowers above medium size, single, white. Very free bloomers. These two varieties are very similar and of about equal merit.

Aline Mocqueris and Gloire de Croncel are much alike. Panicles large, rather loose; flowers large, single, purplish-mauve, brighter in bud.

Charles X.—Panicle medium size, compact; flowers medium size, single, purplish-mauve, soon fading to lighter. A very free bloomer. Still among the best on account of vigour and blooming habit.

Congo.—Panicle large, rather loose; flowers large, single, purplish-mauve, brighter in bud. Much the same colour as Gloire de Croncel and Aline Mocqueris but with livelier shades.

Delepin.—Panicle above medium size, moderately compact; flowers medium size, lavender-blue, whitish about centre. Moderately free bloomer. The bluest lilac in the collection.

Jacques Calot.—Panicle large, loose; flowers large, single, purplish-mauve in bud, violet-mauve when opened. A very attractive shade.

Lovaniensis.—Panicle medium, compact; flowers medium size, single, light-lilac with decided pink effect fading to almost white. A rare and attractive colour. One of the best. Very free bloomer.

Madame F. Morel.—Panicles large, loose; flowers very large, single, purplish-mauve suffused with paler shades and almost white about centre. Free bloomer. A very good one.

Negro.—Panicle large, loose; flowers very large, single, bishop's violet. A free bloomer. Not quite so bright in colour as Congo nor as rich as Toussaint L'Ouverture, but flowers are larger.

Rubella.—Panicle medium size, compact; flowers medium size, single, purplish-mauve suffused with lighter shades, buds brighter. In somewhat the same class as Charles X., but is more attractive.

Toussaint-Louverture.—Panicle above medium size, moderately loose; flowers above medium, single, darkest shade of bishop's-violet, almost purple. The darkest in colour.

DOUBLE VARIETIES.

Charles Joly.—Large, loose panicle; flowers large, semi-double, twisted petals, vinous-mauve, almost purple; free bloomer. One of the best.

Comte de Kerchove.—Panicles large, loose; flowers large, double, purplish-mauve in bud and when opening, afterwards changing to lighter shades with more blue in them. A very fine lilac.

Condorcet.—Panicles large, moderately compact; flowers above medium size, double, violet-mauve in bud, bluish-violet shading lighter when open. Free bloomer. One of the best of those with bluish shades.

Emile Lemoine.—Panicles large, compact; flowers large, double, purplish-mauve suffused with lighter shades in bud; heliotrope, shading to almost white in centre when open. Free bloomer. Later than most. One of the best.

Georges Bellair and Wm. Robinson.—These are much alike. Panicles medium size, compact; flowers above medium size, double, purplish-mauve in bud and when opening, afterwards suffused with lighter shades and central petals tipped with white. Both very good; very free bloomers.

Jean Bart.—Panicle large, loose; flowers large, double with twisted petals, purplish-mauve in bud, violet-mauve when opened shading to lighter. One of the best of this type.

Madame Abel Châtenay.—Panicle above medium size, moderately loose; flowers above medium, double, white. A free bloomer. The best double white tested here.

Madame Amelie Duprat.—Panicles medium size, moderately compact; flowers above medium size, double, bright purplish-mauve in bud and of a lighter shade of the same colour when open, suffused with paler tints. Very good. One of the best.

Madame Casimir Perier.—Panicle medium size, compact; flowers medium size, double white. A very free bloomer. One of the best double white varieties.

Madame Leon Simon.—Panicle very large, compact; flowers very large, double, purplish-mauve in bud, violet-mauve and bluish-violet when open. Very fine.

Marc Micheli.—Panicle medium size, moderately compact; flowers very large, double, violet-mauve in bud, heliotrope shading to almost white in centre when open; free bloomer. Very good. One of the best.

Grand-duc Constantin.—Is very similar to Marc Micheli.

Michel Buchner.—Panicle large, moderately compact; flowers large, double, violet-mauve in bud, bluish-violet shading to almost white in centre when open. Very good. One of the best.

President Grévy.—Panicle very large, moderately compact; flowers large, double, light lilac in bud, violet-blue or lavender-blue when opened. A very striking variety.

President Viger.—Panicle large, moderately loose; flowers very large, double, purplish-mauve in bud, bluish-violet shading lighter when opened. Fairly free bloomer. Very fine.

REPORT OF THE CHEMIST.

FRANK T. SHUTT, M.A., F.I.C., F.C.S., F.R.S.C.

OTTAWA, April 1, 1909.

Dr. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the twenty-second annual report of the Chemical Division of the Experimental Farms.

As heretofore, investigation and research in matters relating to the general agriculture of the Dominion have had our first attention, but there has been no neglect in respect to those other branches of our work that bring us into direct touch with the individual farmer and fruit grower—the furnishing of information by correspondence and the analysis of samples of an agricultural nature sent in for examination. The larger number of the more important problems that we have been at work upon during the past year are reported on, and brief reference may be made to them as follows:—

Wheat.—Continuing our inquiry on the influence of environment on the composition of wheat, we are able to present further evidence that the proportion of protein in wheat is markedly affected by the moisture-content of the soil during the development period of the grain.

Interesting data have been obtained from the analysis of the winter wheats, Turkey Red and Kharkov, grown at Lethbridge and Lacombe, Alta. The quality of the wheats as grown under irrigation as compared with that of wheats from non-irrigated areas, is an important question that receives elucidation from this work.

A noteworthy fact in these analyses is that the percentages of protein from these winter wheats are not appreciably lower than many we have obtained from Red Fife as grown in Manitoba and Saskatchewan.

The influence of storage on wheat and flour has been studied from the chemical standpoint. The work, which is as yet of a preliminary character, indicates a slight increase in the percentage of protein due to storage, the increase being larger when the samples had been kept as flour.

The first steps have been taken towards learning the effect of dampness on the quality of the wheat. The present results indicate that wheat may remain very wet for a considerable time without its composition being materially affected, provided that there has been no heating or fermentation of the grain.

Soils.—A number of soils collected in the valleys of the Upper Columbia and East Kootenay, B.C., have been submitted to analysis. From the chemical and physical data of the examination, suggestions have been made towards the economic maintenance of their fertility.

Certain alkali-affected soils from British Columbia have been examined, and information respecting their reclamation given.

Further data as to the enrichment of soils through the growth of clover have been tabulated. For the past six years a plot has been constantly in clover, and analyses made from time to time show a continued increase in its nitrogen content. The total increase in nitrogen during the period mentioned amounts to 375 lbs. per acre.

Inoculation for the Growth of Alfalfa.—Alfalfa hays from inoculated and untreated soils, at the Experimental Farm, Lacombe, Alta., have been analysed, with the result that the alfalfa from the inoculated plot was found the richer in protein.

Fertilizing Materials.—Under this caption we report upon various materials of more or less fertilizing value, as follows: Dogfish scrap, muck, mussel mud, marl, gypsum, wood ashes, black muck ashes, &c.

Fodders and Feeding Stuffs.—Information of interest and value to the farmer and dairyman is afforded in the data and accompanying notes obtained from the examination of a number of the more important feeds offered on the Canadian market.

Field Roots and Sugar Beets.—The investigations to ascertain the relative feeding value of field roots, the influence of heredity on the composition of mangels and the quality of certain varieties of sugar beets as grown on the Experimental Farms of the Dominion during the past season, have been continued.

Insecticides and Fungicides.—A very considerable amount of investigatory and analytical work has been done in connection with insecticides and fungicides. This has been prompted by the numerous inquiries that have been received from fruit growers and others respecting newly proposed sprays and a number of ready-made commercial products that have recently appeared on the market for spraying purposes. It is hoped that the various chapters under this heading may prove of value to that large body of our readers who find it necessary to combat insect and fungus pests.

The subjects treated of include arsenate of lead, arsenite of lime, lime-sulphur washes, formaldehyde and agricultural bluestone.

Rain and Snow.—Another year's determinations of the nitrogen compounds in the rain and snow are reported. In certain respects they are extremely interesting as showing that practically twice as much nitrogen (chiefly as free ammonia) was found as in the rain and snow of the preceding year. This was traced to the smoke-laden atmosphere which prevailed during the autumn months in the neighbourhood of Ottawa, caused by the extensive bush fires which raged for so many weeks and which resulted in such a large destruction of timber.

Well Waters from Farm Homesteads.—The examination of waters from farm wells has always proved a popular feature, and farmers who have reason to suspect the purity of their supply continue to avail themselves of the privilege of forwarding a sample for analysis. To the results of the past year we have added some words of advice respecting the all-important matter of the rural water supply.

Samples received for Examination.—In the following table we present a classification of the samples received for analysis during the past year, and the provinces from which they were sent.

SAMPLES Received for Examination and Report for the Twelve Months ended March 31, 1909.

Sample.	British Columbia.	Alberta.	Saskatchewan.	Manitoba.	Ontario.	Quebec.	New Brunswick.	Nova Scotia.	Prince Edward Island.	Total.	Number still awaiting examination.
Soils	79	13	12	6	149	26	....	9	.....	294	61
Mucks, muds and marls	.....	.....	.....	1	4	2	3	3	7	20	4
Manure and fertilizers	2	.....	1	1	15	13	7	10	.....	49	4
Forage plants and fodders	6	14	6	7	244	33	1	13	1	325	18
Well waters	4	5	12	8	97	40	2	7	3	178	0
Miscellaneous including dairy products, fungicides and insecticides	9	4	18	14	309	42	2	8	1	407	176
Totals	100	36	49	37	818	156	15	50	12	1,273	263

It very frequently happens that the analytical work in connection with the investigations carried on by the Division entirely precludes the possibility of undertaking, for the time, further work; it should, therefore, be distinctly understood that the reception and acknowledgment by us of samples does not imply their immediate examination. The ever-increasing correspondence and number of samples forwarded, make it more and more difficult to attend promptly to this branch of our duties, and we are consequently obliged to ask our correspondents to exercise patience.

While every effort is made to furnish information respecting the samples of a purely agricultural nature, we wish to advise our readers that it does not come within our province to analyse and report upon samples of commercial fertilizers. Correspondents desiring such analyses should communicate with the Inland Revenue Department, Ottawa. Nor can we undertake the assays or analyses of minerals and mineral waters. Questions relating to minerals may be addressed to the Department of Mines, Ottawa. And, lastly, we cannot make any analysis the results of which we do not consider of general value to the agricultural public. Examination in connection with suspected poisoning cases of animals is not undertaken.

Meat Inspection Division, Health of Animals Branch, Department of Agriculture.—During the past year new and further work has been asked of us in the examination of samples collected by the government meat inspectors at the various packing houses in Canada. These materials include preservatives, dyes, spices and condiments, pickling solutions and various drugs and chemicals used in the packing house business. Our examination was made with the view of determining their nature, purity and the character of adulteration, if present. To date, we have received in the neighbourhood of 250 samples, the greater number of which have been analysed and reported upon. The chemical and microscopical work involved in this investigation has, naturally, made a large draft upon the time of the staff.

Acknowledgments.—To Mr. A. T. Charron, M.A., First Assistant Chemist, Mr. H. W. Charlton, B.A.Sc., and Mr. A. Gordon Spencer, M.Sc., Assistant Chemists, I desire to again tender my thanks for good and efficient work during the past year. In my last report I referred to the various ways in which these gentlemen assisted in and pushed forward the work of the Division, and it may therefore be only necessary on this occasion to state that whatever degree of usefulness this Division may have attained to in its relations to the agriculture of the Dominion, is very largely due to their skill, industry and hearty co-operation.

The clerical duties have been performed by Miss Olive Robertson, to whom I would extend my thanks for much careful and faithful work.

I have the honour to be, sir,

Your obedient servant,

FRANK T. SHUTT,

Chemist, Dominion Experimental Farms.

WHEAT

THE COMPOSITION OF THE GRAIN AS INFLUENCED BY THE SOIL MOISTURE CONTENT.

In studying the problem of the influence of environment—and more particularly of climatic conditions—upon the composition of wheat, we have found that the moisture content of the soil during the period of development markedly affected the percentage of protein in the grain. Our results indicated that prolonged vegetative growth, as induced by excessive moisture, defers the ripening process and allows the further deposition of starch, resulting in a 'piebald' or soft kernel. On the other hand, early ripening of the wheat, such as is brought about by high temperatures and the gradual lessening of the supply of soil moisture during the maturation of the grain, resulted in a hard, glutinous wheat.*

If these conclusions are correct, then it might be conjectured that wheat grown under irrigation in a semi-arid district would be more or less glutinous according to the amount of water supplied during the growing, and more particularly, the ripening period. To obtain information concerning this matter, areas irrigated and non-irrigated were sown last season on the Experimental Farm, Lethbridge, southern Alberta, with Red Fife and Kharkov wheats. This district is usually one of sparse precipitation and one, consequently, where the methods of the so-called 'dry' farming must be practiced in parts where there is no provision for irrigation. As a rule, irrigation is necessary to obtain the best yields.

The object of the experiment was to ascertain what effect the added water on the irrigated areas might have on the quantity and quality of the grain. The season, during the earlier months, was unusually wet, and consequently not favourable to the experiment in hand. Only one irrigation was found necessary, owing to the ample rainfall referred to, and this was not made until July 15, immediately following the second collection of soil samples for moisture-content.

The percentages of moisture in the soil of these areas, as determined at intervals throughout the season, in samples taken to a depth of 14 inches, were as follows:—

	Irrigated. Per cent.	Non-irrigated. Per cent.
May 14, 1908	16·56	15·61
July 15, 1908	8·78	8·11
August 17, 1908	10·37	6·38

Until July 15, therefore, the moisture-content was almost the same for both the areas under examination, but subsequent to that date—that is during the ripening period of the wheat—that of the irrigated was considerably higher than that of the non-irrigated area.

The protein-content of the wheats grown on these areas may now be given. Red Fife is a spring wheat; Kharkov, a winter variety.

		Protein, (N x 5·7.)
Red Fife—	Original seed from Brandon, Man.	15·95 per cent.
"	Grown on irrigated land	13·70 "
"	Grown on non-irrigated land	16·37 "
Kharkov—	Grown on irrigated land	12·31 "
"	Grown on non-irrigated land	13·12 "

* Report of the Chemist, Experimental Farm Report, 1907-8.

In the case of spring wheat we notice a difference of more than 2·5 per cent and with the winter wheat of 1 per cent protein, the richer wheat in both instances being from the soil that partially dried out during the ripening period.

This experiment, therefore, furnishes further evidence to that obtained in northern Manitoba, the details of which were fully discussed in last year's report, and tends to show that the quality of the wheat of any season may be largely determined by the character of the season. It seems more than probable that if there is a sufficiency of moisture in the soil during the earlier part of the season to bring the wheat crop to its full growth, then a grain richer in protein will result if the weeks following are characterized by hot, dry weather, than if the weather during this period is cool and wet.

Climatic conditions influence the quality of the wheat through the vegetative processes—by shortening or lengthening the time which elapses between the formation of the kernel and its maturity—the shorter the period the higher the protein-content within certain limits. High temperatures, long days and absence of excessive moisture during the ripening process, we have evidence, hasten the maturation of the grain and increase its percentage of gluten. These are the conditions that prevail in the Northwestern wheat areas in those seasons which give the largest proportion of first quality wheat, and we may therefore argue that in them we have an asset fully equal in importance towards the production of the finest grain to that which we possess in our fertile prairie soils.

WINTER WHEATS GROWN AT LETHBRIDGE AND LACOMBE, ALBERTA.

Complete chemical analysis has been made of the flours of certain winter wheats (Kharkov and Turkey Red) grown at Lethbridge and Lacombe, Alta., during the season of 1908.* These flours have been made the subject of special study as to baking qualities by the Cerealist, to whose report the reader may be referred for particulars as to bread-making values.

Previous to milling the protein-content of the whole wheat was ascertained, the following data being obtained:—

ANALYSES of Wheats.

Laby. No.	Designation of Sample.	Moisture.	Crude Protein. (Nx6·25)	Ash.
		p.c.	p.c.	p.c.
6563	Kharkov (irrigated) Lethbridge, 1908	7·70	12·31	1·65
6564	" (non-irrigated) Lethbridge, 1908	7·97	13·12	1·50
6565	Turkey Red No. 380 (non-irrigated)—Lethbridge, 1908	8·47	12.25	1·48
6566	Turkey Red (after Timothy sod)—Lacombe, 1908	8·18	12·13	1·79
6567	Turkey Red (after summer-fallow)—Lacombe, 1908	9·17	13·12	1·65

The interesting results for the two samples of Kharkov, showing the higher protein-content of the wheat grown without irrigation, have already been referred to in our consideration of the influence of environment on the composition of the wheats, and, therefore, require no further comment here.

Respecting the two Turkey Red samples grown at Lacombe, we have unfortunately no data as to the moisture-content of the soils during the growing season.

* The wheats known as Kharkov and Turkey Red are, according to the Cerealist, different strains of the same variety.

Ordinarily, we might suppose the 'timothy sod' to be the drier soil and, arguing from previous results obtained in this laboratory, premise that its wheat would be the richer in protein. Such, however, is not the case, and the explanation may lie in the fact that the excessive rains during the early part of the season kept *all* the land practically saturated, thus off-setting the effect of the growing sod of the previous season, which undoubtedly tended towards the drying out of the soil.

ANALYSES of Flours.

Milling No.	Designation of Sample.	Moisture.	Protein. (Nx. 5·7).	Fat.	Carbo-hydrates.	Fibre.	Ash.
		p.c.	p.c.	p.c.	p.c.	p.c.	p.c.
238	Kharkov (irrigated), Lethbridge, 1908	8·65	10·43	1·14	79·02	0·15	0·61
239	" (non-irrigated), Lethbridge, 1908	8·47	11·12	1·08	78·65	0·12	0·56
240	Turkey Red, No. 380 (non-irrigated), Lethbridge, 1908	8·60	10·72	1·05	78·93	0·15	0·55
241	" (timothy sod), Lacombe, 1908	8·76	10·26	1·08	79·14	0·13	0·63
242	" (after summer-fallow), Lacombe, 1908	8·79	11·46	1·03	77·94	0·20	0·58

The first feature to be noted in a consideration of the above data is that the protein-content of the flours follows very closely that of the wheat from which they were milled. We do not call attention to this as a discovery or a fact for the first time noted; in all our work in which both the grain and its flour have been examined we have invariably found this to be the case—the richer the wheat the richer the flour. It is, however, a point worth emphasizing, not merely as showing that variations in nitrogen-content occur in the endosperm or portion of the grain made into flour and not solely in the parts of the grain removed in milling, but as making clear that in the nitrogen-content of the wheat we have a gauge of the protein-content of the flour. The recognition of this is of particular value in breeding and selection investigations in which the quantity of the wheat is insufficient to mill, a comparatively small amount only being required for the nitrogen determination.

It is noteworthy that the percentages of protein in these winter wheats are not appreciably lower than many we have obtained from Red Fife as grown in Manitoba and Saskatchewan. There is little resemblance, so far as the amount of protein is concerned, between the Kharkov and Turkey Red and the 'fall' wheats (e.g., Dawson's Golden Chaff) more commonly grown in Ontario.

GLIADIN, Gliadin-ratio and Wet and Dry Gluten.

Milling No.	Designation of Sample.	Gliadin. (Nx. 5·7).	Percentage of Albuminoids in the form of Gliadin.	Gluten.					
				Wet.	Dry.	Ratio of Dry to Wet.	Physical Characters.		
							Resiliency.	Elasticity.	Colour.
		p.c.	p.c.	p.c.	p.c.				
238	Kharkov (irrigated), Lethbridge, 1908	4·67	44·7	35·26	11·53	3·06	Good.	Good.	Slightly yellow.
239	" (non-irrigated), Lethbridge, 1908	4·56	41·0	37·93	12·32	3·08	"	"	"
240	Turkey Red, No. 380 (non-irrigated), Lethbridge, 1908	4·67	43·5	34·87	11·42	3·05	"	"	Good.
241	Turkey Red (after timothy sod), Lacombe, 1908	4·56	44·4	34·66	11·09	3·12	"	"	"
242	Turkey Red (after summer-fallow), Lacombe, 1908	4·90	42·7	38·32	12·39	3·09	"	"	"

The percentages of gliadin vary but slightly throughout the series, and though somewhat lower than the figures we obtained from Red Fife representative of the grades of 1907, they do not appreciably differ from many of the results from Red Fife and other spring wheats previously examined by us.

As in former work, we find there is a close relationship between the protein-content and the data representing the wet and dry gluten. As regards the physical character of the glutens we could detect very little difference between them; all were good in respect to resiliency and elasticity. The colour of the glutens from the two samples of Kharkov were, however, slightly more yellow than that of the Turkey Red.

To obtain further information on the question of the relationship of composition to volume of loaf, we made the determinations recorded in the following table. As explained in Bulletin No. 60, it is held by certain investigators that the volume of loaf is largely controlled by the amount of nitrogen-and-ash-free extract present in a flour. The argument is that this extract being of the nature of sugar is capable of producing gas under fermentation and the volume of gas so evolved determines the volume of loaf.

FLOURS—Solids, Ash, Nitrogen, &c., in Aqueous Extract.

Milling No.	Designation of Sample.	Percentages of Soluble Constituents of Flours.						Cerealist's Marks.
		Total Solids.	Ash.	Nitrogen.	Alkali as K_2O.	Phosphoric acid as P_2O_5.	Nitrogen-and-ash-free-ext.	Volume of Loaf.
238	Kharkov (irrigated), Lethbridge, 1908	6·79	0·42	0·27	0·161	0·163	4·83	433
239	" (non-irrigated), Lethbridge, 1908	6·26	0·43	0·23	0·178	0·119	4·52	481
240	Turkey Red, No. 380 (non-irrig d), Lethbridge, 1908	7·25	0·40	0·27	0·116	0·116	5·31	450
241	" (after timothy sod), Lacombe, 1908	7·61	0·46	0·29	0·156	0·092	5·50	402
242	" (after summer-fallow), Lacombe, 1908	7·77	0·42	0·29	0·147	0·137	5·70	409

Comparing the Cerealist's numbers for volume of loaf with the data for the nitrogen-and-ash-free extract, no direct relationship is to be observed, though there is a well marked tendency in the series towards an inverse ratio—the higher the percentage of extract the smaller the volume of loaf. This is practically what we found in studying the grades of wheat of 1907, the results of which were published in Bulletin No. 60.

This series of flours was also utilized to further prosecute the inquiry respecting any relationship that might exist between the ratio to total nitrogen of soluble ash constituents and the shape of loaf—a matter fully discussed in Bulletin No. 60, Experimental Farm Series. In the following table we present these ratios and the Cerealist's figures for the shape of loaf (i.e., height divided by diameter).

RATIO to Total Nitrogen of Soluble Constituents, Shape of Loaf and Strength.

Milling No.	Designation of Sample.	Total Nitrogen.	Ratio to Total Nitrogen of Soluble.			Cerealist's Marks.	
			Ash.	Alkali.	Phosphoric acid.	Shape.	Baking Strength.
		p.c.					
238	Kharkov (irrigated), Lethbridge, 1908	1·83	4·4	11·3	11·2	0·69	90
239	" (non-irrigated), Lethbridge, 1908	1·95	4·5	10·9	16·4	0·70	96
240	Turkey Red, No. 380 (non-irrigated), Lethbridge, 1908	1·88	4·7	17·0	16·2	0·71	93
241	" (after timothy sod), Lacombe, 1908	1·80	3·9	11·5	19·5	0·66	82
242	" (after summer-fallow), Lacombe, 1908	2 01	4·8	13·7	14·6	0 63	81

The data for the 'ash' ratio of the first three numbers of the series differ but very slightly, and the same is true for the numbers representing shape. Flour No. 241 has a low ash ratio and also a low number for shape. If this completed the examination, our work might be held to support the view that the ratio varied directly with strength (in so far as the shape of loaf is concerned), but a notable exception exists in No. 242, in which the ratio is the highest of the series with the lowest figure for shape of loaf. We are, therefore, unable to say that this theory, advanced recently by Mr. T. B. Wood, Cambridge University, receives unqualified support from these data. It is possible, however, that with further investigation the irregularities or exceptions may be capable of explanation, for it should be stated that in the larger number of flours examined, we have found a correlation—the higher ratios associated with the higher results for shape of loaf.

In concluding this brief review, it may be said that the data do not indicate, in the samples examined, any special characteristic not possessed by Red Fife and other spring wheats. Differences in composition there undoubtedly are, but these appear to be, so far as chemistry can determine, merely differences of degree—indeed such as might be found among a number of samples of wheat of the same variety grown under varying climatic conditions.

INFLUENCE OF AGE ON WHEAT AND FLOUR.

It is a generally received impression that flour improves as to colour and strength with age. To obtain definite information on this important matter, the Cerealist instituted a series of experiments in 1907, as to the effect of storage on wheat and flour. The chemical work was prosecuted with a view of discovering such changes as might have taken place in composition and which might furnish an explanation for variation in strength due to storage. Three members of the series were stored both as wheat and flour, the remaining four being kept over as grain only. The storage was for a period of sixteen months—from September, 1907, to January, 1909.*

* That part of the investigation including all milling and baking tests, was carried on by the Cerealist, in whose report will be found further particulars regarding the improvement from the baker's standpoint.

INFLUENCE OF AGE ON THE QUALITY OF WHEAT AND FLOUR.

Analysis of Flours—Results Calculated to Basis of 8 p.c. Moisture-content.

Designation of Sample.	Date of Analysis and Baking.	Laboratory Number.	Milling Number.	Ash.	Protein (N x 5·7.)	Gliadin (N x 5·7.)	Percentage of Protein in the form of Gliadin.	Gluten. Wet.	Gluten. Dry.	Gluten. Ratio of Dry to Wet.	Gluten. Physical Characters. Resiliency.	Gluten. Physical Characters. Elasticity.	Gluten. Physical Characters. Colour.	Baking Strength. (Cerealist's marks.)
				p.c.	p.c.	p.c.		p.c.	p.c.					
Huron Selected—Original	Sept. 1907	5143	152	·54	11·74	4·96	42·2	39·81	14·09	2·82	Good.	Good.	Yellow.	87
" Kept as flour	Jan. 1909	6533	152	·50	12·23	5·57	45·5	39·60	14·23	2·78	"	"	Sl. Yell.	100
" Kept as wheat	" "	6532	231	·69	11·89	5·57	46·9	42·74	14·52	2·94	"	"	"	84
Red Fife H—Original	Sept. 1907	5146	155	·50	14·28	6·50	45·5	47·15	16·66	3·03	"	"	Good.	100
" Kept as flour	Jan. 1909	6535	155	·49	14·54	6·66	45·8	44·58	16·03	2·78	"	"	"	108
" Kept as wheat	" "	6534	232	·61	14·46	6·55	45·3	47·46	17·31	2·74	"	"	"	105
Yellow Cross—Original	Sept. 1907	5147	156	·57	13·09	5·61	42·9	41·99	15·32	2·87	"	"	"	75
" Kept as flour	Jan. 1909	6539	156	·57	12·98	5·83	44·9	45·53	17·15	2·65	"	"	"	101
" Kept as wheat	" "	6538	235	·66	13·10	5·72	43·6	46·75	16·93	2·76	"	"	"	87
Stanley A—Original	Sept. 1907	5144	153	·51	9·89	4·19	42·3	34·46	12·67	2·72	"	"	"	81
" Kept as wheat	Jan. 1909	6537	234	·68	10·82	4·52	41·8	35·20	12·71	2·77	"	"	"	81
Chelsea—Original	Sept. 1907	5145	154	·51	10·51	4·71	44·8	33·96	12·49	2·72	Fair.	Fair.	"	86
" Kept as wheat	Jan. 1909	6536	233	·68	12·11	4·93	40·7	32·47	12·99	2·50	Good.	Good.	"	90
Dawson's Golden Chaff—Original	Sept. 1907	5148	157	·46	11·13	5·06	45·4	38·35	14·11	2·72	Poor.	Poor.	"	70
" " Kept as wheat	Jan. 1909	6531	229	·54	11·45	5·18	45·2	40·65	13·03	3·12	Fair.	Fair.	"	77
Turkey Red, No. 380—Original	Sept. 1907	5149	158	·49	10·41	4·54	43·6	34·81	11·53	3·02	Good.	Good.	"	95
" " Kept as wheat	Jan. 1909	6530	228	·58	10·49	4·33	41·2	33·62	11·29	2·97	"	"	"	89

Protein.—A comparison of the protein data of the members of each group, *inter se*, indicates a slight increase in the percentage of this important constituent due to storage—the increases being larger when the samples had been kept as flour. One exception occurs in the case of the Yellow Cross, in which the protein-content remained practically constant whether the wheat was kept as grain or flour throughout the entire storage period.

The slight increase in the percentage of protein might, we presume, be accounted for by the destruction of some of the carbohydrates by slow oxidation during storage, and no doubt the fact that flour presents a larger surface to the air, thus allowing more rapid oxidation, furnishes the explanation for the change being greater in the flour than in the grain.

Comparing group with group it is evident that the amount of protein is related to the baking strength of a flour. Thus, in the Red Fife group we have over 14 per cent protein accompanied by baking values of more than 100, while Dawson's Golden Chaff with a protein-content of less than 11·5 per cent has baking values less than 77. Though the percentage of protein is an index of strength, we have not been able to establish any definite ratio between these two classes of data.

Gliadin.—A tendency towards an increase in this constituent is observed in a number of the groups, showing a certain amount of parallelism between protein-content and gliadin.

Throughout the series there are no indications within the group that the quantity of gliadin materially influences the baking strength. Differences in baking values among the members of a group are at times quite marked, but the percentages of gliadin for these same flours may not vary beyond the limits of experimental error. It is, however, significant that the percentages of gliadin of the Red Fife group, rated as the highest in baking strength, are decidedly higher—1·5 per cent—than those of the Dawson's Golden Chaff group, which, it will be observed, stands lowest in strength. Again, Chelsea, Stanley A and Turkey Red all fall below 5 per cent in gliadin, and the strength of their flours is considerably under 100—the mark awarded to several in the series containing 5 per cent and over of gliadin.

Gluten.—The general agreement between dry gluten and protein, regarding which we have in past years furnished much evidence, is again to be noted. It follows, therefore, that whatever we have said concerning the relationship of protein to baking strength applies equally to dry gluten.

Nitrogen-and-ash-free Extract and Volume of Loaf.—A consideration of the results from the determinations of the nitrogen-and-ash-free extract and the volume of loaf indicates that if there is any relationship between the two classes of data it is not as might have been expected—volume increasing with the amount of extract—but rather the reverse, for in four of seven groups maximum extract is associated with minimum volume of loaf.

NITROGEN-AND-ASH-FREE Extract and Volume of Loaf.

No of Sample.	Nitrogen-and-Ash-free Extract.	Volume of Loaf (Cerealist's Marks).
	p.c.	
5143	3·39	433
6533	2·14	474
6532	4·45	395
5146	3·19	534
6535	3·08	539
6534	3.65	539
5147	4.28	402
6539	3·44	484
6538	2·62	421
5144	3·85	402
6537	5 21	366
5145	3.67	415
6536	4.58	420
5148	3·26	374
6531	3·43	392
5149	4·08	485
6530	4 39	407

Ratio of Soluble Ash to total Nitrogen and Shape of Loaf.—These data lend no support to the view that the shape of loaf is governed by the proportion of protein (or total nitrogen) to the soluble ash constituents, as will be evident from an inspection of the following table.

RATIO to Total Nitrogen of Soluble Constituents and Shape of Loaf.

No of Sample.	Ratio to Total Nitrogen of Soluble.			Shape of Loaf (Cerealist's Marks).
	Ash.	Alkali as K_2O	Phosphoric acid as P_2O_5	
5143	6·0	20	16	·61
6533	7·0	20	16	·73
6532	4·0	15	11	·67
5146	7·6	21	21	·63
6535	7·4	22	20	·73
6534	6·0	19	15	·71
5147	6·4	16	17	·56
6539	4.9	14	11	·75
6538	6·1	16	13	·70
5144	5·0	15	15	·60
6537	3·9	12	9	·68
5145	5·0	14	14	·65
6536	4·7	14	11	·72
5148	6·6	18	20	·56
6531	7·0	17	16	·66
5149	5·9	17	17	·64
6530	5·0	14	12	·71

THE EFFECT OF DAMPNESS ON THE QUALITY OF WHEAT.

It sometimes happens in the wheat fields of northwestern Canada, that, owing to inclement weather following the cutting of the grain, wheat becomes damp while in the stook and may remain so for some weeks before it is threshed. Since such wheat receives a lower commercial grade on account of the duller and paler appearance of the grain in some cases, and because of the common impression that the moisture in the grain has injuriously affected the gluten and thus impaired the resultant flour for bread-making purposes, it becomes a question of considerable importance to ascertain as carefully as may be, by chemical and baking tests, how far this contention may be correct. Damp wheat which does not contain a large excess of moisture is known commercially as 'tough.'

In October, 1908, Messrs. Joseph G. King & Co., lessees of the Canadian Pacific Railway elevator, Port Arthur, Ontario, furnished us with three samples of such wheats, describing them as follows: 'They grade respectively, "tough" No. 1, 2 and 3 Northern. We dried them, the wheats losing from 4½ to 5 per cent moisture. These wheats had been wet at least eight or nine months, for they were from the 1907 crop. These samples show no apparent signs of fermentation, and there was no evidence when the wheats were received, either from appearance or smell, that they had been heated.'

On being submitted to analysis the following results were obtained:—

COMPOSITION of 'Tough' Wheats.

Laby No.	Designation.	Weight of 1,000 kernels.	Moisture.	Fat.	Protein. (Nx6.25)	Carbo-hy-drates.	Fibre.	Ash.
		Grammes.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.
5958	Red Fife—Tough No. 1 Northern	26·64	12·73	2·11	14·37	67·05	1·99	1·75
5959	" " " No. 2 "	26·12	12·05	2·25	15·10	66·77	1·88	1·95
5960	" " " No. 3 "	24·84	12·33	2·17	15·23	66·19	2·37	1·71

The data show that, as received, all three wheats were normal as to moisture-content; the drying in the elevator had evidently dispelled the excess of moisture.

In point of protein-content the wheats are all very satisfactory, and a general survey of the analytical results reveals no abnormality as to composition.

ANALYSES of Flours.—Protein, Gliadin,

Treatment of Sample.	Laby. No.	Milling No.	Ash.	Protein (N x 5·7)	Gliadin (N x 5·7)	Percentage of Albumenoids in the form of Gliadin.	Wet.	Dry.	Ratio of Dry to Wet.
			p.c.	p.c.	p.c.		p.c.	p.c.	
Red Fife—Original sample untreated.	6608	246	·59	11·79	5·22	44·2	38·55	13·90	2·77
" 5 minutes in water........	6609	247	·54	12·00	5·20	43·3	38·52	14·09	2·73
" 10 days damp..........	6610	248	·54	11·79	5·22	44·2	38·22	13·14	2·90
" 20 days damp............	6611	249	·52	11·50	5·11	44·4	37·97	12·31	3·08
" 27 days damp............	6612	252	·55	11·70	5·13	43·8	37·19	12·02	3·09

Unfortunately the samples were not sufficiently large to allow of milling, and we were therefore constrained to ascertain the character of the gluten from the ground whole wheat, rather than from the flour, as is usually our custom. Our trials with the gluten so prepared indicated in all three instances excellent quality; the glutens were characterized by toughness and resiliency and might be considered as satisfactory. From these results, therefore, it would seem that the wheats in question have not appreciably suffered as regards quantity and quality of gluten, and this deduction is in accord with the opinion of Joseph G. King & Co., who maintain that 'the moisture does not injure the gluten, provided fermentation has not taken place.'

The further proseeution of this investigation has been made with the co-operation of Dr. Charles E. Saunders, Cerealist, who had instituted a series of experiments, damping wheats artificially to ascertain what deterioration or change in bread-making value might result from keeping wheat more or less damp for a longer or shorter period before being milled.

The general method of treatment is outlined in the first column of the following table. The range of temperature of the wheat while being kept damp was for the first ten days between 40 degrees F. and 50 degrees F., for the subsequent ten days between 45 degrees F. and 58 degrees F., and for the last seven days between 47 degrees F. and 50 degrees F. In the sample that had been kept damp twenty days, mustiness was notieed, and in that which had been damp for twenty-seven days, the mustiness was more pronounced and sprouting had commenced. At the expiration of the treatment periods, these wheats, the water-content of which ranged from 23 per cent to 28·5 per cent, were spread in thin layers and allowed to dry spontaneously.* They were then milled and the resultant flours submitted to chemical and baking tests.

---

* Further particulars regarding the treatment of these wheats together with the presentation and discussion of the milling and baking results will be found in the current report of the Cerealist.

Gliadin-ratio and Wet and Dry Gluten.

Gluten.			Aqueous Extract.									
Physical Characters.									Ratio to total nitrogen of soluble.			
Resiliency.	Elasticity.	Colour.	Ash.	Solids	Alkali as K_2O.	Phosphoric acid as P_2O_5	Nitrogen.	Nitrogen-and-ash-free extract.	Ash.	Alkali as K_2O.	Phosp'ic acid as P_2O_5.	Baking strength.
			p.c.	p.c.	p.c.	p.c.	p.c.	p.c.				
Good...... ...	Good.......	Good...	·424	7·05	·123	·158	·31	4·86	4·8	17	13	93
"	"	" ...	·343	6·79	·133	·133	·31	4·68	6·1	16	16	94
"	"	" ...	·329	6·63	·131	·130	·31	4.53	6·0	16	16	96
Fair...........	Fair........	" ...	·341	7·17	·129	·132	·34	4·89	5·9	16	15	100
Almost poor, tendency to stickiness.	Almost poor.	" ...	·430	8·88	·150	·149	·34	6·51	4·7	14	14	86

The data for the protein and gliadin are throughout the series very close, and consequently show that the treatments which the wheats have severally received had not affected the percentages of these constituents in the resultant flours. They offer no basis for the differentiation of the flours as to quality, nor would great differences be looked for from an inspection of the Cerealist's marks for strength, as with the exception of the last member of the series these differ but slightly among themselves.

Considering the gluten data, it is rather significant that no falling off in quantity or quality could be detected in the flour from the wheat that had been kept damp for as long as ten days. In the case of the two flours (Nos. 6611 and 6612) obtained from the wheats which were kept twenty and twenty-seven days, respectively, in the damp condition, there was a slight falling off in the percentage of dry gluten and a noticeable deterioration in the quality, more especially in that of No. 6612.

The slight inferiority observed in No. 6611 is not noticeable in the results obtained by the Cerealist for baking strength. In the case of 6612, however, a gluten of most decidedly poor quality, a very considerable falling off in strength is recorded.

The results for the nitrogen-and-ash-free extract throw no light upon any relation that may exist between this datum and volume of loaf, as will be evident from the following figures:—

NITROGEN-AND-ASH-FREE Extract and Volume of Loaf.

No. of Sample.	Nitrogen-and-Ash-free Extract.	Volume of Loaf. (Cerealist's Marks.)
	p.c.	
6608	4·86	454
6609	4·68	471
6610	4 53	479
6611	4·89	521
6612	6·51	506

As regards the effect of continued dampness we cannot observe any regular variation in the amount of nitrogen-and-ash-free extract; indeed the variation is almost inappreciable, except in the case of No. 6612 obtained from the wheat which had been damp for twenty-seven days, in which the extract is about two per cent higher than in the rest of the series.

The ratios of soluble ash constituents to total nitrogen do not vary within any wide limits, and it is impossible from a study of such differences as do occur to detect any influence of the treatment to which the wheat had been subjected or to establish any direct relationship between these data and those for the shape of loaf. It is worthy of note that the Cerealist's marks for shape of loaf differ but slightly throughout the series. But he reports that in order to obtain a well shaped loaf from No. 6612 it is necessary that there should be a considerable reduction in the amount of water added to the flour when making the dough.

RATIO to Total Nitrogen of Soluble Constituents and Shape of Loaf.

No. of Sample.	Ratio to total Nitrogen of Soluble.			Shape of Loaf. (Cerealist's Marks.)
	Ash.	Alkali as K_2O.	Phosphoric acid as P_2O_5	
6608	4·8	17	13	·69
6609	6·1	16	16	·68
6610	6·0	16	16	·68
6611	5·9	16	15	·72
6612	4·7	14	14	·68

Though this work must be regarded as of a preliminary character, we may safely state that the present results indicate that wheat may contain an excessive amount of moisture for some considerable time without its composition being very materially affected, provided the temperature conditions are such that no heating or fermentation of the wheat takes place.

The baking qualities of these flours are more particularly commented upon by the Cerealist; the writer has merely considered them with a view of learning what relationship, if any, might exist between the chemical data of these damp wheats and their baking strength.

SOILS.

SOILS FROM THE UPPER COLUMBIA AND EASTERN KOOTENAY DISTRICTS, B.C.

During an agricultural tour in British Columbia, in the summer of 1906, the writer journeyed by wagon from Golden, on the main line of the Canadian Pacific Railway, to Cranbrook, on the Crow's Nest Pass branch of the same railroad, a distance of nearly 200 miles, visiting the ranches by the way, examining the soils and otherwise obtaining information respecting the agricultural possibilities of this district.*

In the course of this inspection samples of soil, more or less typical of virgin and cultivated areas, were collected for further examination and analysis. The analytical work has been completed during the past year, and we are, therefore, now in a position to consider these soils as to the amount and availability of their plant food. It may also be possible to deduce from the data certain rational and economic methods for the up-keep of their fertility under general farming and fruit culture.

The areas from which the samples were taken lie for the most part within the so-called semi-dry belt of British Columbia—a region in which sage-brush and bunch-grass lands largely predominate. The scanty natural vegetation, specially noticeable on the higher plateaus and benches, at first sight suggests the lack of soil fertility, and the appearance of much of the soil would further support this view, as it is a light, very loose sandy loam of apparently very poor quality. The very luxurious growth, however, that is to be noticed on these lands following the application of water (by irrigation) immediately dispels this impression. It was with the object of learning how far the peculiar climatic influences of the dry belt had tended to an accumulation of plant food in available form that this chemical work was chiefly undertaken.

* An account of this tour will be found in the Report of the Chemist, Experimental Farms, 1906.

COMPOSITION of Soils from the Valleys of the Upper Columbia and Kootenay, B.C.

Laboratory No.	Description.	Water.	Organic and Volatile	Clay and Sand.	Oxide of Iron and Alumina.	Lime.	Magnesia.	Potash.	Phosphoric Acid.	Carbonic Acid, etc. (Undetermined).	Nitrogen.	Available.		
												Lime.	Potash.	Phosphoric Acid.
		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.
4315	R. R. B., Windermere, B.C., virgin soil..	1·77	13·96	68·60	6·33	6·42	2·06	·42	·214	·226	·370	·90	·028	·005
4317	" " cultivated soil	1·76	10·56	77·59	7·18	1·41	1·38	·45	·182	....	·353	·82	·052	·023
4324	B. A., " virgin soil..	·87	5·68	80·85	5·34	3·87	1·33	·30	·096	1·67	·155	2·55	·027	·021
4320	E. C., " " ..	1·35	7·81	79·69	6·73	1·93	1·48	·37	·198	·442	·283	1·26	·059	·023
4321	" " cultivated..	1·35	10·91	72 06	6·24	4·86	1·87	·34	·160	2·21	·361	2·46	·037	·023
4314	Capt. M., Wilmer, B.C.	3·61	17·13	36·95	4·38	18·72	4·21	·16	·147	14 693	·232	2·05	·034	·002
4323	Sage bush land, Windermere Road........	1·39	6·47	81·13	7·80	·83	1·29	·49	·083	·517	·205	·51	·079	·014
4352	P's Ranch, Balfour, B.C., virgin soil	2·07	10·09	77·95	7·84	·47	·55	·17	·547	·313	·169	·08	·065	·018
4347	J. A., Kaslo, B.C., "	2·28	6·47	75·56	11·89	·74	·86	·23	·445	1·525	·093	·12	·035	·127
4348	Upper bench soil, Kaslo, B.C...........	2·95	6·95	75·09	11·82	·77	·88	·22	·621	·699	·093	·19	·029	·084
4424	A. G., above Kaslo, B.C................	1·78	5·67	79·48	10·11	·63	1·15	·24	·387	·553	·083	·26	·041	·099
4391	Covert's Ranch, Grand Forks, B.C., bench soil.	2·11	10·24	78·53	6·22	1·31	1·08	·21	·221	·079	·330	·55	·030	·028

The first five samples on the chart were from areas in the immediate vicinity of Windermere—a village on the lake of that name situated about ninety miles south of Golden. Driving from the north, the typical sage-brush country is entered some thirty or forty miles before reaching Windermere, at which place farmers and fruit growers feel or admit the necessity of irrigation for the growth of crops generally. Here, as indeed in almost all other parts of the dry belt, the results from judicious irrigation showed that excellent crops could be secured and that the soil could not be devoid of fertility. Nos. 4315 and 4317 are fine-grained, mouse-brown loams, taken from one of the lower benches, representative of the first four inches of the virgin and cultivated areas. The cultivated soil No. 4317 had borne six crops of oats without any application of manure, and, as far as one could judge, had originally been uniform in all essential particulars with No. 4315—the virgin soil. The data show that both soils are abundantly supplied with the essential elements of plant food, and more particularly with nitrogen. The percentage of organic matter and lime are also excellent, betokening soils of more than average fertility.

Comparing the soils, we do not find that the six years under crop has very materially affected the amounts of 'total' nitrogen, phosphoric acid and potash, nor would any very marked differences have been expected from so short a period of cultivation; but when we turn to the amounts of 'available' phosphoric acid and potash very considerable differences are to be observed. Thus, the cultivated (and irrigated) soil contains almost twice as much potash and almost five times as much phosphoric acid in an available form as the virgin soil. Some years ago (1889), in examining irrigated and non-irrigated soils from near Calgary, Alta., we noted the same peculiarity, raising the question whether cultivation with irrigation did not materially serve to increase the availability of these mineral elements. The point is deserving of further investigation, for if the above deductions be correct we have at least one explanation for the exceptional productiveness of these soils under irrigation—and possibly also a warning that this fertility must be maintained by rational, judicious cultural methods, or the excellent results obtained when these soils are at first tilled will more or less rapidly disappear.

No. 4324 is a sample of the uncropped, unmanured soil from the first four inches of one of the lower benches on the west side of Lake Windermere. In general appearance it is very similar to the soils just discussed, being a fine-grained, loose, sandy loam of a light chocolate-brown colour. A careful comparison, however, by one accustomed to examining soils, indicates that it is somewhat less rich in organic matter, and analysis bears out this conclusion. Similarly with the lower percentage of organic matter we find a reduction in the amount of nitrogen present. Though in 'total' phosphoric acid and potash this soil would not rank with many of our richest loams, the proportions of these elements that are more or less immediately available for crop use are exceedingly good. The lime-content is also very satisfactory. From the favourable physical condition of the soil as well as from its adequate stores of plant food, we judge that with provision for water it should prove very productive.

No. 4320.—This is a further sample typical of the sage-brush land. It was taken from an unbroken area on one of the lower benches on the east side of the lake some two miles south of Windermere. In appearance and physical characters it is very similar to the soils already described. The nitrogen-content betokens a soil of more than average productiveness, while the percentages of phosphoric acid and potash both 'total' and 'available' are quite satisfactory.

No. 4321, from the same ranch, was collected from a bench or plateau lower than that represented by No. 4320 and from an area that had been under cultivation—oats and other grains chiefly—for a number of years, but which had not been manured. Compared with the foregoing it would appear to be somewhat richer in vegetable matter, and the analysis bears out this view. In the amounts of phosphoric acid and potash present it closely approximates No. 4320, but is considerably richer in lime. The data support the practical experience of those tilling these areas that the lower benches and 'bottom' lands are more productive than the higher benches, due very largely, we believe, in the first place to their higher humus and nitrogen-content and, secondly, to their being richer in lime.

No. 4314 was collected for a specific purpose. It was taken from what may be described as a high bottom land, that is a depression, probably the site of a pond or small lake on a plateau in one of the higher valleys. It was of a light-grey colour and of a marly appearance. The crops had repeatedly failed and alkali was suspected. The analysis proved the absence of all deleterious alkali, and showed in fact a marl mixed with a considerable proportion of vegetable matter or muck, evidently the deposition of years during which the soil was under water.

No. 4323, representative of the first four inches of sage-brush land on the Golden-Windermere road, between Vermilion and Macauley creeks. No marked differences were to be observed in colour or texture between this soil and the other samples we have spoken of as 'sage-brush' land. As regards composition its lime-content is much lower than those of similar origin in the series; it is also below the average in phosphoric acid. The percentage of nitrogen is extremely satisfactory, as indeed are the proportions of 'available' lime and potash.

To sum up these considerations, we may say that our knowledge of these soils of the sage-brush areas, both in situ and in the laboratory, permits the following conclusions and deductions:—

1. That they are for the most part light chocolate, or brownish, sandy loams of a loose, almost ash-like character. The sand grains are chiefly very fine and the proportion of clay is quite small. They are soils that are extremely easy to work, but careful management is necessary when irrigating to prevent the cutting of deep channels and the washing away of the surface soil. There is no strong colour line of demarcation between the surface and the subsoil, the former merging almost imperceptibly into the latter. As might be expected, however, there is more humus, and consequently the soil is somewhat darker, nearer the surface.

2. While the results of analysis do not show that uniformity in composition that characterizes many tracts of northwestern prairie soil, the evidences from the chemical standpoint are strongly indicative of a common origin.

Their nitrogen-content is exceedingly good and much higher than might be conjectured from their physical appearance. They are characterized by a large percentage of lime, a further feature betokening fertility. The amounts of potash present are also very satisfactory.

The proportion of the mineral plant food constituents in available form is worthy of special attention. Although the soils are not rich in total phosphoric acid, the amount present that is more or less immediately assimilable is in all cases, save one, far above the average. As already noted, the potash content of the soils is excellent and the data denote a very large proportion of this store to be immediately available. The figures for the available lime also are very good, indicating undoubtedly a high degree of productiveness.

No. 4352.—A coarse sandy or gravelly loam, containing pebbles and small rock fragments, collected at Proctor, on the Kootenay river, and characteristic of much of the soil on both sides of the river as far as Nelson. A considerable amount of root fibre is present, but the humus-content, judging from the indications, would be low. The area from which the sample was collected had been recently burnt over in the clearing of the land.

Compared with the typical sage-brush land this soil is, from the chemical and physical standpoint, distinctly inferior. Experience has shown that this and similar soils in East Kootenay have so far proved fairly satisfactory for fruit growing. But it must be remembered that, as yet, there has been practically no demand upon their fertility. Most of the areas so far cleared and planted have been brought under cultivation during the past five years—many of them more recently—and a very young orchards requirements as regards plant food are not excessive. Later, as these orchards come into bearing and greater demands upon the stores of fertility are made by the growth of vegetables and small fruits, careful attention will have to be paid to the upkeep of these soils—and particularly as regards their humus-content. While it will no doubt be advantageous in many cases to use commercial fertilizers, green manuring, i.e., the occasional growing and turning under of a green crop, will be found the most rational and economic method to adopt for maintaining the soil in good heart, even when a certain amount of barnyard manure is available. As a green crop for this purpose clover, or some other legume, will be found more beneficial than buckwheat or rye, for the reason that the latter are not nitrogen-gatherers. Where difficulty, however, at first exists in getting a catch of clover, owing to insufficient moisture or other causes, these crops may be advantageously used.

Nos. 4347, 4348 and 4424 are virgin soils taken in the vicinity of Kaslo, East Kootenay. They are all very similar—reddish clay loams—and scarcely distinguishable the one from the other.

No. 4347 is from the rising ground just above Kaslo. The sample represents depth of eight inches, below which there is a subsoil of gravel.

No. 4348 is a similar sample from a bench higher up.

No. 4424 was collected three miles above Kaslo from an uncultivated area, and represented a depth of six inches. The area had been burnt over some few years previously, but was now covered with a strong native vegetation. The subsoil was gravel.

The analytical data indicate a very strong similarity between these soils; indeed in all essential particulars, and especially as regards nitrogen and potash, they are almost identical. They would not be considered, judged solely from the chemical standpoint, as ranking with our better soils, except with respect to phosphoric acid, in which element they are well supplied. They are comparatively low in nitrogen and lime, but the proportions of the mineral constituents that are available are very satisfactory.

No. 4391 was collected on the Covert ranch at Grand Forks in the Boundary district. It formed a part of a large accumulation on one of the benches at the foot of the mountain, and resulted in part from heavy washing of the light loam of the upper plateau by injudicious irrigation.

It is a black sandy loam of excellent texture, and evidently one particularly rich in humus and nitrogen. It was producing, at the time of collection, large crops of vegetables and fruits, and the chemical data corroborate this evidence as to its great fertility. This instance may, however, serve to emphasize the result of careless and excessive irrigation on steep slopes, for, an examination showed clearly the severe denudation that the upper benches had received in the building up of this deposit.

ALKALI SOILS.

From time to time we are called upon to examine samples of soil suspected of containing alkali. These, for the most part, are from the northwestern provinces and the semi-dry belt of British Columbia. Our examination has not been exhaustive in every instance, but sufficient analytical data were always obtained to allow of a clear diagnosis as to the nature of the alkali present.

Ducks, B.C.—This was forwarded for examination by Hon. H. Bostock. While moist it had all the appearance of a rich soil, but on drying—as by simple exposure to the air—evidence of alkali became apparent through the formation of a white incrustation. The following data represent the water soluble constituents of the air-dried soil:—

	Per cent.
Carbonate of sodium	·042
Chloride of sodium	·053
Sulphate of sodium	2·235
Sulphate of calcium	·295
Sulphate of magnesium	1·055

These results bear out the impression gained from an inspection of the air-dried sample, viz., that it is highly impregnated with alkali. It is satisfactory to note that the amount of carbonate of soda (black alkali) is very small; this simplifies the work of reclamation. However, the quantity of sulphate of soda and sulphate of magnesia (white alkali) present is so large that persistent effort would be necessary—probably for a number of years—to make this soil suitable for crops in general.

Cranbrook, B.C.—Forwarded by E. A. Liezert, who states that the land is covered with a heavy growth of tall grass (?), but that on bringing it under cultivation it proves unsatisfactory, many crops refusing to grow. We obtained the following results from the analysis of the air-dried soil:—

	Per cent.
Chloride of sodium	·232
Sulphate of sodium	·506
Total solids in aqueous extract, obtained directly	·730

This, again, is a case of white alkali which, as we have pointed out in previous reports, is not to be feared in the same degree as black alkali. Nevertheless, this soil is so highly charged with saline matter—more or less injurious to vegetation—that proper means for its reclamation would have to be adopted before the soil could be cultivated with profit.

Windermere, B.C.—Three samples of soil suspected of being impregnated with alkali were received from this place. The statement of the sender was to the effect that these lands had until the last few years yielded excellent crops, but that owing to exhaustion or the presence of alkali (which until recently had not been observed) these areas now were practically sterile. The appearance of the samples certainly did not betoken exhaustion and the suspicion became strong that the trouble was due to alkali. The examination comprised a determination of the plant food constituents and a search for deleterious salts.

ANALYSIS of Soils from Windermere, B.C.

—	No. 1.	No. 2.	No. 3.
	p.c.	p.c.	p.c.
Moisture	4·61	1·81	2·66
Organic and volatile matter	10·41	12·14	15·55
Nitrogen	·370	·330	·302
Phosphoric acid	·19	·22	·17
Potash	·45	·40	·40
Lime	3·25	6·28	7·05
Available constituents—			
Phosphoric acid	·018	·008	·006
Potash	·109	·028	·081
Lime	1·50	·16	1·86

These soils were all from the ranch of Mr. R. R. Bruce, Windermere, valley of the Upper Columbia. No. 1 was taken 'south of the high road,' and represented the immediate surface soil over a considerable area receiving the seepage of higher lands that had been liberally irrigated. No adequate drainage had been provided to take off this water, and the result was that on evaporation soluble salts to an excessive degree had accumulated in the surface soil. No. 2 was taken below No. 1, representing a depth of between 2 and 4 inches. No. 3 was collected at no very great distance from No. 1, in a slight depression kept moist by seepage water. The sample represented merely the surface ¾ inch.

The results of the chemical analysis furnish satisfactory evidence that the reason for the unproductiveness of this area is not to be found in any deficiency of the more important constituents of plant food. Indeed, in certain particulars—and more especially as regards nitrogen—this soil must be judged as one decidedly above the average and one which under favourable climatic conditions should prove most profitable under cultivation. The high lime-content is worthy of remark; it is a characteristic of soils of semi-arid areas, and may be considered as indicative of productiveness.

The explanation of the trouble was readily apparent when a search for deleterious salts was made. In all three of the samples, and more especially in No. 3, considerable amounts of sulphate of soda, sulphate of magnesia, chloride of soda and other salts which might be included in the group forming white alkali, were found, and in No. 1 a certain small amount of the more injurious carbonate of soda was also present.

Winona, Ont.—This is a rather remarkable instance of the occurrence of alkali. It is most unusual in eastern Canada, as indeed in humid districts, to find an arable soil saturated with saline matter; the constant rainfall preventing any such accumulation. In a letter accompanying the sample, which, as we shall see, was heavily impregnated with alkali, our correspondent says: 'There are here (Winona, Ont.) about six (6) square yards of land which every spring become encrusted with white alkali (?). It is grape land and this is the second year that I have planted vines on the spot and they have died; they grow for a while—during cultivation—and seem to do well, but subsequently die. This must surely be due to a salt or soluble mineral matter in the soil. We are about thirteen (13) rods from the lake shore. What can be done towards reclaiming the land?'

Upon analysis the air-dried soil was found to contain the following amount of saline material:—

	Per cent.
Sodium chloride (common salt)	·29
Calcium sulphate (sulphate of lime)	·25
Magnesium sulphate (Epsom salts)	·61

Undoubtedly the sulphate of magnesia is here the compound most harmful to vegetation; the common salt and sulphate of lime in the above proportions cannot be considered injurious—indeed both substances are used to a certain extent as fertilizing materials. Of course the surface soil after a period of drought, during which cultivation had not been practiced, might contain much larger amounts of these chemicals than we found and, hence, the injury to vegetation greater than that which might be predicted from the present results.

If the affected area could be thoroughly drained and the soil then leached, further accumulation of saline matter might be prevented. Provided the salts are being constantly supplied by a subterranean source or spring, drainage suggests itself as the most effective method for preventing saturation of the soil. Frequent cultivation will of course be necessary in checking surface evaporation and preventing the rise of the alkali. The various means that may be adopted in the reclamation of alkali soils—drainage, leaching, cultivation, application of farmyard manure, &c.—have been fully discussed in Bulletin 4, Series II, Experimental Farm, Ottawa, in which publication we have also considered the more common forms of alkali found and their specific treatment, and enumerated the crops most resistant to alkali. This bulletin should be read by those who have alkali lands to reclaim.

THE NITROGEN-ENRICHMENT OF SOILS THROUGH THE GROWTH OF LEGUMES.

In the report of this Division for 1905 we gave an account of certain experiments that we had instituted in 1902 to ascertain the amount of nitrogen that could be added to and become part and parcel of the soil through the growth and turning under of clover. One of these experiments, still in progress, may be described as follows: A plot 16 feet by 4 feet was staked off, and the sides protected by boards sunk to a depth of eight inches. The surface soil to this depth was then removed, and in its place a strictly homogeneous but very poor sandy loam substituted—the nitrogen content of which was ·0437 per cent. This was dressed with superphosphate at the rate of 400 lbs. per acre and muriate of potash at the rate of 200 lbs. per acre. It was then (May, 1902) sown with red clover. During each succeeding season the growth has been cut and the material allowed to decay on the soil. At the end of every second season the soil has been thoroughly stirred to a depth of four inches and the plot sown with clover the following spring. In order to trace the influence of this treatment we have determined, at intervals, the nitrogen-content of this soil, the sample for analysis being taken to a depth of four inches. The following table presents our results to date:—

NITROGEN Enrichment of Soil due to Growth of Clover.

—	Date of Collection.	Nitrogen.	
		Percentage in water-free soil.	Pounds per acre to a depth of 4 inches.
Before experiment	13·5·02	·0437	533
After two years	14·5·04	·0580	708
" four "	15·5·06	·0608	742
" five "	30·5·07	·0689	841
" six "	23·5·08	·0744	908
Increase in nitrogen due to six years' growth	....	·0307	375

Each succeeding season, it will be observed, has shown an increase in nitrogen content. After six years, despite losses by oxidation, &c., which must occur in such a light sandy soil, this enrichment amounts to 375 lbs. per acre.

In these results we have direct and satisfactory proof of the manurial value of clover. Although this nitrogen is not present in an immediately available condition it is associated with readily decomposable organic matter and would be set free for the use of succeeding crops.

INOCULATION FOR THE GROWTH OF ALFALFA.

Certain striking results showing the value of inoculation for alfalfa on soils that had not previously grown this legume were obtained on the Experimental Farm, Lacombe, northern Alberta, during the past season. Mr. G. H. Hutton, the superintendent, furnishes the following particulars respecting the experiment: 'Two plots of soil, side by side, alike as to quality and previous cultivation, were sown to alfalfa, one of these plots being dressed with surface soil from a field that had grown alfalfa on the Experimental Farm, Lethbridge, Alberta. The application was at the rate of 300 lbs. of soil per acre, the inoculating soil being broadcasted and harrowed in at the time of seeding. Dates of sowing and cutting were the same and the crop from each plot was cured under the same conditions and hauled at the same time. In fact in every way, so far as possible, the treatment was identical. The inoculated plots yielded at the rate of 7,200 lbs. per acre, while the uninoculated yielded at the rate of 2,560 lbs.'

Although in our past work with inoculating materials we have obtained at times considerable increases in yield following upon inoculation, we have never had hitherto results so favourable to inoculation. The yield on the treated plots was almost three times that on the untreated plots. No doubt the phenomenal success of the inoculation was in a large part due to the absence, or practical absence, of nitrogen-fixing bacteria in the original soil, but it is gratifying to note that this large increase of yield was brought about by the method that we have advocated as probably the most effective and cheapest, namely, the use of soil from an area that has recently grown luxuriantly the legume about to be sown.

An inspection of the samples of alfalfa hay when received very clearly showed that the plants from the inoculated area had been by far more robust, that is, taller, stouter and greener, than those from the adjacent uninoculated area.

Analysis of Alfalfa Hays.

—	Inoculated plot.	Uninoculated plot.
	p.c.	p.c.
Moisture	6·38	5·99
Protein	17·81	15·62
Fat	1·11	1·05
Carbohydrates	36·72	40·75
Fibre	27·89	25·60
Ash	10·09	11·01
	100·00	100·00

The larger proportion of crude protein in the hay from the inoculated plot is a matter of considerable importance, though not one of surprise, as we have in previous work occasionally found the inoculated legume to be the richer in nitrogen.

The results in the field and laboratory, therefore, show that in this case inoculation has not only increased the yield, but given a higher nutritive value to the fodder produced.

FERTILIZING MATERIALS.

FISH SCRAP FROM DOGFISH REDUCTION WORKS.

Analyses of this product have been made annually since 1905, the results appearing in reports of this Division. It is essentially a nitrogenous fertilizer, though containing a notable amount of phosphoric acid.

The sample examined in September, 1908, was from the Government Reduction Works at Shippegan, N.B. Its analysis afforded the following data:—

Analysis.

	Per cent.
Moisture	5·47
Nitrogen	8·78
Phosphoric acid	7·73
Total mineral matter	19·77
Mineral matter insoluble in acid	·28
Oil	16·58

In certain important particulars this scrap is superior to samples previously analysed, for while its nitrogen-content is fully equal to that in past years, the percentage of phosphoric acid is considerably higher. Hitherto we have found the phosphoric acid between 3 per cent and 4 per cent; in this sample it is between 7 per cent and 8 per cent. A notable improvement is also to be observed in the smaller amount of oil present, the reduction being approximately from 25 per cent to 16 per cent. Since the presence of much oil tends to delay the setting free in the soil of the fertilizing elements of this product, this reduction is a matter of considerable moment and would raise the values for the nitrogen and phosphoric acid. Further, the percentage of moisture is only about one-half that found in samples previously analysed.

The use of this material as a fertilizer for farm and garden crops was discussed in our report for 1906, where formulæ are to be found for the preparation of a 'complete' fertilizer, by the addition of certain chemicals.

MUCKS, MUDS AND MARLS.

Muck, St. Stephen, N.B.—Our correspondent (W. F. Todd) writes: 'We are anxious to ascertain what manurial value this muck may have; please let us know its nitrogen-content and values in potash and phosphoric acid.'

Brownish-black, apparently well decomposed, slightly acid, its analysis, made on the air-dried sample, afforded the following data:—

Analysis of Muck.

	Per cent.
Moisture	7·58
Organic and volatile matter	67·63
Mineral matter, including sand	24·79
	100·00
Fertilizing constituents—	Per cent
Nitrogen	2·03
Phosphoric acid	·19
Potash	·15

This muck is of good average quality, and would be well worth using for its nitrogen and humus-forming material. Its direct application to the soil would not in all probability prove profitable, but it might advantageously be used after being subjected to incipient fermentation, as in the compost heap. It also seems well adapted (after being air-dried) to act as an absorbent in and about the farm buildings—a use that we have generally advocated as being probably the most profitable means for the utilization of mucks. In the resultant manure there is not only much plant food that might have been washed by the draining away of the liquid from the cowhouse, pigpen, &c., but the fertilizing elements in the muck itself are presented to the crop in forms much more readily assimilable than as originally present.

The percentages of potash and phosphoric acid are, as might be expected, quite small—indeed negligible—considering the muck as a fertilizer.

A further sample of muck from near St. Stephen, N.B., and sent in by another correspondent (E. H. Barter), was found on analysis to have the following composition in the air-dried condition:—

Analysis.

	Per cent.
Moisture	7·71
Organic and volatile matter	79·61
Mineral matter	12·68
	100·00
Nitrogen	1·77

This was taken from the surface of a large area which it was intended to put under cultivation.

This muck is almost entirely vegetable matter, the constituents, clay and sand, which give stability, firmness and supply mineral plant food are practically absent.

In the reclamation of such an area, drainage is the first essential. At the outset open ditches should be dug to remove surface water. After the soil has settled somewhat, it would be well to put in tile drainage. If feasible and not too expensive, the addition of sand or clay, or, better, both, to be worked into the surface soil, is to be advocated. Unfortunately it is but seldom that this part of the work of reclamation can be followed out, the haulage distance being too great.

A dressing of lime or, still better, wood ashes, merely harrowed in, will be very beneficial in supplying mineral plant food generally lacking in such soils. If wood ashes are not obtainable, I would suggest basic slag 500 lbs., muriate of potash 150 lbs., per acre, broadcasted and harrowed in.

Although the soil is very rich in nitrogen very little of this element is present naturally in an available condition, hence, it has been found that applications of barnyard manure are most useful. After a year or two they can be discontinued, as by that time the manure will have inoculated the soil with the bacteria necessary for the continued conversion of the soil plant food into available forms.

Muck from Grand Manan, N.B.—This sample, as in the previous instance, was forwarded with a view to obtaining information as to its reclamation. Mr. L. E. Foster writes: 'What fertilizer would be best on this soil for potatoes?' The air-dried muck was submitted to analysis and the following results obtained:—

Analysis.	Per cent.
Moisture	8·03
Organic and volatile matter	86·17
Mineral matter, including sand	5·80
	100·00
Nitrogen	1·50

This is essentially vegetable matter and would not be considered as a good potato soil, though such land has, with proper treatment, frequently been made to give very fair yields.

All that has been just said regarding the necessity of drainage and the value of an initial supply of manure applies in this case, and in addition the following fertilizer might be suggested:—

Basic slag	300 to 500 lbs. per acre.
Sulphate of potash	100 "

Broadcast on the prepared land before planting and harrow in.

Mud from Mahone Bay, N.S.—This material, forwarded by Dr. Charles A. Hamilton, represented the 'mud' as brought up in the dredging of Mahone bay. The object of the inquiry was to ascertain what fertilizing value it might possess, as large quantities were available to farmers in the vicinity. The mud, dried by simple exposure to the air, was found to have the following composition:—

Analysis.	Per cent.
Moisture	9·56
Organic and volatile matter	26·85
Mineral matter, including clay and sand	63·59
	100·00

Fertilizing constituents—	Per cent.
Nitrogen in organic matter	·73
Phosphoric acid	·24
Potash	·32
Lime	·82

The fertilizing value of the mud as dredged would be extremely low. The mineral plant food constituents (phosphoric acid, potash and lime), even in the air-dried material, are present in exceedingly small amounts. The percentage of nitrogen is certainly notable (·75 per cent on the water-free substance), but in all probability this element does not exist in a readily available form for crop use.

It may be pointed out further, that certain sulphur compounds are present, and this would necessitate an exposure of the mud to the atmosphere for some weeks previous to its incorporation with the soil, or injury to the crops might result.

An important matter in connection with the use of muds in general is that they may very materially affect, beneficially or injuriously, the tilth of the soil to which they are applied. The sample under discussion, it might be presumed, is adapted for sandy rather than for clay loams.

Mussel Mud from Souris, P.E.I.—Sent by James Howlett, with a request for particulars as to fertilizing qualities. It is stated that a large number of farmers in the neighbourhood have access to the deposit, while others living as far distant as twenty-four miles are using it.

Upon inspection it appeared to consist essentially of mussel shells, with a small proportion of clay. The composition of the air-dried mud is as follows:—

Analysis.

	Per cent.
Moisture	·44
Organic and volatile matter	4·12
Clay and sand	9·70
Carbonate of lime	84·88
Oxide of iron, &c., by difference	·86
	100·00
Nitrogen, in organic matter	·092
Phosphoric acid	·13

This is essentially carbonate of lime, as we judged from the appearance of the sample. The proportion of clay, sand, &c., is not large, so that it can be considered a mussel mud of very fair quality. The percentage of phosphoric acid is not larger than that found in many soils. A number of mussel muds examined in this laboratory have shown considerably larger percentages of organic matter and nitrogen, but this deposit, nevertheless, has some value in furnishing these constituents.

The practice of depending entirely on such muds for the maintenance of fertility is to be deprecated. Undoubtedly for a number of years increased yields will follow its use, largely owing to the lime it supplies, but experience has shown that *alone* it cannot prevent the soil from wearing out, and, sooner or later, the yields from falling off. The analytical data, in proving that they are essentially a lime fertilizer, furnish the explanation for this behaviour.

Marl from St. Raymond, Man.—Forwarded by David Langill, with a request for information as to its general character and use. It had, approximately, the following composition:—

Analysis.

	Per cent.
Insoluble rock matter	37·30
Carbonate of lime	45·37
Oxide of iron, &c., by difference	17·33
	100·00

In appearance this substance was a light yellow, brick-like, brittle mass, made up largely of small stones or particles of rock; the material easily disintegrates and falls as an earthy sediment when placed in water.

Though not a first quality marl, it might be used beneficially on both heavy and light loams deficient in lime.

Calcareous Deposit or Indurated Marl.—Sent by George E. Winkler, Penticton, B.C., who states that it is found as a deposit from the waters of certain springs and streams in his neighbourhood which are richly impregnated with carbonate of lime.

Its analysis afforded the following data:—

Analysis.

	Per cent.
Carbonate of lime	72·99
Insoluble rock matter	18·74
Oxide of iron and alumina	3·70
Phosphoric acid	·15
Organic matter, by difference	4·42
	100·00

If crushed, this material would no doubt be useful in furnishing lime to soils deficient in this element. In its present condition, being so hard and refractory, its application would result in very little benefit.

The percentage of phosphoric acid is so small that the deposit cannot be said to have any value from the standpoint of a phosphatic fertilizer.

Further information respecting these deposits, which occur at many points in the so-called semi-dry belt of British Columbia, will be found in the report of this Division for 1904.

Gypsum.—A sample stated to be from Tobique, N.B., and sent in for examination as to quality by M. A. Bourbeau, Victoriaville, Que., was found of excellent quality containing 94·12 per cent sulphate of lime.

A specimen sent by Mr. H. D. Buchannan, Sussex, N.B., and stated to be representative of a very large deposit, was also submitted to analysis. It contained 94·40 per cent sulphate of lime.

When crushed or ground this forms the well known land plaster. The agricultural value of this material depends largely upon the nature and composition of the soil. As it is not a fertilizer in the commonly accepted meaning of the term, that is, it does not furnish nitrogen, phosphoric acid or potash, it is very doubtful if it could be used profitably on any poor soils unless associated with an application of barnyard manure. It certainly furnishes lime, an element of plant food and, further, serves to liberate potash from its inert stores in the soils. Possibly it may help to flocculate heavy soils and thus improve their tilth.

In previous reports we have emphasized the advantage of using finely ground gypsum in the stable. By this means it renders a most valuable service in preventing loss of nitrogen as ammonia from the manure, and, of course, eventually finds its way to the soil.

The crops apparently most benefited by gypsum are clover and peas.

Wood Ashes.—A sample sent by F. Seaman, Nelson, B.C., and stated to be from an ash pile from a sawmill using, chiefly, tamarac, fir and pine, but no hardwood. The inquiry is 'of what fertilizing value would this ash be for fruit trees?'

Analysis of Ashes, Nelson, B.C.

	Per cent.
Moisture	8·31
Potash	7·90
Phosphoric acid	2·59
Lime	44·00

These ashes are evidently of good quality, the percentage of potash being considerably above the average found in commercial samples.

In addition to the potash they contain, the amounts of phosphoric acid and lime enhance the fertilizing value of these ashes, making them particularly serviceable for fruits and vegetables on light lands.

A sample of ashes brought to the laboratory by Mr. F. T. Webster, Billings Bridge, Ont., and collected from an exposed pile of ashes at a sawmill, gave the following results on analysis:—

Analysis.

	Per cent.
Moisture	27·40
Insoluble in acid (clay and sand)	38·45
Fertilizing constituents—	
Potash	2·20
Phosphoric acid	traces

These ashes are admixed with sand, &c., and have been very seriously leached; they still retain a large proportion of water. Their very low potash-content makes them of little value, probably in the neighbourhood of $2 per ton.

Manure Ashes.—These resulted from the burning of a large manure pile at St. Norbert, Manitoba. The manure had been accumulating for several years, and the heap at the time when it caught fire contained about 200 cubic yards. The sample of ashes taken for analysis was collected in September. The fire started in June, the manure burning until extinguished by the rains at the latter end of August.

Analysis of Manure Ashes.

	Per cent.
Moisture	4·57
Organic and volatile matter	7·31
Sand, &c., insoluble in acid	54·92
Oxide of iron and alumina	10·91
Lime	8·65
Magnesia	4·43
Potash	3·40
Phosphoric acid	6·14
	100·33

Valuing the potash and phosphoric acid at 5 cents and 5½ cents per lb., respectively—the prices they would bring when bought in the form of commercial fertilizers—these ashes would be worth $8.45 per ton. Although this manure ash is seen to have a high fertilizing value, the great loss that has ensued in the dissipation of nitrogen and humus-forming material in the burning of the heap must not be overlooked. We have always considered that the great benefit, which all acknowledge as following the judicious employment of manure, is due rather to the organic matter and the concomitant nitrogen it furnishes than to its percentages of mineral plant food.

Cow Manure.—The analysis of this sample is interesting as the manure was from a heap, the accumulation of ten years on a dairy farm. Our correspondent, at Rosebery, B.C., states that it could be purchased and laid down on his farm for about $2.50 per ton.

Analysis of Manure.

	Per cent.
Moisture	80·90
Organic matter	15·35
Mineral	3·75
	100·00

Fertilizing constituents—

	Percentage.	Lbs. per ton.
Nitrogen	·47	9·40
Phosphoric acid	·41	8·20
Potash	·26	5·02

Valuing the plant food at prices assigned to that in commercial fertilizers, we find this manure would be worth $1.93 per ton. The plant food on one ton of average cow manure is worth about $2, so that the present sample does not show much deterioration. Such loss as there has been through leaching has been chiefly in potash.

Black Muck Ashes.—This sample forwarded from St. Basile Station, Quebec, had resulted, according to our correspondent, from the burning of an area covered with black muck. The request accompanying the ashes was for a report as to their fertilizing value and the best means of employing them upon the land.

Analysis of Black Muck Ashes.

	Per cent.
Moisture	4·70
Organic and volatile matter	6·13
Mineral matter	89·17
	100·00
Mineral matter insoluble in acid, sand, &c.	59·02
Oxide of iron and alumina	25·70
Lime	1·28
Magnesia	trace
Potash	·49
Phosphoric acid	2·94

Though not equal to the best unleached wood ashes, which contain in the neighbourhood of 2 per cent phosphoric acid and 6 per cent potash, these ashes certainly possess a notable fertilizing value.

These ashes can be used to advantage on sandy and peaty soils, for all kinds of crops but especially for corn, clover, potatoes and cabbages. Their application may be similar to that of ordinary wood ashes, namely, broadcasted on the prepared land in the spring before seeding and harrowed in.

Boiler Scales and Flue Dust.—Many inquiries have been received from time to time regarding the possible fertilizing value of the cleanings of the tubes and flues of steam boilers—large amounts of such material, commonly known as boiler scale—accumulating in machine shops in the course of time, for which, apparently, there has been no use. Though it was very doubtful if our examination would show any appreciable amount of plant food, it was thought desirable to analyse a few samples, in order to have data for the enlightenment of those seeking information on the subject. The two samples examined were from Sydney Mines, N.S., and were described as 'cleanings from the tubes and flues of steam boilers at No. 3 slope.' They are similar in appearance being in the form of black, coarse granular powder, not unlike coal dust.

Analysis·Boiler scales and Flue dust.

	No. 1.	No. 2.
Moisture	·71	·28
Organic and volatile matter	35·79	43·67
Mineral matter or ash	63·50	56·05
	100·00	100·00
Nitrogen	·20	·13
Phosphoric acid	·14	·08
Potash	·02	·04

The amount of organic matter is noteworthy, but, unfortunately, this must be largely in the form of coal dust and hence not in a condition to be of much value for humus formation. The material might, however, prove useful on some lands for improving their physical condition, as in lightening the texture of heavy and plastic clays.

As to fertilizing value, very little can be said in its favour. The amounts of phosphoric acid and potash are so small as to be negligible, while the percentage of nitrogen is not larger than that found in soils of average fertility.

FODDERS AND FEEDING STUFFS.

Every winter for many years past we have submitted to analysis a number of the more important feeding stuffs on the Canadian market. This work has been found necessary in order to obtain the information to satisfactorily answer the inquiries we are constantly receiving respecting the composition and feeding value of the various by-products and concentrated feeds offered for sale.

While the farmer or dairyman may feel himself competent to decide on the quality of such well-known and simple materials as bran and shorts, he finds himself quite unable, from mere inspection, to say what the nutritive value might be of a large number of the milling and manufacturing products that have appeared of recent years, and for many of which high prices are obtained. The nature of the material may be disguised by fine grinding. Thus, certain feeds, shown by analysis to be essentially oat hulls and consequently comparatively worthless, have been placed on the market in such a fine state of division that the naked eye fails to detect their nature. The same has been found true in the case of pea meal adulterated with a large excess of pea hull. Again some 'mixed' materials may present an attractive appearance by reason of the presence of a certain amount of cracked corn and yet the bulk of the feed made up of useless materials such as mill sweepings—so that the whole has a much lower feeding value than might be supposed at first sight. And then again there is a large list of manufacturing by-products, as from the sugar beet factory, the starch and glucose factory, &c., some of them feeds of concentrated character and of high nutritive value, and yet many of which are very poor. For this whole class—in which appearance goes for very little—analysis is absolutely necessary. By no other means can the nature and worth of such feeds be ascertained.

In the following table of data we present the results of the examination of forty-one samples. These feeds of course do not represent all the various brands offered for sale, they are merely those respecting which we have received inquiries and which, consequently, have been examined in the Farm laboratories. A few of them are not commercial feeding stuffs, as apple pomace, respecting which information was sought as to their nutritive qualities. The tabulated information together with the subjoined notes will undoubtedly prove of interest to a large number of those who purchase feeding stuffs.

FEEDING STUFFS, 1908.

Number.	Name.	Particulars.	Moisture.	Crude Protein.	Fat or oil.	Carbo-hydrates.	Fibre.	Ash.
			p. c.	p. c.	p. c.	p. c.	p. c.	p. c.
	Corn products—							
1	Gluten feed	Brantford Starch Works, Brantford, Ont.	5·93	17·12	11·85	58·55	5·70	0·85
2	" Meal Jersey Brand	St. Lawrence Starch Co., Port Credit, Ont.	6·15	18·25	3·65	64·46	6·77	0·72
3	" "	St. Lawrence Starch Co., Port Credit, Ont.	8·00	18·00	2·54	66·33	4·48	0·65
4	Corn meal	James Frier, Shediac, N.B.	9·17	9·81	4·80	72·11	2·70	1·41
	Wheat products—							
5	Bran	William Weld Co., London, Ont.	10·58	13·63	3·98	57·02	9·44	5·35
6	"	Wm. Wenman, Golden, B.C.	10·33	14·31	5·28	53·58	10·64	5·86
7	"	R.J.M., Western Can. Flour Mills.	6·85	15·48	5·54	54·94	11·07	6·12
8	"	" Oglivie Milling Co.	6·69	16·06	5·50	55·26	10·04	6·45
9	"	F. S. Caldwell, Carp, Ont.	6·18	11·31	3·62	52·43	19·42	7·04
10	Shorts, (Oglivie)	Agricultural Division, C.E. Farm Ottawa, Ont.	9·21	17·09	5·77	53·92	9·39	4·62
11	" (Renfrew)	J. P. Robinson, Whitney, Ont.	7·92	15·25	5·05	60·01	7·81	3·96
12	" (Manitoba)	" "	6·67	16·00	5·42	57·81	9·86	4·24
13	Middlings, (Manitoba).	" "	7·46	17·12	5·85	58·35	6.89	4·33
	Oat products—							
14	Oat feed	The Tilson Co. Ltd., Tilsonburg, Ont	8·16	2·62	0·89	51·40	32·16	4·77
15	"	Graham Bros., Haileybury, Ont.	4·73	4·12	1·64	52·16	31·24	6·11
	Pea products—							
16	Whole peas, (Arthur variety)	Agricultural Division, C. E. F., Ottawa, Ont.	5·41	23 50	1·04	62·57	4·90	2·58
17	Pea meal	Flavelle Milling Co., (manufacturer) (per Edwardsburg Starch Co)	8·80	25·50	1·74	53·53	7·13	3·30
18	"	D. McPherson, Lancaster, Ont.	7 84	16·00	1·24	41·09	31·05	2·78
19	"	N. Sangster, manufactured by T. Baird & Son, Ormstown, Que.	7·30	14·12	1·30	39·44	35·23	2 61
20	"	Jas. Wilson & Sons, Fergus, Ont.	7·70	17·37	1·32	49·49	21·45	2·67
21	Pea bran (pure hulls)	" "	5·54	5·63	0·44	34·65	51·29	2·45
22	Split peas (without hull)	" "	6·43	27·69	0·94	61·46	0.97	2·51
	Cottonseed meal—							
23	Cottonseed meal from Barbadoes, 1907	E. B. Elderkin, Amherst, N.S.	10·73	26·50	5·84	30·83	19·97	6·13
24	Cottonseed meal from Barbadoes, 1908	" "	7·82	26·06	4·17	38·34	18·69	4·92
25	Cottonseed meal *a* (Owl brand)	F. W. Broder & Co., Memphis, Tenn. (manufacturer), per D. E. Taylor.	5·81	40·74	9·93	28·06	8·04	7·42
26	Cottonseed meal *b* (Soper's choice)	J. E. Soper & Co., Boston, Mass., (manufacturer), per D. E. Taylor.	8·35	43·68	8·07	26·35	6·75	6·80
27	Cottonseed meal	R. J. Messenger, Bridgetown, N.S.	5·86	37·62	7·91	32·29	9·87	6·45
	Miscellaneous feeding stuffs—							
28	Moulée (linseed feed(	Canada Linseed Oil Mills Co., (manufacturer), per J. J. Riley	8·37	11·56	9·71	47·55	18·09	4·72
29	Fine flax screenings, No. 3	Jos. G. King & Co., Port Arthur, Ont.	5·77	17·44	18·41	29·55	12·85	15·98
30	Small seeds from wheat.	" " "	7·20	16·44	10·53	45·40	16·02	4·41
31	Feed from wheat and flax screenings	" "	10·57	12·18	5·90	53·74	12·35	5·26

FEEDING STUFFS, 1908—*Concluded.*

Number.	Name.	Particulars.	Moisture.	Crude Protein.	Fat or oil.	Carbo-hydrates.	Fibre.	Ash.
			p.c.	p.c.	p.c.	p.c.	p.c.	p.c.
32	Cyphers—Daniel's egg mash	Jos. Tardif, St. Louis, Montreal	8·01	21·75	3·64	53·04	8·92	4·64
33	Bent's milk albumen, No. 1	R. A. A. Johnston, Ottawa, Ont.	8·39	41·21	1·45	16·61	......	32·34
34	Bent's milk albumen, No. 2	" "	......	72·43	......	......	......	2·31
35	Feed No. 1, from corn, rye and barley malt mash	H. Walker & Sons, Walkerville, Ont.	6·27	19·69	5·78	52·33	14·62	1·31
36	Feed No. 2, from pure barley malt mash	" " "	3·83	17·56	5·05	49·30	20·46	3·80
37	Feed No. 3, from rye and rye malt mash	" " "	5·01	14·31	7·12	60·48	11·85	1·23
38	Apple pomace from cannery	Spratt & Schou, Burnaby Lake, B.C.	85·07	1·41	0·71	7·71	4·73	0.37
39	Apple pomace from cider mill	Col. D. W. Stevenson, Berwick, N.S.	8·51	3·63	1·81	69 38	14·61	2·06
40	Apple pomace from cider mill	S. Allen, Norwick, Ont.	5·53	5·19	2·46	66·20	18·38	2 24
41	Feed No. 2, Walkerville Distlllery	T W. Raphael & Co., Montreal, Que.	5 73	12·87	4·05	61·63	10·50	5·22

CORN PRODUCTS.

In commenting, in last year's report, upon the various feeding stuffs resulting as by-products from the manufacture of starch and glucose, it was pointed out that the term 'gluten meal' was being wrongly used by certain manufacturers, the material being put out under this name being really of the nature of gluten feed. This cannot be considered as accidental or of no consequence, for gluten meal has long been recognized as a feed of the most concentrated character, with practically 35 per cent of protein, whereas gluten feed has been equally well known as a much inferior article containing from 15 per cent to 20 per cent protein. According to our analysis—and we have thoroughly investigated the matter—there is only one Canadian firm that puts a genuine gluten meal on the market, though there are several materials sold under this name which should be branded as gluten feed. It is only this mis-branding that can be objected to—gluten feed is an excellent food and one that can be advantageously used to increase the protein-content of the ration. It is, however, surely misleading to sell it under a name commonly understood to carry with it double the amount of protein present.

It will be noticed that the Gluten Feed of the Brantford Starch Works and the 'Jersey Brand Gluten Meal' (really a gluten feed) contain practically the same amount of protein; the former, however, is the more valuable since it contains a much larger proportion of oil or fat.

The analysis of the corn meal (No. 4) shows it to be genuine and of good quality. It was sent from a shipment that was supposed to be adulterated by admixture with ground corn cob.

WHEAT PRODUCTS.

Five samples of bran were examined. No. 5 is somewhat low in protein and fat, though not sufficiently so as to warrant any suspicion of adulteration. Freedom from the presence of any notable amount of oat hulls, sweepings, &c., is attested by the fact that the percentages of fibre and ash are not excessive.

With respect to Nos. 6, 7 and 8, it may be said all were genuine and of good quality. In no instance was the foreign matter (fragments of hay and straw, weed seeds, hulls, &c.) present in such quantity as to materially affect the feeding value of the bran. Our work on genuine brans in 1903 furnished the following limits: Protein, 13·25 per cent to 15·31 per cent; fat, 3·60 per cent to 5·19 per cent, and fibre, 9·28 per cent to 10·93 per cent.

Bran sample No. 9 contained a very considerable proportion of oat hull and other offal, and, consequently, was of decidedly inferior quality. The analysis confirms the opinion formed by inspection, for the protein is about 3 per cent lower and the fibre 8 per cent to 9 per cent higher, than in genuine samples.

As a class, shorts are characterized by somewhat higher percentages of protein, fat and carbohydrates and a lower percentage of fibre, than bran. Shorts, therefore, should constitute the superior feed. As produced from hard wheat by the modern roller process, shorts have the appearance of finely ground bran. Under the older milling methods shorts or middlings were quite floury. All the samples analysed were of good quality. The limits obtained in 1903 for genuine shorts were: Protein, 15·15 per cent to 17 per cent; fat, 3·98 per cent to 6·23 per cent, and fibre, 3·82 per cent to 7·51 per cent.

OAT PRODUCTS.

It is among the by-products of the oatmeal mills and certain breakfast food factories that we find the most worthless of the feeds upon the market. As a class these so-called oat feeds are decidedly low grade, being characterized by a small percentage of protein and a high fibre-content due to the large proportion of oat hulls and other offal from the mills they contain. Very few of these feeds are worth the price asked, but yet they appear to compete successfully with bran and other products of high feeding value.

Sample No. 14 was forwarded by a correspondent in Prince Edward Island, who states that it was a product of the Tilson Company, Limited, and was invoiced at $20 per ton. It was found to consist essentially of oat hulls, with a protein-content of 2·62 per cent and fibre 32·16 per cent. These results establish its extremely low value as a feeding material.

Sample No. 15, sent by a correspondent in Haileybury, Ontario, is said to be a by-product of the rolled-oat mills and known by the name of 'X' oat feed. It was sold at $20 per ton. Analysis shows only 4·12 per cent protein; the fibre-content is 31·24 per cent. It is in the same category as No. 14—practically valueless for use as a part of the meal ration.

PEA PRODUCTS.

Information having reached us that much of the pea meal being sold was adulterated by an admixture of pea hulls, a number of samples were submitted to analysis. Genuine pea meal is a material of high feeding value, with protein in the neighbourhood of 25 per cent and about 5 per cent fibre. It is not a feed rich in fat. Many of the pea meals upon the market appear to be of inferior quality, due to the presence of pea hulls. The hull or bran of the pea is an extremely poor food, containing only 5 per cent protein and over 50 per cent fibre. Nos. 16 and 17 are genuine pea meals. No. 21 gives the composition of pea hulls and No. 22 of split peas. Nos. 17, 18 and 19 are examples of commercial pea meals that contain an admixture of pea hull.

COTTON SEED MEAL.

Cotton seed meal is not much used in Ontario, but is largely fed in the Maritime Provinces, coming by water-freight from Florida and the southern States. There are several qualities on the market, the better brands containing from 35 per cent to 40 per cent protein and some 10 per cent oil. Examples of inferior quality are not wanting, however, that run as low as 23 per cent protein and 5 per cent oil, due to the large proportion of cotton seed hulls present. High grade meals are bright yellow and free from hull, inferior brands are dark in colour and show coarse fragments of hull.

Samples Nos. 23 and 24, from shipments from Barbadoes, are of inferior quality. Their protein is scarcely more than half that in genuine cotton seed meal and, further, they are very poor in oil and altogether too high in fibre.

Nos. 25 and 26 are first-class genuine meals, the latter being somewhat the better of the two. No. 27, though of good quality, is not equal in protein to the very best brands.

MISCELLANEOUS.

Moulée (No. 28).—This is a product of the Canada Linseed Oil Mills, Montreal, composed chiefly of the ground cleanings of the flax shipments. Its constitution will necessarily alter somewhat with the condition of the flax seed as received at the mills, the cleaner the seed, the better the quality of the feed. For furnishing the nitrogenous part of the ration it would, we think, be decidedly inferior to bran, the protein being some 3 per cent less and in all probability not so digestible. The percentage of fat or oil is comparatively high, evidently due to the flax seed present. This large proportion of fat is, undoubtedly, the chief feature in favour of this material. The fibre is decidedly high (from fragments of hay, straw, &c., present), and this fact detracts from the value of the feed as a concentrate.

Elevator Products.—Nos. 29, 30 and 31 are from the Canadian Pacific Railway Elevators at Port Arthur, Ontario (Joseph G. King & Company, Lessees). For several years past analyses of these waste materials have been made (ground weed seeds, cleanings, &c.) with a view of determining their nutritive value, the data being published in the annual reports of this Division. The output of such refuse or screenings must be very large, and there seems no good reason, provided the material is palatable and the grinding has been sufficiently fine to prevent all possibility of weed seeds growing, why it should not be sold as feed. One feature in connection with such feeds appears to be the difficulty in keeping the meal uniform as to feeding value, owing to variableness in the nature of the refuse accompanying the grain. Great differences in composition are found among weed seeds, and consequently the percentages of protein and of fat of the resulting feed will be notably affected by the kind of weed seed predominating in the screenings.

No. 29. Fine Flax Screenings.—Though not quite so rich in oil as similar material forwarded the year previous, it is still very high in this constituent, viz., 18 per cent. It is also rich in protein, so that the feed would rank among the best feeding stuffs. No doubt these good qualities are due to the large amount of broken flax seed present.

No. 30. Small Seeds from Wheat.—Compared with No. 29, it is decidedly poorer in oil, slightly lower in protein and contains more fibre.

No. 31. Wheat and Flax Screenings.—A material of fair feeding value, but distinctly inferior to Nos. 29 and 30, as evinced by its lower protein and fat.

No. 32. Cypher's-Daniel Egg Mash.—This contains a considerable percentage of protein—the nutrient more especially necessary for egg production—but is not rich in fats or phosphates.

Upon its condimental or medicinal properties we are unable to pronounce, but considered simply from the nutritive standpoint the price quoted ($2.75 per 100 lbs. f.o.b. Toronto) would appear to be too high. We consider that a ration of equal feeding value could readily be compounded from materials upon the market at much less cost.

No. 33. Bent's Milk Albumen No. 1.—This is described as 'skim-milk in the dry form without the sugar,' and is really a by-product of the milk sugar factory. It is put forward by the manufacturers—The Bent-Croissant Company, Antwerp, N.Y., U.S.A.—as a concentrated food for poultry that may take the place of meat scraps and animal meals. It comes in the form of a coarse granular powder, which, as far as our experience shows, has excellent keeping qualities.

Our analysis shows that it is a highly nitrogenous food—the protein-content being 41·21 per cent. It should, therefore, if used judiciously, prove a valuable addition to the ration of both laying and fattening stock. Skim-milk has been repeatedly shown to have a special value for poultry feeding; it seems, therefore, that this 'Milk Albumen' may prove a 'convenient wholesome and palatable substitute' when fresh skim-milk is not readily obtainable.

Bent's Milk Albumen No. 2 is a product still more concentrated than the preceding sample analysed by us, showing 72·43 per cent protein. From what we can learn, however, this brand is of more recent introduction and, consequently, experience in its practical use in the poultry yard is as yet but limited.

Nos. 35, 36 and 37. These are by-products from the Walkerville distillery and may be described as follows: No. 35 is 'the dried grains from a mash composed of corn, rye and barley malt,' No. 36, 'the dried grains from a pure barley malt mash,' and No. 37, 'the dried grains from a rye and rye malt mash.'

Dried distiller's grains furnish a feeding stuff of considerable value, possessing a fairly high (though somewhat variable) protein-content, with a notable percentage of fat. They are readily eaten by cattle and when purchased at a fair price have given good returns with milch cows and fattening stock.

That the nutritive value of this class of feeds is by no means a fixed quantity is evident from the analyses of the present series—the range in protein-content being from 14·38 per cent to 19·69 per cent. It is important, therefore, that the purchaser should assure himself by special inquiry as to the composition of the brand or brands offered him.

No. 38. Apple pulp from Cannery. This is described as 'the refuse of apples after being boiled and subjected to hydraulic pressure, the extracted juice being used in the manufacture of jam and jellies.'

It will be seen that this pomace contains in the neighbourhood of 15 per cent of dry matter, of which practically one-tenth is protein.

We should not consider that the nutritive value of this material was equal to that of the ordinary farm roots or of corn ensilage, but no doubt it could be used to advantage, if sound, to furnish a part of the succulent ration of the milch cow, and possibly also, to a certain extent, for other classes of farm animals.

The manurial value of this pomace is very small—practically negligible—as will be observed from the following results:—

	Per cent.
Nitrogen	·22
Phosphoric acid	·06
Potash	·11

In our report for 1906, in speaking of a sample of pomace from a cider mill, the composition of which we were publishing, we cited our correspondent's opinion as to its feeding value. This was to the effect that it had proved very valuable in keeping up the milk flow. Commencing with a pailful of pomace per day the quantity had been increased to two feeds of half a bushel each, and omitting a feed meant a falling off of about 1½ lbs. at the next milking. Respecting the present sample, Mr. Schou writes as follows: 'We waited until our stock of roots (turnips and carrots) was finished and then used the pulp. We were pleased to find the milk did not decrease at all. Two small pigs used to eat all they could find and seemed to thrive on it.'

No. 39. This as received was a sample of dried apple pomace from a cider mill. It was perfectly sweet and quite attractive in appearance. While by no means a fodder of high feeding qualities, it had been found a profitable feed quite palatable to cows and sheep and, according to our correspondent, growing in favour in the neighbourhood of the cider mill.

No. 40. Apple pomace from cider mill, the sample having been dried in the autumn of 1907. The inquiry accompanying this pomace—as to its probable value as a commercial cattle food—may be answered as follows. From appearances we should judge that when ground this dried apple pomace would prove a palatable feeding stuff, swelling on the addition of water and making a succulent fodder that could be used to take the place, in part or wholly, of roots, corn or other coarse fodders. As, however, its protein-content is small, its nutritive value would be decidedly low and this fact would prevent it from being used in the ration as a substitute for one or other of the more concentrated foods, such as bran, oil cake, gluten meal, &c.

THE COMMERCIAL FEEDING STUFFS ACT.

In concluding this brief review of our recent work on feeding stuffs it affords us peculiar satisfaction to note that during the past two months a bill has been drawn up and introduced in the House of Commons that will provide for a systematic and comprehensive examination of the various by-products, &c., sold on the Canadian market as feeding stuffs and, further, necessitate the branding of such feeds by the manufacturers with a guarantee setting forth the percentages of protein and fat the feed contains. Such an Act has been constantly urged by the writer and others for some years past as the best means for affording farmers the necessary information in purchasing these feeds and for providing adequate protection against poor and worthless materials which may from time to time be offered for sale. The details of the Act, which will be carried out as in the case of commercial fertilizers, under the Department of Inland Revenue, have not at the time of writing been finally settled, but undoubtedly the Act will pass. Its enforcement will assuredly effect a great improvement on the existing condition of affairs and prove a very valuable assistance and protection to the purchasers of feeding stuffs.

SPIKE-RUSH (SCIRPUS CÆSPITOSUS).

At the request of the late Dr. Fletcher, Botanist of the Dominion Experimental Farms, we submitted to analysis a sample of a species of Spike-rush received from Mr. G. R. B. Elliott, of Barrington, N.S., with a request for information regarding its nutritive qualities.

Analysis of Hay of Spike-rush.

	Per cent.
Moisture	4·79
Protein	8·06
Fat	1·15
Carbohydrates	56·25
Fibre	27·56
Ash	2·19
	100·00

Our report upon this examination was as follows: Although there is a fair proportion of protein, considering the nature of the material, the nutritive value of this sedge would not, in our opinion, be high. It is a coarse, rough plant, and is scarcely likely to be palatable to animals; probably they would not eat it unless pressed by hunger. In acknowledging this report, Mr. Elliott wrote: 'This sedge is the principal vegetation and flourishes abundantly on extensive sphagnum and peat bogs in southwest Nova Scotia. Around the edges of the bog where there is more water and high land influence it is crowded out by other plants, but in the barder central portions it is easily the most prominent. Cattle turned out in the summer thrive on the various wild plants they can pick up. They are seldom seen to browse on the leaves of bushes, and the only other fodder for them is blue-joint grass. This does not occur in sufficient quantities to sustain the number feeding upon it and they are forced to rely on what can be gathered on the bog. Apparently, given the choice, they will always eat blue-joint grass, but the sedge is often their principal feed. Cattle living on this food are particularly well muscled and strong.'

THE RELATIVE VALUE OF FIELD ROOTS.

In this research we have determined, season by season, for a number of years past, the percentages of dry matter and sugar in the following root crops, mangels, turnips and carrots. It is thus possible, from a study of the results, to obtain a very fair knowledge of the comparative feeding values of a large number of the more commonly grown varieties.

The two chief influences affecting the composition of roots are those of heredity and of season. If we could feel assured that the seed of any particular variety was always from the same strain then we could say, in comparing the figures of that variety from year to year, that the differences in composition to be observed were due to seasonal characteristics. But, unfortunately, such is not the case—seedsmen are not particular in this matter—and, further, confusion is frequently caused by the constant renaming by seedsmen of well known varieties, and this fact makes identification in many cases well-nigh impossible.

However, in spite of these difficulties, our work has made evident that the influence of heredity is to be observed among the varieties upon the market, for arranging the roots of any one class according to order of merit (as based on dry matter and sugar content) it will be found that any particular variety occupies practically the same position year after year. This will be more apparent in discussing later in this article the case of the mangels, Gate Post and Giant Yellow Globe, which we have examined for the past nine years more particularly from this standpoint.

MANGELS.

In the following table are presented, in the order of feeding value, the data obtained from the examination of twelve varieties of mangels grown on the Experimental Farm, Ottawa, during the season of 1908. They represent those which in previous trials had given the best results in the field, though there are one or two that, judging from their names, are now analysed for the first time.

ANALYSIS of Mangels, C. E. F., Ottawa, Ont., 1908.

Variety.	Water.	Dry Matter.	Sugar in Juice.	Average weight of one root.	
	p.c.	p.c.	p.c.	Lbs.	Oz.
Perfection Mammoth Long Red	86·86	13·14	7·07	2	9
Mammoth Red Intermediate	87·22	12·78	6·34	2	0
Half Sugar White	87·37	12·63	4·22	2	3
Half Sugar White (Vilmorin's)	87·86	12·14	5·47	2	7
Crimson Champion	87·94	12·06	5·67	1	9
Gate Post	87·98	12·02	4·94	1	11
Prize Mammoth Long Red	88·00	12·00	6·47	2	4
Yellow Intermediate	88·07	11·93	4·34	1	10
Jumbo	88·45	11·55	5·05	1	15
Selected Yellow Globe	89·20	10·80	6·09	2	12
Giant Yellow Intermediate	89·30	10·70	3·87	1	14
Giant Yellow Globe	89·34	10·66	4·47	2	4

It is to be observed that very considerable differences exist in this series: the percentages of dry matter range from 13·14 to 10·66, a difference equivalent to 19 per cent of the total dry matter; the sugar-content, from 7·07 to 4·47 per cent, a difference amounting to 37 per cent of the total sugar. These results clearly indicate the advisability of considering feeding value, in addition to yield per acre and keeping quality, when selecting the variety to sow.

The averages for the past five years are given in the subjoined table, and the differences to be remarked are, we think, for the most part to be attributed to the characteristics of the seasons of the different years.

MANGELS—Average Composition—1904-1908.

Year.	Number of Varieties Analysed.	Average weight of one root.		Dry Matter.	Sugar.
		Lbs.	Oz.	p.c.	p.c.
1904	10	2	11	11·69	6·62
1905	17	3	9	10·04	4·67
1906	16	2	7	11·63	5·93
1907	10	2	11	12·64	7·46
1908	12	2	2	11·87	5·33

The averages for 1908 are seen to fall somewhat below those of the preceding season.

Turnips.—Thirteen varieties have been analysed, and while the differences in dry matter are very similar in amount to those observed in mangels, the sugar-content throughout the series is most constant. This peculiarity has been noticed every season since this investigation began.

A comparison of the results in the following table with those for this crop grown in 1907 show that heredity is as potent in turnips as in mangels—the relative position of a number of the better known varieties being the same for both years.

ANALYSIS of Turnips, C. E. F., Ottawa, Ont., 1908.

Variety.	Water.	Dry Matter.	Sugar in Juice.	Average weight of one root.	
	p.c.	p.c.	p.c.	Lbs.	Oz.
Skirvings	88·36	11·64	1·74	3	1
Bangholm Selected	88·96	11·04	1·24	2	9
Hall's Westbury	89·32	10·68	1·43	2	10
Kangaroo	89·47	10·53	1·42	3	2
Good Luck	89·71	10·29	1·43	3	6
Halewood Bronze Top	89·83	10·17	1·33	3	11
Jumbo	90·35	9·65	1·54	6	1
Perfection Swede	90·40	9·60	1·33	3	11
Magnum Bonum	90·78	9·22	1·33	4	8
Derby	90·87	9·13	2·88	3	7
Hartley's Bronze Top	90·92	9·08	1·33	6	0
Carter's Elephant	91·28	8·72	1·43	3	7
Mammoth Clyde	91·44	8·56	1·34	3	8

In the next table the averages for the past four years are given. As in the case of the mangels, the turnips of 1908 were not quite equal in dry-matter-content to those of 1907.

TURNIPS—Average Composition—1905-1908.

Year.	Number of Varieties Analysed.	Average weight of one root.		Dry Matter.	Sugar.
		Lbs.	Oz.	p.c.	p.c.
1905	20	2	13	10·09	1·10
1906	20	1	10	12·18	1·78
1907	14	3	5	10·14	1·11
1908	13	3	12	9·87	1·52

Carrots.—As in former years we do not find any very large differences in dry matter and sugar among the varieties analysed. In this respect they differ markedly from mangels and, to a certain degree, from turnips. The White Belgian, for some reason we cannot give, falls from the first place it has occupied for some years. The Half Long Chantenay, which has been second for some seasons, now appears as first on the list.

ANALYSIS of Carrots, C. E. F., Ottawa, Ont., 1908.

Variety.	Water.	Dry Matter.	Sugar in Juice.	Average weight of one root.	
	p.c.	p.c.	p.c.	Lbs.	Oz.
Half Long Chantenay	88·39	11·61	3·94	1	3
Giant White Vosges	88·62	11·38	3·95	1	5
Improved Short White	88 76	11·24	3 65	—	15
Ontario Champion	88·91	11·09	2·91	1	1
Mammoth White Intermediate	89·04	10 96	3·45	1	4
White Belgian	90·93	9·07	2·14	1	7

The averages for the past four seasons as given below, again emphasize the approach to uniformity in the composition of carrots to which we have already referred—the differences being such as to be practically within the limits of experimental error. In the case of carrots, therefore, there does not seem that necessity we observed with mangels to consider composition. Other factors, such as yield, forkiness, and keeping qualities, are evidently of greater importance in selecting the variety to be grown.

CARROTS—Average Composition—1905-1908.

Year.	Number of Varieties Analysed.	Average weight of one root.		Dry Matter.	Sugar.
		Lbs,	Oz.	p.c.	p.c.
1905	11	1	3	10·25	2·52
1906	10	1	2	10·59	3·36
1907	6	1	1	10·30	3·02
1908	6	1	3	10·89	3.34

INFLUENCE OF INHERITED QUALITIES.

The main points usually considered by the farmer in selecting the varieties of roots—mangels, turnips, carrots—to be grown are yield per acre and keeping quality, and, undoubtedly, these are very important matters. It must not be lost sight of, however, that the nutritive value will depend largely on the percentage of dry matter they contain, and more particularly on the richness of this dry matter in sugar—and that in these particulars varieties are apt to differ considerably. It is true that the character of the season, and more especially of the weather during the period of ripening, has a potent effect on the richness of the root in sugar, but apart from this there is a well marked tendency in roots to transmit to their seed their distinctive qualities as regards dry matter and sugar. This fact, the influence of heredity, has been recognized in the breeding of sugar beets for factory purposes, and, undoubtedly, might be employed in improving strains of roots for feeding purposes.

To ascertain how far certain varieties of mangels might maintain their relative position in respect to dry matter and sugar, we selected in 1900 two well known varieties, the Gate Post and Giant Yellow Globe, and have grown them side by side on practically identical soil and under similar treatment since that year. The analytical data of this series, therefore, show the degree to which heredity and varying seasonal conditions influence the condition of the crops. The Gate Post was chosen as the representative of the richer mangels and the Giant Yellow Globe as typical of the poorer varieties.

DRY MATTER and Sugar in Gate Post and Giant Yellow Globe Mangels.

Seasons of Growth.	Gate Post.			Giant Yellow Globe.		
	Average weight of one root.	Dry Matter.	Sugar in Juice.	Average weight of one root.	Dry Matter.	Sugar in Juice.
	Lbs. Oz.	p.c.	p.c.	Lbs. Oz.	p.c.	p.c.
1900	....	11·14	6·15	....	8·19	2·64
1901	2 9	9·41	4·15	3 3	9·10	4·08
1902	3 2	13·90	9·39	3 9	10·24	5·24
1903	3 3	12·93	7·38	3 13	10·89	6·17
1904	2 14	12·64	7·62	2 13	9·24	5·26
1905	2 13	12·07	6·83	3 12	8·64	3·55
1906	2 2	12·90	6·59	1 8	12·73	6·45
1907	3 10	12·53	7·25	2 7	10·78	6·34
1908	1 11	12·02	4·94	2 4	10·66	4.47
Average for 9 years	....	12·17	6·70	....	10·05	4·91

The facts set forth in the above table, while showing the influence of season upon the composition of the roots, clearly indicate that each variety has maintained, during the nine years of the experiment, practically the same relationship to the other. The Gate Post has always proven the superior root and it is interesting to note that the difference in its favour in dry matter, approximately 2 per cent, coincides very closely with the difference in sugar-content. Since sugar is undoubtedly the chief nutrient of value in roots, this result is worthy of note by those who largely grow mangels for feeding purposes.

SUGAR BEETS FOR FACTORY PURPOSES.

Further data have been obtained respecting the quality of sugar beets as grown in various parts of the Dominion. The varieties examined comprised Vilmorin's Improved, Klein Wanzleben and Très Riche, probably the three best sorts for the purposes of the beet sugar factory.

Since climatic conditions during growth and maturity materially influence the sugar-content of the beet, it might be supposed that considerable differences would be found between roots grown at such widely distant points as the several Experimental Farms. Our results, however, do not show any such differences. There is, indeed, an almost remarkable uniformity throughout the series, and we find that all the beets, save those from Lacombe (northern Alberta), are of excellent quality and well suited for sugar extraction.

The two highest records are from Nappan, N.S., and Agassiz, B.C., but these are closely followed by the results from beets grown at Ottawa, Ont., Lethbridge (southern Alberta), Brandon, Man., and Indian Head, Sask. The season at Lacombe was particularly unfavourable, being extremely wet in the early part of the summer and very cold weather, with frosts, setting in before the beets had begun to mature. These conditions resulted in a very low percentage of sugar and a low coefficient of purity.

A new feature in this work is the comparison of beets grown with and without irrigation, on the Experimental Farm at Lethbridge. The results do not show any great differences, due no doubt to the fact that the rainfall was ample during the early part of the season, making but one irrigation necessary and that a rather late one. With a dry season there is every probability of greater differences in sugar-content and weight of root being obtained. The larger yield from the irrigated plots, unaccompanied by any marked falling off in richness, is worthy of note.

The exceedingly high percentage of sugar in the Klein Wanzleben, Raymond 'seed'—the strain used by the growers for the sugar factory at Raymond, Alta., is a matter of peculiar interest. The analytical data are practically identical for both irrigated and non-irrigated beets.

Sugar Beets grown on the Dominion Experimental Farms, 1908.

Variety.	Locality.	Percentage of Sugar in Juice.	Percentage of Solids in Juice.	Co-efficient of Purity.	Average Weight of One Root.		Yield per Acre.	
					Lbs.	Oz.	Tons.	Lbs.
Vilmorins Improved..	Nappan, N.S.........	17·79	19·87	89·5	..	15	16	505
" " ..	Ottawa, Ont..........	16·84	18·89	89·1	1	6	20	1,400
" " ..	Brandon, Man.......	16·59	19·33	85·8	1	8	18	432
" " ..	Indian Head, Sask ..	12·43	19·20	64·7	1	5	10	1,780
" " ..	Lethbridge, Alta., irrigated	16·69	19·13	86·7	..	13	10	374
" " ..	Lethbridge, Alta., non-irrigated..	17·80	20·65	86·2	..	13	9	454
" " ..	Lacombe, Alta........	11·70	14·80	79·0	1	5	11	176
" " ..	Agassiz, B.C..........	17·47	20·00	87·3	..	13	12	816
Klein Wanzleben. ...	Nappan, N.S..........	17·81	20·57	86·6	..	14	12	90
" " ..	Ottawa, Ont....	16·93	19·29	87·8	1	1	15	800
" " ..	Brandon, Man........	15·35	19·46	79·9	1	7	20	1,184
" " ..	Indian Head, Sask....	17·73	20·03	88·5	1	8	10	196
" " ..	Lethbridge, Alta., irrigated	15·60	19·03	82·0	1	1	12	790
" " ..	Lethbridge, Alta., non-irrigated...........	16·52	19·49	84·7	..	15	9	1,503
" " ..	Lethbridge, Alta., Raymond seed irrigated..	18·13	20·17	89·9	1	1	12	1,740
" " ..	Lethbridge, Alta., Raymond seed non-irrigated	18·08	21·67	83·4	..	15	10	770
" " ..	Lacombe, Alta.......	10·77	14·20	75·8	1	7	8	1,248
" " ..	Agassiz, B.C........	17·15	19·20	89·3	1	1	10	328
Trés Riche	Nappan, N.S....... ..	16·98	19·67	86·3	1	1	11	1,430
"	Ottawa, Ont..........	15·14	18·09	83·7	1	7	18	200
"	Brandon, Man........	15·51	18·69	83·0	1	7	18	1,221
"	Indian Head, Sask .	16·84	18·80	89·6	1	4	7	1,708
"	Lethbridge, Alta., irrigated	15·97	18·23	87·6	..	13	14	1,601
"	Lethbridge, Alta., non-irrigated..........	15·86	18·40	86·2	..	15	9	1,602
"	Lacombe, Alta........	11·16	14·30	78·0	1	10	14	160
"	Agassiz, B.C..........	16·82	20·03	84·0	..	15	8	1,688

In the results set forth below we have the averages for the past seven seasons of the three varieties discussed. The data for the past year are, on the whole, very satisfactory, betokening the fact that beets might be grown in Canada over a very wide range, and that these, in point of richness, would be fully equal to those employed in the United States and the continent of Europe for sugar extraction.

AVERAGE PERCENTAGE of Sugar in Juice in Sugar Beets Grown on the Experimental Farms, 1908.

Locality.	1902.	1903.	1904.	1905.	1906.	1907.	1908.
Nappan, N.S.	15.87	15.33	14.41	16.52	17.08	....	17.53
Ottawa, Ont.	16.77	15.34	16.91	12.45	14.37	15.44	16.30
Brandon, Man	....	11.36	16.62	11.09	15.50	16.99	15.82
Indian Head, Sask.	15.15	16.54	15.24	14.94	14.91	15.92	15.66
Lethbridge, Alta—irrigated	....	....	....	....	....	....	16.09
" " non-irrigated	....	....	....	....	....	....	16.73
Lacombe, Alta.	....	....	....	....	....	13.34	11.21
Agassiz, B.C.	....	17.44	8.10	17.32	14.23	17.65	17.15

INSECTICIDES AND FUNGICIDES.

ARSENATE OF LEAD.

Though first proposed for the destruction of leaf-eating insects as long ago as 1892, arsenate of lead has only received general recognition in Canada as a substitute for Paris green during the last three or four years. Judging, however, from the correspondence regarding this insecticide during the past two seasons, it is growing rapidly in popularity, having in certain districts already established an excellent reputation among orchardists and potato growers.

Though possibly a somewhat slower poison than Paris green, it has properties which gives it a certain advantage over this well-known insecticide. In the first place it is non-injurious to foliage, and, therefore, the spray can be used at any desired strength without fear of the leaves being in the least affected. Secondly, it has greater adhesive powers than Paris green, and consequently the period of effectiveness of its spray is longer. And, lastly, owing to its fine state of division it remains longer in suspension than Paris green after being mixed with water, a matter that contributes considerably towards a uniform application of the poison in the spray.

Arsenate of lead for insecticidal purposes is prepared and put upon the market chiefly in the form of a paste, the spray being made by simply adding the required weight of paste to the barrel of 40 gallons of water and stirring the mixture. The strength of the spray, to be at once effective and economic, is as yet an open question. Most entomologists, at the present day, advocate for codling moth, potato beetle, &c., from 2 lbs. to 3 lbs. of the commercial paste per 40 gallons of water, and the directions as printed by the manufacturers usually call for amounts within these limits. As this insecticide is not injurious to foliage, larger quantities than these may be used if desired, but such are, of course, more expensive. Certain authorities recommend 5 lbs. to 6 lbs. of the paste per 40 gallons, but it is doubtful if such a strength is necessary for general use.

There are practical difficulties in the manufacture of commercial arsenate of lead paste which may be said to almost preclude the possibility of turning out continuously a product uniform in composition. The aim of the larger number of manufacturers, however, is to place upon the market a paste containing, approximately, 40 per cent water, in which practically all the arsenic and lead present exist as the insoluble arsenate of lead, and in which the impurities—soluble and insoluble—are present in negligible amounts. The proportion of arsenic to lead will be determined largely by the nature of the chemical used, the percentage of arsenic being higher when lead nitrate is used than when lead acetate is employed as the precipitant.

We have not as yet any legal standard in Canada for lead arsenate paste, but from the opinion of entomologists and others in the United States who have considered the matter, it seems desirable that, to be accounted genuine, it should contain at least 50 per cent of arsenate of lead, that the arsenic oxide should not be less than 12·5 per cent, that the water soluble forms of arsenic should not exceed 1 per cent, calculated as arsenic oxide, and that there should be no admixture with foreign materials to reduce or affect its strength.

In the table on the following page the analytical data obtained during the past year from the examination of a number of brands of arsenate of lead sold in Canada:

ANALYSES of Arsenate of Lead.

Laby. No.	Brand and Manufacturer.	Received from.	Water.	Total Arsenic Oxide ($As^2 O^5$)	Total Lead Oxide. (Pb O)	Soluble Impurities (other than $As^2 O^5$ and Pb O).	Insoluble Impurities (by difference).	Total.	Soluble Arsenic Oxide.	Soluble Lead Oxide.	Remarks.
			p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	
6991..	"Electro," the Vreeland Chem. Co., N.Y.....	National Drug Chem. Co., Toronto	31.69	19.31	46.00	2.81	.19	100.00	1.79	.10	Taken from original container—100lb crock—very stiff paste.
7008..	"Vanco," The Chemical Laboratories Ltd., Toronto.	The St. Catharines Cold Storage and Forwarding Co., St. Catharines..........	55.15	11.99	28.83	2.50	1.53	100.00	.28	.03	
6759..	"Grasselli's," The Grasselli Chem. Co., Cleveland, Ohio	Manufacturer..............	43 04	15.85	39.16	.50	1.45	100.00	.24	traces.	Sample in original container
5975..	"Swift's," Merrimac Chem. Co., Boston, Mass..... ..	W. E. Saunders Co., London, Ont........................	46.63	14.13	36.02	.95	2.27	100.00	traces.	.11	" " "
5976..	"Adler's," Adler Color and Chem. Co., N.Y	W. E. Saunders Co., London, Ont........................	40.20	18.94	38.72	.90	1.24	100.00	.98	.10	Not in original package.
5984..	"Commercial," Powers-Weightman-Rosengarten Co., Phila., Pa.	Lymans, Limited, Montreal..	47.93	10.87	34.17	5.77	1.26	100.00	traces.	.39	Sample in original container
5981..	"Mercks," Merck & Co., N. Y..........	Lymans, Limited, Montreal..	27.13	17.89	52.23	.47	2.28	100.00	.10	.21	Partially dried out when received.
5655..	Not stated.................	The Toronto Chemical Works, Toronto..................	31.22	21.37	44.34	1.00	2.07	100.00	1.07	.10	Partially dried out when received.
6764..	"Grasselli's Powdered," The Grasselli Chem. Co., Cleveland, O..................	Manufacturer	.28	26.48	69.70	.82	2.72	100.00	.28	traces.	Very fine white powder, in original container.

In order to arrive at the insecticidal values of these brands it will be necessary to take into consideration, first, the percentage of water present. Other things being equal, the paste containing the least water will be the strongest. Secondly, the percentage of arsenic oxide is of importance as determining the toxic value of the paste. Thirdly, the amount of impurities—soluble and insoluble—not only as affecting the strength of the paste but possibly also its effect on foliage, must be taken into account. In every well-made paste, that is, one in which practically all the arsenic and lead are present as insoluble arsenate of lead, the efficiency or strength of any brand may be approximately arrived at by subtracting the sum of the water and impurities from 100—the larger the remainder the stronger the paste.

To determine the economic values of any number of brands it will be necessary for the purchaser to calculate the cost per lb. of the arsenate of lead present in the paste. An illustration may serve to make this clear. Two brands A and B, are offered; the price of A, laid down, is 15 cents per lb., and it contains, approximately, 35 per cent of water and impurities; B is 12 cents per lb., laid down, and contains, approximately, 50 per cent water and impurities. In the case of A, 65 lbs. arsenate of lead cost $15, or 23 cents per lb., while in B, 50 lbs. arsenate of lead cost $12, or 24 cents per lb.

With respect to sample No. 7008, the manufacturers state in the circular advertising this product: 'Our prices are based on 40 per cent moisture, if the analysis shows a slightly higher percentage we accordingly adjust the weight of the package to figure on 40 per cent moisture content.'

Samples Nos. 5981 and 5655 were received in a partially dried-out condition, so that the analytical data do not indicate accurately the composition of the brands as placed on the market.

No. 6764 is a powdered arsenate of lead, to be used in the dust form only. It is not suitable for application with water as a spray and therefore is not directly comparable with the other brands analysed, which are all pastes.

HOME-MADE ARSENATE OF LEAD.

In view of the difficulty which the majority of farmers and fruit growers will meet in obtaining, generally, chemicals of a known composition—and this refers especially to sodium arsenate—it is not at all probable that the home preparation of arsenate of lead will become popular. However, as so many correspondents have written us during the past year on the matter, and so many formulæ have appeared in agricultural publications, we thought it desirable to examine the necessary chemicals upon the Canadian market with a view to establishing the correct proportions to be used in the preparation of a safe spray. The chemicals employed are acetate of lead (sugar of lead) and arsenate of soda, and it is desired to mix them in such proportions that there is no excess of arsenate of soda in the resultant spray, for this chemical has a scorching effect upon foliage. A slight excess of acetate of lead is necessary, in order to ensure the complete precipitation of the arsenic.

ACETATE OF LEAD.

This chemical is of fairly uniform composition, as will be evident from the following data which were obtained from samples analysed in the Farm Laboratories during the past year:—

ANALYSES of Acetate of Lead.

Laby No.	Description.	Insoluble in water.	Lead Oxide.
		%	%
	Baker and Adamson (C.P.) C. & S. S. Co.	·27	60·19
5977	Mercks (C. P.) W. E. Saunders & Co.	·27	59·93
5656	'Brown,' Lymans, Limited.	3·81	57·72
5657	'White Crystals' Lymans, Limited	·29	58·35
5658	'Powdered' Lymans, Limited	·39	58·23
5978	'Commercial' W. E. Saunders & Co.	·20	58·07

ARSENATE OF SODA.

This chemical is found in two forms—crystalline and dry—the former naturally containing less arsenic. From our analyses (see subjoined table) a very fair degree of uniformity is to be observed in the crystalline variety as regards percentage of arsenic oxide, the constituent which determines the strength of the sample for our present purposes.

The case, however, is not so simple with arsenate of soda in the 'dry' form, for it is evident from the samples analysed that this is not a compound of constant composition. Thus we find in the three samples analysed amounts of water varying from 5·15 per cent to 27·59 per cent. This variability of composition is undoubtedly due to the temperature employed in the drying of the chemical and the difficulty is that the purchaser is not aware in buying the 'dry' form to what extent the material has been modified. This fact, of course, makes it impossible to state with precision the amount of the so-called 'dry' arsenate of soda to be used in the formula. The 'dry' arsenate of soda is also sold under the names 'crude' and 'anhydrous.' The term commercial is used for both the crystalline and dry arsenate, the latter, however, is easily distinguished from the former by being in the form of a powder.

ANALYSES of Arsenate of Soda.

Laby No.	Description.	Insoluble in water.	Water of Crystallization.	Arsenic oxide. (As_2O_5).	Arsenious oxide. (As_2O_3).
		%	%	%	%
5979	'Com'l Crystals,' W. E. Saunders & Co.	·01	41·06	36·30	None.
5980	'Pure Crystals,' Mercks	·03	38·99	36·08	"
5982	" "	·02	40·27	36·70	"
5763	'Pure Dry B P.' Mercks	·08	27·59	44·22	·55
5730	'Com'l Dry Powdered,' Lymans Limited	1·49	8·29	53·53	6·35*
5983	" " Powers Weightman-Rosengarten	1·52	5·15	53·81	8·80†

* The total arsenic in No. 5730, is equivalent to 60·91 per cent arsenic oxide.
† The total arsenic in No. 5983 is equivalent to 61·03 per cent arsenic oxide.

Laboratory experiments have been conducted by us, using both forms of arsenate of soda, to ascertain the proportions in which the chemicals must be employed in the correct preparation of the spray. From the results the following formulæ have been drawn up. With certain brands of the 'dry' arsenate of soda less acetate of lead would suffice than is indicated, but, that there may be no risk of injury to foliage, the formulæ provide for an excess of lead even when the driest, or most modified, brand of arsenate of soda is used.

FORMULAE for Arsenate of Lead Sprays.

—	A.	B.
Acetate of lead	22 ozs.	33 ozs.
Arsenate of soda (crystalline)	11 "	16½ "
Arsenate of soda (dry, powdered)	7½ "	11¼ "
Water	40 galls.	40 galls.

A. This spray is, approximately, equivalent in arsenical strength to 2 lbs. arsenate of lead paste (50 per cent arsenate of lead) per 40 gallons.

B. This spray is, approximately, equivalent in arsenical strength to 3 lbs. arsenate of lead paste (50 per cent arsenate of lead) per 40 gallons.

In preparing the spray, the arsenate of soda and acetate of lead are dissolved in separate vessels, using in each case from 1 to 2 gallons of water—the exact quantity is of no moment. When dissolved, pour the two solutions simultaneously into a 40-gallon barrel two-thirds full of water, and finally fill to the containing mark. This method will ensure the precipitation of the arsenate of lead in a very finely divided form which will remain in suspension much longer than if the precipitation is made from more concentrated solutions and subsequently diluted.

ARSENITE OF LIME.

So far as Canadian experience is concerned this is practically a new insecticide, though its properties as an insoluble compound, harmless to foliage and an effective poison for biting insects, have long been known. Thus, Lodeman, in his manual 'The Spraying of Plants,' 1896, wrote 'As an insecticide it is probably not surpassed by any compound of arsenic; it is advisable to mix some colouring matter with the poison to lessen the danger of mistaking it for some other article.'

Arsenite of lime is not upon the market, but its preparation is not a matter of great difficulty. The method more commonly advocated involves, as the first step, the formation of arsenite of soda by the boiling together of white arsenic and washing soda (sal soda or carbonate of soda, in crystals). The proportions generally recommended are white arsenic 1 lb., washing soda 4 lbs., water, 1 gallon. These compounds dissolve very readily as the liquid approaches the boiling point, and further heating is unnecessary when they have passed into solution. The result is a solution of arsenite of soda. *This cannot be used as a spray as it is strongly corrosive and would quickly strip the trees of their foliage. It must be converted into arsenite of lime.*

The conversion of the arsenite of soda into arsesnite of lime constitutes the second and very essential part of the process; it may be accomplished in one of two ways as follows:

1. Thoroughly slake two pounds of good, fresh quick lime and stir into 40 gallons of water; then pour in with constant stirring of the lime water one pint of the arsenite of soda solution. The spray is ready for use immediately as the formation of arsenite of lime takes place at once. This spray contains 2 ounces of white arsenic or as much arsenic as one made by adding 4 ounces of Paris green to 40 gallons. The above proportions allow for a fair excess of lime, which serves the double purpose of preventing injury to the foliage and of making visible the degree of thoroughness with which the spray has been applied.

2. With Bordeaux mixture. This is the more common method as it allows the employment of a fungicide and insecticide in one spray. Bordeaux mixture made according to the formula used so successfully for many years, viz.: 4:4:40, contains a sufficient excess of lime to allow the addition of 1 pint of arsenite of soda solution per barrel of 40 gallons, that is, the excess of lime in the Bordeaux converts all the soluble arsenic into the insoluble arsenite of lime. All that is necessary is to simply pour the requisite quantity of arsenite of soda (1 pint) into the barrel of Bordeaux, stirring meanwhile. We have now Bordeaux mixture containing as much arsenic (in the form of arsenite of lime) as the 'poisoned Bordeaux mixture,' in which 4 ounces of Paris green per barrel has been used.

If sprays of greater insecticidal strength are desired, our experimental work shows that 1 quart (instead of 1 pint) of the arsenite of soda solution may be used in either of the above No. 1, or No. 2, and the resultant sprays (now containing the equivalent of 8 ounces Paris green per barrel of 40 gallons) will be found non-injurious to apple and potato foliage.

Following upon our experimental work in the preparation of the above sprays, it occurred to us that it might be unnecessary to first form the arsenite of soda, and that the white arsenic, in proper portions, might be added directly to the lime water (No. 1) or to the Bordeaux mixture (No. 2). This simplified method has proved with us quite satisfactory, so far as the complete formation of arsenite of lime and the non-injurious character of the spray to apple and potato foliage are concerned. The two points to be regarded in this method of preparation are (1) that the white arsenic must be in the form of powder, (if lumps are present they may be crushed by rolling the arsenic between sheets of paper with a bottle); and (2) that in order to insure complete conversion of the arsenic into arsenite of lime it is desirable that thorough stirring at intervals for say an hour should follow the addition of the white arsenic.

The formulæ corresponding to the sprays, already described, but in the preparation of which white arsenic is used directly are as follows:—

Arsenite of Lime Sprays.

(A)	Lime..................................	2 lbs.
	White arsenic (powdered)..................	2 ounces.
	Water..................................	40 gallons.

(Equivalent in arsenic to a spray containing 4 ounces Paris green per 40 gallons.)

(B)	Lime..................................	2 lbs.
	White arsenic (powdered)..................	4 ounces.
	Water..................................	40 gallons.

(Equivalent in arsenic to a spray containing 8 ounces of Paris green per 40 gallons.)

Bordeaux Mixture with Arsenite of Lime.

(C)	Lime..................................	4 lbs.
	Copper sulphate..........................	4 lbs.
	White arsenic (powdered)..................	2 ounces.
	Water..................................	40 gallons.

(Equivalent in arsenic to Bordeaux containing 4 ounces Paris green per 40 gallons.)

(D)	Lime..................................	4 lbs.
	Copper sulphate..........................	4 lbs.
	White arsenic (powdered)..................	4 ounces.
	Water..................................	40 gallons.

(Equivalent in arsenic to Bordeaux containing 8 ounces Paris green per 40 gallons.)

At the time of writing this report experiments are in progress in conjunction with the Horticultural Division to ascertain the relative efficiency of these sprays from an insecticidal standpoint. We have proved by actual trial that all the sprays described may be used without fear of injury to the foliage of apple and potato. If we may assume that arsenic in the form of arsenite of lime is as effective for insecticidal purposes as that in Paris green, then these newly proposed sprays will be cheaper than those containing Paris green—for white arsenic is quoted at 13 cents to 17 cents per lb., while Paris green varies from 21 cents to 30 cents per lb., according to quantity purchased. The difference in price of the arsenic in these two chemicals is greater than even the above figures indicate, for the equivalent in arsenic of 1 lb. white arsenic is 2 lbs. of Paris green, making the arsenic in Paris green approximately four times as expensive as that in white arsenic.

COMMERCIAL BORDEAUX MIXTURES.

Analyses have been made of several brands of Bordeaux paste and Bordeaux powders upon the market. The consensus of opinion among fruit growers appears to be that the freshly prepared mixture has proved a more efficient fungicide than the commercial preparations, and there is little probability from the present outlook that the practice of making the Bordeaux mixture in the field, as at present in vogue, is likely to give way to the use of the factory-made product. The results of this work will, however, be of interest to many of our readers, as numerous inquiries have been received regarding the nature and strength of these commercial preparations.

Grasselli's Bordeaux Mixture Paste.—(Laby No. 6760) is a smooth thick paste of a pale blue colour. It contains 62·43 per cent of water, the equivalent of 15·38 per cent of sulphate of copper and 22·30 per cent of slaked lime.

In the preparation of the paste a sufficiency of lime has been used to precipitate all the copper, and hence the resultant spray should be non-injurious to foliage. Compared with the home-made mixture prepared from the commonly used formula, 4:4:40, the dilution of this paste according to the printed directions of the manufacturers would result in a much weaker spray.

Vanco Bordeaux Mixture Paste.—(Laby No. 7007.) This is manufactured by the Chemical Laboratories, Ltd., Toronto, and is a brownish creamy paste. Its analysis showed 40·48 per cent water, the equivalent of 24·94 per cent sulphate of copper and 24·81 per cent of slaked lime. There was no free copper sulphate present. This paste, it will be observed, is considerably stronger than No. 6760, just described.

Campbell's Improved Bordeaux Mixture (Laby No. 6613) comes in the form of a powder and is virtually a mixture of sulphate of copper and carbonate of soda and, hence, is properly speaking a Burgundy Bordeaux. Its composition is 62·03 per cent sulphate of copper and 33·38 per cent carbonate of soda. On the addition of water there would be no copper sulphate left in solution.

Grasselli's Bordeaux Mixture Powder (Laby No. 6763).—This is a true lime-Bordeaux, and consists of a mixture of anhydrous sulphate of copper and quick lime in the proportion of, approximately, 50 parts of the latter to 30 parts of the former. It is intended to be used only in the dust form.

***Bordeaux-Lead** Arsenate Mixtures.*—These preparations are intended to act as a combined insecticide and fungicide. Two samples have been analysed, both products of the Grasselli Chemical Company, with the following results:—

Laby No. 6761—Grasselli's Bordeaux-Lead Arsenate Paste.—A smooth, thick, light-blue paste.

Laby No. 6762—Grasselli's Bordeaux-Lead Arsenate Powder.—A very finely-ground bluish powder.

ANALYSIS of Grassell's Bordeaux-Lead Arsenate Products.

—	No. 6761.	No. 6762.
	p. c.	p. c.
Water	57·07	6·87
Hydrate of Lime, $[Ca(OH)_2]$	19·59	
Oxide of Lime, (CaO)	......	32·31
Copper Sulphate Crystals, $(CuSO_4 5H_2O)$	13·62	
Copper Sulphate, Anhydrous, $(CuSO_4)$	......	18·64
Oxide of Lead, (PbO)	5·89	22·51
Arsenic Oxide (As_2O_5)	3·40	8·84

Neither of them show excess of sulphate of copper, indicating their non-injurious character to foliage. With respect to the paste (No. 6761) the directions state: 'No general rule as to the amount to use can be given. Ten pounds to 60 (U.S.) gallons are used for general spraying. For spraying trees having a delicate foliage, such as peach trees, 10 pounds to 100 gallons of water will be effective.' It may be remarked that at the rate of 10 pounds per 60 (U.S.) gallons the spray would be about one-third as strong as that resulting from the 4:4:40 formula. The powder (No. 6762) is intended to be used only in the dust form.

LIME-SULPHUR WASHES.

This spray, as pointed out in our last annual report, is now being widely used both as an insecticide and a fungicide, not only on dormant wood but, in a diluted form, during the summer.* There seems but little doubt but that the efficiency of the spray depends upon the amount of sulphur present in the form of sulphides. We have, therefore, in the examination of certain brands sold on the Canadian market, determined both the percentage of total sulphur in solution and that of the sulphur combined as sulphide.

LIME-SULPHUR Washes.

Laboratory No.	Brand and Manufacturer.	Specific gravity.	Sulphur in Solution.		Sulphur per 40 gallons Spray diluted for use.		Remarks.
			Total.	As Sulphides.	Total.	As Sulphides.	
			p. c.	p. c.	lbs. oz.	lbs. oz.	
6832	Vanco Lime-Sulphur Wash, Chemical Laboratories Ltd., Toronto.	1·314	27·58	26·87	12 1*a*	11 12	Deep orange, red fluid, clear, very slight deposit
6935	" " " ..	1·304	26·65	25·55	11 10*a*	11 2	" " ..
6933	Lime-Sulphur Wash, St. Catharines Cold Storage Co.	1·133	9·98	6·49	22 10*b*	14 11	Light orange-red fluid, considerable black deposit.
6934	" " " ..	1·129	9·92	6·90	22 6*b*	15 9	" "
6822	Lime-Sulphur Wash, Grasselli Chemical Co., Cleveland, U.S.A.	1·279	24·76	23·38	10 9*a*	9 15	Deep orange-red fluid, clear, very slight deposit.
6766	" " " ..	1·280	24·80	23·37	10 9*a*	9 15	" "
6936	" " " ..	1·280	25·13	24·12	10 11*a*	10 5	" "

* Particulars useful to those preparing the wash on the farm will be found on pages 169-170, Report of Chemist, for year ending March 31, 1908.

a Original wash diluted with eleven parts of water, as directed by manufacturer.
b Original wash diluted with an equal volume of water, as directed by manufacturer.

Nos. 6832 and 6935 are the product of the Chemical Laboratories, Limited, Toronto. One sample (6832) was procured from the manufacturers, the other (6935) was sent us by a purchaser. For materials of this character, the samples show a very satisfactory uniformity, both as to total dissolved sulphur and as to that present as sulphides.

The directions are to dilute one volume of concentrated wash with eleven of water. So diluted, the spray would contain the weights of sulphur (total and as sulphides), per 40 gallons, indicated in the sixth and seventh columns of the table.

Nos. 6933 and 6934, forwarded by the St. Catharines Cold Storage and Forwarding Company, St. Catharines, Ont., were accompanied by the following particulars:—

'No. 3 (6933) 25 lbs. sulphur and 16 lbs. lime, boiled one hour.'

'No. 4 (6934) 22 lbs. sulphur and 16 lbs. lime, boiled one hour.'

'For use, dilute with an equal volume of water.'

These two washes are practically the same as to total sulphur-content, containing about one-third of the sulphur in the samples just considered. The amount of sulphur as sulphides is approximately one-fourth that in the other members of the series. As sold, therefore, these washes are the weakest of the samples examined. Since, however, in the preparation of the spray for use the directions are to dilute with an equal volume of water—and not one to eleven, as for the other washes—the resultant sprays are the strongest in the series.

The proportion of sulphur present as compounds other than sulphides is very much larger than in any of the other brands. These compounds are sulphates, sulphites and thio-sulphates, and are considered practically of no value from the horticultural point of view.

Nos. 6822, 6766 and 6936, are made by the Grasselli Chemical Company, Cleveland, Ohio, U.S.A., two of the samples being sent by the manufacturers, the third by a purchaser. They are well prepared solutions, uniform as to composition and rich in sulphides.

The more generally used formula to-day for the home-made lime-sulphur solution for dormant wood reads as follows:—

Sulphur, powdered or as flowers..	15 lbs.
Lime..	20 "
Water..	40 gallons.

The directions for the preparation of the spray are: Slake the lime with hot water, avoiding excess, and while slaking add the sulphur by dusting it over the lime and stir well together. On the completion of the slaking add more water to facilitate stirring and boil for an hour. Strain and dilute to 40 gallons.*

If all the sulphur is dissolved, as it should be, the spray necessarily contains 15 lbs. of sulphur, practically all of which should be present as sulphides, per 40 gallons. It is obvious, therefore, that such a spray will be somewhat stronger than the *diluted* washes of the Chemical Laboratories, Limited, and the Grasselli Chemical Company, and of about equal strength with those of the St. Catharines Cold Storage Company. However, sprays of any desired degree of concentration may be made from these commercial preparations by a recognition of their sulphur-content and diluting accordingly. The final cost of the spray ready for use (say, per barrel of 40 gallons) made from any commercial lime-sulphur wash will depend upon the price of the wash (including freight) and the degree to which it can be diluted to give a spray of a desired strength.

---

* In connection with the home-made spray, it may be pointed out that our experiments show (1) that provided the lime is good there is no necessity to use more lime than sulphur in order that the latter may be all brought into solution, and (2) that as soon as all the sulphur is brought into solution boiling should cease, as continued boiling tends to increase the proportion of sulphur compounds of less value than the sulphides.

AGRICULTURAL BLUESTONE.

Under various names substitutes for copper sulphate as a fungicide are continually being put upon the market. These are for the most part mixtures of sulphate of iron and sulphate of copper. As we have repeatedly shown that the former is much inferior as a fungicide to the copper compound, and especially so in the destruction of smut spores in the treatment of wheat, these mixtures must be regarded as far less efficacious than bluestone. Occasionally the claims made for these preparations are of an exceedingly extravagant character, and the prices asked exorhitant and out of all proportion to their composition. It is well, therefore, for the farmer and fruit grower to remember, when these compounds are offered him, that sulphate of iron is a very much cheaper material—and a much less valuable compound as a fungicide—than bluestone.

In our last annual report the analysis of 'Anti-Fungi'—a material of this nature manufactured in New York and widely advertised in northwestern Canada for the treatment of grain—was given; this year we present data respecting three samples of materials of like character forwarded to the laboratory for examination and report:—

ANALYSIS of Agricultural Bluestone.

—	A.	B.	C.
	%	%	%
Iron sulphate, $Fe\ So_4\ 7H_2O$	58·93	57·51	49·51
Copper sulphate, $Cu\ So_4\ 5H_2O$	41·96	41·76	52·83
	100·89	99·27	102·34

A. '*Agricultural bluestone,*" forwarded by a correspondent in Brandon, Man., who writes as follows:—'The wholesale house handling this compound state "that it gives equally good results as sulphate of copper as a fungicide and is considerably cheaper."' The claim that it is the equal of sulphate of copper for fungicidal purposes is far from correct, for it contains nearly 60 per cent sulphate of iron, a compound, as we have pointed out, of much lower fungicidal qualities.

B. '*Agricultural powder.*'—This is most probably identical with the sample discussed in the preceding paragraph. It was sent to us by a large wholesale and importing house in Montreal, who were anxious to know whether, as claimed, it could be recommended to take the place of copper sulphate.

C. '*Copper sulphate bi-product.*'—The firm sending the material under this name state that 'it is about to be offered to the agriculturists and fruit growers of Canada as a substitute for sulphate of copper,' and are anxious to know 'if it would be effective in the making of Bordeaux mixture.' The data show the presence of sulphate of iron to the extent of almost 50 per cent. It would not, therefore, have the same efficiency, weight for weight, as sulphate of copper for the treatment of wheat. Further, we do not consider that this material could be used effectively as a substitute for copper sulphate in the preparation of Bordeaux mixture, for not only would the spray be of little value as a fungicide but the hydrated oxide of iron precipitated by lime would tend to clog the nozzle, making the application of the spray a difficult operation.

Samples 'A' and 'C' had somewhat effloresced; that is, lost a part of their water of crystallization by exposure to dry air. This furnishes the explanation for the sum of the amounts of their constituents being greater than 100, the percentages of iron and copper sulphate being calculated to the crystalline form.

FORMALDEHYDE.

Formaldehyde is being more and more used in the Canadian Northwest in the treatment of wheat for the prevention of smut. It is fast taking the place of bluestone or copper sulphate—which for many years has been used so universally for this purpose—because experience has shown it to be equally efficacious as a smut preventive and easier of preparation, mere dilution of the chemical being all that is necessary. As regards its action on the vitality of the seed, it has been found less injurious in the strengths recommended (1 lb. formaldehyde in 32 to 40 gallons of water) than bluestone solutions (1 lb. bluestone dissolved in 8 to 12 gallons) that have been commonly employed for this purpose.

The extensive use of formaldehyde has resulted in a comparatively large number of brands being put upon the Northwestern market. This fact and the inability of the purchaser by mere inspection to determine the strength of the chemical, have led to a number of samples being sent in for analysis.

ANALYSIS of Formaldehyde Solutions.

Laboratory No.	Sender.	Manufacturer or Vendor.	Formaldehyde by weight.
			p. c.
5537	W. H. M., Gilbert Plains, Man.	The Montreal Chemical Works	37·76
6712	G. E. H., Dalmeny, Sask	The Standard Chemical Co	36·40
6736	A. H., Heward, Sask	" "	37·55
6749	D. H., Boissevain, Man.	" "	37·30
6819	J. M., Elkhorn, Man	" "	38·05
6713	J, E. H., Dalmeney, Sask	The Martin-Boyle Wynne Co., Winnipeg, Man	36·95
6737	A. H., Heward, Sask	" " "	37·35
6839	W. H. M., Gilbert Plains, Man	" " "	38·43
6754	G. K., Petrofka, Sask	T. Eaton Co., Winnipeg, Man	36·70
6784	C. H. H., Alameda, Sask	Noyes Bros. & Cutler, St. Paul, Minn	36·15
....	C. E. F., Ottawa, Ont.	National Drug and Chemical Co	36·24
5554	A. T., Minto, Man	Particulars not furnished	36·60
6723	H. F., Hochstead, Sask	" "	34·15
6775	W. R. H., Swift Current, Sask	" "	18·35
6783	R. B. P., Yellow Grass, Sask	" "	37·20
5831	T. T., Laxdal, Sask	" "	37·35

Our results, it will be noticed, are stated as percentages of formaldehyde 'by weight,' and the figures are consequently somewhat lower than if they had been stated 'by volume.' According to certain authorities, a 40 per cent 'by volume' solution is equal to 37·3 per cent by weight. The guarantee usually found upon the label is 'Formaldehyde 40 per cent solution,' meaning 40 per cent by volume. We have been asked by manufacturers to make our returns 'by volume,' so that purchasers may not be led to infer that the brand is below the guaranteed strength. Our answer to this request is, (1) that it is customary for chemists at the present day to state their results in percentages by weight, and that it is desirable to have our data comparable with those of other laboratories. (2) As the solution of formaldehyde is sold by weight and not by volume, it seems only natural to expect that any statement as regards composition would express the results as percentages by weight.

The percentages recorded are very similar to those published in the report of this Division for 1903 and 1905, at which times the various brands then upon the market were analysed.

Though all the brands examined are not identical as to strength, there is a fair measure of uniformity throughout the series. We do not consider any of the samples markedly below standard strength save No. 6723, of which, unfortunately, we could not obtain particulars as to brand.

THE FERTILIZING VALUE OF RAIN AND SNOW.

Since February, 1907, determinations have been made of the nitrogen compounds in each fall of rain and snow that furnished, on the catchment area used, a sufficient quantity for analysis. From the data so obtained and the precipitation results (rain and snow in inches) we have been enabled to calculate, approximately, the amount of combined nitrogen furnished to the soil, per acre, in the vicinity of Ottawa.

The first year's results in this investigation (March, 1907, to February, 1908, inclusive) were given in the last annual report of this Division, and it was shown that the total precipitation during that period—24·05 inches of rain and 133 inches of snow—had furnished per acre, 4·323 lbs. of nitrogen of fertilizing value.*

In the tables that follow we present the data of the year ending February 29, 1909, and it will be noticed that in certain respects they differ markedly from those of the preceding year. The difference lies chiefly in the much larger amounts of nitrogen found in the rain, more especially in the months of September and October. We shall in the discussion of the data offer a reason that will, we believe, satisfactorily account for this abnormal richness of the rain in ammonia last autumn.

The monthly precipitations, the average amounts of nitrogen present as free ammonia, albuminoid ammonia and nitrates and nitrites as obtained from the several analyses, and the pounds of nitrogen furnished per acre, are set forth in the following table:—

RAIN and Snow at Ottawa, for the year ending February 28, 1909.

Month and Year.	Precipitation in Inches.			Nitrogen.				Pounds of Nitrogen per Acre.
	Rain.	Snow.	Total as Inches of Rain.	In Free Ammonia.	In Albuminoid Ammonia.	In Nitrates and Nitrites	Total.	
1908.				p.p.m.	p.p.m.	p.p.m.	p.p.m.	
March	2·24	13·25	3·57	·262	·029	·183	·474	·383
April	1·34	4·00	1·74	·702	·056	·374	1·132	·446
May	5·46	....	5·46	·492	·058	·174	·724	·903
June	1·31	....	1·31	·288	·052	·194	·534	·159
July	2·77	....	2·77	·453	·052	·114	·619	·450
August	1·72	....	1·72	·638	·061	·208	·907	·354
September	1·00	....	1·00	4·839	·716	·897	6·452	1·462
October	2·28	....	2·28	3·531	·171	·551	4·253	2·197
November	1·48	10·00	2·48	1·337	·129	·171	1·637	·920
December	·21	41·75	4·39	·267	·063	·148	·478	·476
1909.								
January	2·46	11·00	3·56	·266	·124	·129	·519	·420
February	·72	16·25	2·35	·212	·043	·109	·364	·194
Total for 12 months	22·99	96·25	32·63	....	....	....	....	8·364

The amount of nitrogen in the rain and snow at Ottawa during the year, it will be seen, was 8·364 lbs. per acre—practically twice the quantity found in the preceding

* The reader is referred to this report (1908) for particulars respecting the method of calculation and the proportions of the various nitrogen-compounds in the rain and snow during that period.

twelve months. Further reference to the foregoing data shows that the rain falling in September, October and November was particularly rich in ammonia. A very severe drought prevailed during August, September and the first three weeks of October, the rainfall being considerably below the average for these months. This excessive dryness of the weather allowed the bush fires, which are not unusual at this time of the year, to spread and gain very considerable headway. Fires were common not only in the district known as the Ottawa Valley but also over large territories in Ontario and Quebec and the northern part of New York State. These fires raged almost, continually, the rainfalls being very light for many weeks, so that for two months, more or less, the atmosphere was heavily charged with smoke. Hundreds of acres of forest were burnt and thousands of dollars worth of timber destroyed. So dense was the smoke at times that for several days together at Ottawa it was difficult to see clearly for many yards, and the irritation to the eyes and mucous membrane of the nose and throat was excessive. Not until the heavy rain of the 24th and 25th of October was the atmosphere again cleared. This smoke naturally contained large proportions of ammonia as a product of combustion, and hence the scanty precipitations that occurred during these weeks were exceptionally rich in that constituent. To this cause then we attribute the exceptional and phenomenally high results recorded in the table.

A further disturbing factor that we observed was the high winds that prevailed from time to time, immediately before or during the early part of a rain and when the surface soil was dry. This happened repeatedly last year, both in the spring and summer months, and especially did we remark instances during April and June. Severe thunderstorms, almost cyclonic in their violence, are by no means uncommon at Ottawa during the hot months, and it frequently happens that the rain is then preceded by a wind which may reach the velocity of a hurricane. As such usually occur after a period of longer or shorter drought, when the surface of the cultivated fields is dry and loose, the air is filled with particles of organic matter, manure and debris of various kinds. Naturally the rain falling through such an atmosphere has its nitrogen content very greatly increased. Unfortunately there seems to be no plan or method whereby this source of error can be eliminated or avoided, and it is quite possible that a part of the larger amount of nitrogen, recorded for the past year, is due to the greater frequency of such winds during periods of dryness last summer.

Of the total amount of nitrogen, 8·364 lbs., 84 per cent, or 7·026 lbs., occurred as free and organic ammonia, and 16 per cent, or 1·338 lbs., as nitrates and nitrites.

The nitrogen furnished by the rain was estimated at 90 per cent of the whole, or 7·528 lbs. per acre; that by the snow at 10 per cent, or ·836 lbs. per acre.

The average nitrogen-content of the rain and of the snow is set forth in the following table:—

AVERAGE Nitrogen Content of Rain and Snow—Amount of Nitrogen, per Acre, as Free and Albuminoid Ammonia and as Nitrates and Nitrites.

—	Number of Samples analysed.	Precipitation in Inches.	Nitrogen. Parts per Million. In Free Ammonia.	In Albuminoid Ammonia.	In Nitrates and Nitrites.	Total.	Percentage of Total. In Free Ammonia.	In Albuminoid Ammonia.	In Nitrates and Nitrites.	Per Acre. As Free and Albuminoid Ammonia.	As Nitrates and Nitrites.
										Lbs.	Lbs.
Rain......	64	22·99	1·276	·149	·278	1·703	75	9	16	7·026	1 338
Snow.....	25	96·25	·277	·050	·141	·468	59	11	30	·527	·226

As pointed out in our discussion of this subject in the last annual report, rain is very much richer in nitrogen compounds than snow, but comparing the above with similar data for the year previous, the present results show a much greater difference. This is due to the smoke-laden atmosphere of the autumn months to which we have already referred. The largest increase is in the free ammonia, which, taking the average for twelve months, is between three and four times that recorded for the year ending March, 1908.

The average composition of the snow is remarkably close to that of the preceding winter, though, the snowfall (96·25 inches) being less than that of 1907-8 (133 inches), the total amount of nitrogen thus furnished is not as large.

HART'S CASEIN TEST.

This method for determining the percentage of casein in milk was devised at the Wisconsin Experiment Station, and has for its object the valuation of milk, presumably in conjunction with the results of the Babcock test, for cheese-making purposes. It is stated to be 'accurate, simple, and requiring but a short time to make the test.'*

The principle of the test lies in the precipitation of the casein or curd by acetic acid while the fat is kept in solution by chloroform. A centrifuge is required to make the separation complete, and the amount of curd, appearing as a small, white pellet, is, subsequent to a whirling of 7 or 8 minutes, read off in the graduated tube in which the test is made.

Our purpose in examining this process was to merely ascertain how closely it might give the percentage of casein or curd in fresh milk and milk to which preservatives had been added; no attempt was made to learn how far the method might be useful in the practical valuation of milk for cheese making.

RESULTS with Hart's Casein Tester.

1908.	—	Illuminata.	Alice.	Queenie.
		%	%	%
June 26....	Fat, by Babcock	3·8	3·4	6·2
	Total protein, by chemical analysis	2·65	2·78	3·68
	Casein, by chemical analysis	1·95	1·95	2·89
	Curd, by Hart's Tester, in fresh milk	2·20	2·00	2·90
	" " in milk, preserved with formaldehyde	2·3	2·4	3·4
July 6....	Fat, by Babcock	....	3·35	6·15
	Protein, by chemical analysis	....	2·91	3·90
	Casein "	....	1·92	2·83
	Curd, by Hart's Tester, in fresh milk	....	1·80	2·50
	" " in milk preserved with corrosive sublimate	....	2·3	3·8
	Curd, by Hart's Tester, in milk preserved with bichromate of potash	....	2·2	3·5
July 8....	Fat, by Babcock	....	3·4	6·15
	Protein, by chemical analysis	....	2·92	3·89
	Casein "	....	1·88	2·79
	Curd, by Hart's Tester, in fresh milk	....	2·0	3·0
	" " in milk preserved with formaldehyde	....	2·2	3·7
	Curd, by Hart's Tester, in milk preserved with bichromate of potash	....	2·2	3·3
	Curd, by Hart's Tester, in milk preserved with corrosive sublimate	....	2·1	3·5

* This method is fully described in Bulletin 156, Wisconsin Experiment Station, and the necessary instructions for conducting the test are issued by the Fargo Creamery Supply House, St. Paul, Minn., who have the apparatus for sale.

As will be seen by an examination of the tabulated data, three cows were employed, one of which was giving an exceedingly rich milk, the two other milks of average quality. In addition to the testing of the fresh milk on three separate occasions, milk preserved by (1) formaldehyde, (2) corrosive sublimate, and (3) potassium bichromate—substances used in conjunction with composite testing by the Babcock method—was examined.

The data of the investigation include percentages of fat by Babcock test, the percentages of protein and of casein, or curd, by chemical methods and the results from Hart's tester. The accuracy of the Hart test will be determined by the degree of accord between its results and the percentages of casein as ascertained by chemical analysis.

Fresh Milk.—In two of the seven determinations the differences between the cheminical results and those with the Hart's tester were less than one-tenth of one per cent; in two, between one-tenth and two-tenths, and in the remaining three cases the differences ranged between two-tenths and three-tenths. It seems therefore that with fresh milk the percentage of curd obtained by the test is, for all practical purposes, sufficiently close to the amount actually present. Our work, however, showed that it was necessary to follow the directions carefully if satisfactory results were to be secured.

Milk containing Preservatives.—We find that the presence of the preservatives formaldehyde, corrosive sublimate and potassium bichromate, seriously interfered with the accuracy of the test. They keep the pellet more or less loose and spongy, and thus give readings considerably higher than those obtained with the same milk to which no preservative has been added. Further, concordant duplicate readings were found difficult to obtain—a fact that indicates the unreliability of the test made under these conditions.

WELL WATERS FROM FARM HOMESTEADS.

Though we received during the year 178 samples of water only 96 were submitted to 'a complete sanitary water analysis.' Of the remainder, some were specially examined as to the presence of 'alkali' or an excessive saline content, while many by reason of the small quantity sent, dirty corks or containers, &c., had to be rejected.

Of the 96 now reported on, 40 were from Ontario and 33 from Quebec; the remaining 19 being from the other seven provinces of the Dominion.

As regards their quality, we adjudged 26 as pure and wholesome, 32 as suspicious and probably dangerous, 26 as seriously polluted and 12 as saline. The particulars of the analyses, with a condensed pronouncement as to quality, are given in the appended table.

While it may be impossible to say anything new regarding the importance of pure water and the danger that lurks in the barnyard well, having brought such matters before our readers in every succeeding annual report since the institution of the Experimental Farm system, we do not apologize for again issuing a word of warning to those drawing their supply from shallow wells situated in the vicinity of farm buildings or of accumulations of filth. The results of twenty years' investigation have shown unmistakeably that it is quite exceptional to find a water from such a source free from pollution. Almost invariably in such waters the evidences of the presence of excrementitious matter are clear and strong. It is well to remember that a soil may become so saturated with organic filth that it can no longer perform its office of purification, and that under such a condition the water that passes through it on its way to the well must be unwholesome and a menace to health. Every one ought to know now-a-days that many serious disorders, prominent among which is typhoid fever, are frequently conveyed by polluted water—indeed that such is by far the most common means of disseminating many germ diseases and causing an epidemic.

It has been advised that wells dangerously near possible sources of pollution should be lined say to a depth of 10 feet from the surface with puddled clay, or, still better, cement, so that the water entering the well must first travel through a considerable depth of soil. This undoubtedly would be a safeguard of considerable value, but it is by no means absolute, for even if the water entering such wells were free from disease-producing germs, it would still in all probability be loaded with the products of the partial decomposition of excrementitious matter, which must certainly be more or less injurious to health.

The installation of a water system that will furnish an abundant and pure supply on the farm homestead, is a matter that should receive more intelligent consideration than it does at present. No very great outlay is required to establish such a system in the majority of cases, and it would mean not only health for the farmer and his family and thrift for his stock, but it would make possible a bathroom, the convenience of having fresh water always on hand for culinary and drinking purposes, and the disposal of the household sewage by the septic tank system.

We do not generally advise the household filter in cases of suspected water, as it may readily become clogged and it is then useless or may indeed be a source of danger. The most efficient filters are those containing animal charcoal, but even these require cleaning from time to time to retain their purifying action. Our experience goes to show that boiling for five minutes all the water required for drinking purposes is the most effective means of destroying germ life, and it is this simple and inexpensive method that we accordingly advocate when fear is entertained as to the purity of the supply. If the boiled water is exposed to the air for a few hours it will lose its insipidity and become palatable.

Farmers desirous of having their supply analysed may apply to the Experimental Farm, Ottawa, for the directions necessary to follow in collecting and shipping the sample.

ANALYSES OF WELL WATERS, 1908.

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.
			1908.									
1	Hirsch, Sask.	G.H.L.	Apr. 1	·05	·135	·057	6·5	391·6	270·4	121·2	....	Suspicious.
2	Gilbert Plains, Man.	H.B.	" 1	5·376	·170	·679	60·0	3980·8	3947·2	233·6	....	Saline.
3	Sorel, Que.	L.S.R.	" 13	·08	·295	19·45	64·5	566·0	439·2	126·8	H. traces	Polluted.
4	"	"	" 13	3·46	·55	21·46	66·5	848·4	699·6	148·8	"	"
5	"	"	" 13	·01	·185	·23	1·95	79·6	45·6	34·0	None	Wholesome.
6	Leofeld, Sask.	M.D.	" 17	Free.	·20	Free.	9·75	516·8	358·4	158·4	Free	Unpolluted.
7	Sorel, Que.	C.O.P., No. 1	" 29	Free.	·175	·22	2·1	75·2	35·6	39·6	V. sl. traces.	Excellent.
8	"	" No. 2	" 29	·01	·165	9·55	77·0	702·8	481·6	221·2	"	Very suspicious.
9	Hampton, N.B.	R.E.S.	May 1	Free.	·365	·867	10·0	120·8	72·0	48·8	Trace.	Suspicious.
10	Ballymote, Ont.	G.L.	" 5	Free.	·18	1·176	9·0	260·8	213·6	47·2	Trace.	"
11	Halcyonia, Sask	E.C.	" 22	1·67	·125	·131	90·0	3100·8	2581·6	519·2	Trace.	Saline.
12	Ste. Anne de Bellevue, Que	J.F.S., No. 1	" 29	·01	·15	·108	·5	47·2	24·4	22·8	....	Wholesome.
13	" "	" No. 2	" 29	·12	·102	·0329	35	49·2	27·2	22·0	....	Unpolluted.
14	" "	" No. 3	" 29	·01	·12	·089	·5	47·2	26·0	21·2	....	"
15	" "	" No. 4	" 29	·014	·15	·0856	·25	41·8	20·8	21·0	....	"
16	" "	" No. 5	" 29	·06	·165	·041	Free.	43·6	22·8	20·8	....	"
17	Sonya, Ont.	H.F.	" 30	·38	·105	5·386	80·0	432·8	228.0	204·8	V. sl. traces.	Probably polluted.
18	Ottawa, Ont.	L.W.H.	June 9	Free.	·155	Free.	20·	393·6	267·2	126·4	"	Suspicious.
19	Hamilton, Ont.	W.G.W., No. 1.	" 16	·03	·02	·024	5·5	505·6	384·0	121·6	Trace.	Unpolluted.
20	"	" No. 2.	" 16	Free.	·025	·922	6·75	479·2	388·4	90·8	H. traces	"
21	Boissevain, Man	E.B.	" 18	·33	·12	1·95	40·0	1190·8	989·6	201·2	H. precip.	Polluted.
22	Aylmer, Que.	F.G.W	" 19	·08	·03	Free.	6·0	429·6	335·6	94·0	"	Suspicious.
23	Watson, Sask.	B.L.F	" 20	·02	·17	·42	20·0	3648·0	3112·0	536·0	Trace.	Saline.
24	Carp, Ont	Dr. G.H.G.	" 29	·01	·03	7·65	35·0	428·0	384·8	43·2	V. sl. traces.	Seriously polluted.
25	Aylmer, Que.	F.G.W	July 8	·08	·02	Free.	6·5	414·8	287·6	127·2	"	Suspicious.
26	Amherst, N.S	J.G.McD.	" 13	·03	·505	·0082	9·75	79·2	38·4	42·8	Trace.	"
27	London, Ont.	F.D.	" 13	·20	Free.	·008	42·5	1371·2	1084·4	286·8	Free.	Saline.
28	Ladysmith, B.C	N.D.L.	" 13	Free.	·08	5·18	27·0	212·8	126·4	86·4	Trace.	Decidedly suspicious.
29	Moosejaw, Sask.	J.L.	" 16	·09	·075	·241	170·0	5080·0	4235·0	845·0	"	Saline.
30	Cowansville, Que.	W.G.B., No. 1.	" 25	·045	·137	·16	5·5	73·0	38·0	35·0	"	Suspicious.
31	"	" No. 2.	" 25	·04	·105	·156	5·1	70·8	39·6	31·2	Trace.	"
32	Fielding, Sask	C.W.D.	" 27	1·79	·05	·119	37·0	2720·0	2180·0	540·0	"	Saline.
33	Nepean, Ont.	W.J.K	" 28	·09	·105	4·70	15·0	344·0	274·0	70·0	Trace.	Polluted.

ANALYSES OF WELL WATERS, 1908—*Concluded.*

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.
34	Cornwall, P.E.I	D.S	Aug. 7	·11	·355	1·36	11·0	106·0	60·8	45·2	Trace.	Seriously polluted.
35	Lochiel, Ont............	D. D. McM., No. 1.	" 7	·105	·13	11·163	32·0	585·6	403·2	182·4	H. traces...	"
36	"	" No. 2.	" 7	·03	·25	11·43	105·0	864·4	518·4	346·0	V. h. traces.	"
37	Nepean, Ont........ ...	W.J.K........	" 8	·10	·13	5·88	14·5	409·6	274·4	135·2	" ..	Polluted.
38	Channell, Que	W.D.T........	" 10	Free.	·05	·856	Free.	168·0	108·0	60·0	H. traces...	Excellent.
39	St. Marcel, Que.........	J.B.C	" 12	Free.	·21	·15	31·0	366·0	222·0	144·0	" ..	Suspicious.
40	Amherst, N.S	Dr. J. G. McD., No. 1.	" 20	·03	·195	·025	3·4	72·8	32·8	40·0	Trace......	Unwholesome.
41	"	" No. 2.	" 20	·055	·315	·012	4·4	80·8	28·8	52·0	"	"
42	Carleton Place, Ont.....	Dr. M. A. McF., No. 1.	" 26	·225	·12	5·878	29·0	386·0	318·0	68·0	"	Seriously polluted.
43	" ...	" No. 2.	" 26	22·34	·79	20·50	67·0	1250·0	1078 0	172·0	V. h. trace..	"
44	Vankleek Hill, Ont.	H.N.McI......	" 27	·12	·105	·296	16·8	293·6	196·0	97·6	H. trace....	Suspicious.
45	Ironside, Que......	D.T............	" 27	·04	·20	·262	20·4	323·0	205·0	18·0	V. h. trace..	Very suspicious.
46	Ottawa, Ont	M.H	" 28	Free.	·31	Free.	7·0	302·0	211·0	91·0	Trace......	Wholesome.
47	Dalhousie Mills Station, Que	M.F.McC., No. 1	Sept. 4	·30	·09	Free.	4·0	276·0	200·0	76·0	"	Free from pollution.
48	" " ..	" No. 2	" 4	33·36	1·99	8·84	160·0	1122·0	731·0	391·0	"	Most seriously polluted.
49	Bolton Glen, Que..	C.H.B., No. 1..	" 10	Free.	·04	·906	1·0	58·0	36·0	22·0	"	Good and wholesome.
50	"	" No. 2..	" 10	·02	·115	6·28	21·0	320·0	184·0	136·0	"	Decidedly suspicious.
51	Aylmer, Que......... .	F.G.W........	" 15	·13	·10	Free.	7·0	409·2	363·2	146·0	Sl. trace....	Suspicious.
52	Almonte, Ont..	H.H.C	" 15	Free.	·135	5·04	22·5	420·0	327·0	93·0	H. trace....	Very suspicious.
53	Georgetown, Ont.......	A.V.P	" 21	·09	·16	·206	63·0	424·0	327·0	97·0	Trace......	"
54	Alexandria, Ont	J.McL.........	" 21	5·39	·60	7·05	124·0	742·8	622·8	120·0	Sl. trace....	Very seriously polluted.
55	Vankleek Hill, Ont......	H.M.McI......	" 21	·21	·065	·008	18·0	299·2	222·0	77·2	Trace......	Suspicious.
56	Kirk's Ferry, Que. ...	A.F.B.........	" 22	·13	·145	·304	Free.	188·4	114·0	74·4	"	Free from pollution.
57	St. Andrews, Ont......	J.McM	" 23	9·85	·125	Free.	5500·0	9400·0	6820·0	2580·0	"	Saline.
58	Widdifield Station, Ont.	A.N...........	" 28	·38	·15	·041	Free.	59·2	25·6	33·6	"	Polluted.
59	Black River Bridge, N.B.	A.J.W.M......	" 28	1·51	·382	·21	610·0	1292·0	986·0	306·0	"	Most seriously contaminated.
60	Escot, Ont.............	N.H	" 28	·04	·05	10·92	24·5	363·6	212·4	151·2	"	Suspicious.
61	Knowlton, Que..........	H.S.F.	Oct. 5	Free.	·112	4·24	1·0	115·0	18·0	97·0	"	Unpolluted.
62	North Pelton, Ont......	T.F.	" 8	1·91	·16	Free.	700·0	1903·2	1566·8	336·4	"	Saline.
63	Moosomin, Sask	W.L.W........	" 9	1·78	·115	Free.	24·0	1979·2	1511·6	467·6	"	"

64	Vankleek Hill, Ont.	H.N.McI.	"	10	·10	·60	·016	18·5	294·4	244·8	49·6	"	Suspicious.
65	Florence, N.S.	E.J.W.	"	10	·09	·03	·058	24·0	142·0	92·0	50·0	H. traces	Very suspicious.
66	Dunkin, Que.	G.O.N	"	16	Free.	·045	·115	Free.	100·0	86·0	14·0	Trace	Excellent.
67	Minnewakan, Man.	W.C.J	"	19	·39	·215	Free.	19·0	758·2	492·0	264·2	"	Polluted.
68	Laverlochère, Que.	W.A.L.	"	22	11·04	·22	1·28	114·0	523·2	389·6	133·6	V. h. traces.	Seriously polluted.
69	Aylmer, Que.	L.S.M.	"	22	·075	·03	Free.	6·0	245·6	207.6	38·0	Free	Free from pollution.
70	New Perth West, P.E.I.	S.M.	"	23	·13	·11	1·128	10·0	78·0	30·0	48·0	Trace	Very suspicious.
71	Massawippi, Que.	G.W.K.	"	30	Free.	·265	Free.	Free.	197·6	171·6	26·0	"	Free from contamination.
72	Dunrobin, Ont	H.A.R	Nov.	6	·10	·18	6·75	90·0	609·6	439·6	170·0	"	Polluted.
73	St. Télesphore, Que.	D.A. McD	"	7	10·95	·815	·45	5·5	285·2	208·0	77·2	H. trace	"
74	Alexandria, Ont	D.McM., No. 1.	"	20	·33	·32	1·31	22·0	269·6	188·8	70·8	Trace	Seriously contaminated.
75	"	" No. 2.	"	20	·63	·135	4·80	16·0	333·6	262·8	70·8	"	Suspicious.
76	"	A.McD	"	20	·12	·13	4·45	22·0	434·4	361·6	72·8	"	Highly suspicious.
77	"	E.O.	"	20	Free.	·11	4·65	149·5	916·8	709·6	207·2	"	Suspicious.
78	Maple Ridge, Que	D.D.	"	25	Free.	·075	·032	3·0	245·0	131·0	114·0	Free	Free from pollution.
79	Montreal, Que	T.L.W	"	26	·103	·075	·193	95·0	845·0	777·0	68·0	"	Of doubtful purity.
80	Ottawa, Ont	F.A.W.	Dec.	10	·385	·56	12·91	20·0	870·8	738·4	132·4	H. trace	Polluted.
81	Forest, Ont	W.R., No 1	"	18	·55	·22	·057	520·0	1282·0	1020·4	261.6	Trace	Saline.
82	"	" No. 2	"	18	·28	·52	·115	445·0	1126·0	921·2	204·8	H. trace	"
83	Ottawa River, Ottawa, Ont	C.E.F. tap	"	28	·14	·20	·131	.70	47·2	16·8	30·4	V. sl. trace..	Unpolluted.
84	" "	Britannia Rpds.	"	30	·15	·16	·131	·50	58·4	28·0	30·4	"	"
85	Folly River, N.S.	A.C.	"	30	·03	·07	3·12	11·0	89·2	62·0	27·2	Free	Of doubtful purity.
			1909.										
86	Valleyfield, Que	A.D.P	Jan.	14	Free.	Free.	·142	28·0	372·8	280·8	92·0	H. traces	"
87	Williamsburg, Ont.	M.D	"	22	·06	·115	·131	65·0	437·0	370·0	67·0	Free	Free from pollution.
88	Prescott, Ont.	J.B.C.	Feb.	1	·11	·075	·024	4·0	268·8	207·6	61·2	"	Probably unpolluted.
89	Gladys, Alta.	H.H.	"	8	Free.	·525	·082	2·0	4670·0	3660·0	1010·0	"	Saline.
90	Beaver Meadow, Hull, Que	E.A.H.	"	22	Free.	·13	3·8	3·0	244.4	174·4	70·0	H. traces	Pure and wholesome.
91	Oshawa, Ont.	A.J.J.S.	Mar.	3	·08	·075	5·37	40·0	591·6	492·2	99·4	Trace	Polluted.
92	Ottawa, Ont	G.H.G.	"	5	·04	·08	4·62	14·0	565·6	395·6	170·0	Trace	Of doubtful purity.
93	Lyons Brook, N.S	J.R.McK.,No.1	"	16	·03	·07	0·41	5·5	32·0	12·4	19·6	V. sl. trace..	Very good.
94	" "	" No. 2	"	16	·04	·07	7·17	220·0	542·4	418·4	124·0	Trace	Decidedly suspicious.
95	Huntley, Ont	J.F.A.	"	24	Free.	·48	·032	13·5	344·0	232·0	112·0	V. sl. trace..	"
96	West Monkton, Ont.	G.B.M	"	24	·08	·14	·082	4·0	240·8	159·2	81·6	"	Polluted.

REPORT OF THE CEREALIST.

CHARLES E. SAUNDERS, B.A., Ph.D.

OTTAWA, March 31, 1909.

Dr. WM. SAUNDERS, C.M.G.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the sixth annual report of the Cereal Division.

While the season of 1908 was not favourable at Ottawa for cereals, good progress was made in the work of selecting and fixing the best types from among the thousands of new cross-bred sorts which are grown on the Central Experimental Farm every year. The propagation of those new varieties which had shown themselves of fixed character in the year 1907 did not progress as rapidly as could have been wished last summer, but some increase was obtained in all cases, and not infrequently a very good yield.

During the months of August and September I visited all the western branch Experimental Farms for the purpose of inspecting the crops of grain grown under various climatic conditions and becoming at the same time more familiar with the special needs of each district. The time spent in this way was found to be very profitable, valuable information being gathered in regard to some of the problems connected with the growing of cereals.

In the winter months much of my time was occupied in the selection of the most desirable individuals from the large number of cross-bred plants gathered during the harvest. Milling and baking tests also formed an important part of the winter's work, special attention being given this year to problems in connection with the storage of wheat and flour, and the effect of dampness on wheat. While a very considerable amount of work will yet be required before some even of the simplest problems in these directions will be solved, the work which has been done in the cereal and chemical laboratories on this Farm has already brought to light many facts of interest and value. Altogether these investigations promise to be of quite unusual importance from a commercial point of view.

It is with pleasure that I record my indebtedness to Mr. Geo. J. Fixter, the foreman in charge of the field work of this Division, for the careful and capable manner in which he has discharged his duties during the year.

Some of the chief results of the experiments and tests carried on from April 1, 1908, to March 31, 1909, are presented in the following pages.

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

CHARLES E. SAUNDERS,
Cerealist.

VISITS TO BRANCH EXPERIMENTAL FARMS.

As soon as the harvest at Ottawa was well enough advanced to permit me to leave this Farm, I started on a trip through parts of central and western Canada for the purpose of inspecting the cereal crops at the branch Experimental Farms and becoming better acquainted with the varying conditions of soil and climate in some of the more important sections of the west. Problems in connection with the transportation, grading, cleaning and milling of wheat and oats were also studied. The principal points visited were Port Arthur, Winnipeg, Brandon, Indian Head, Lethbridge, Lacombe, Calgary, Agassiz, Vancouver and Victoria. Information which will be of value in connection with the work of this Division was acquired at all of these points. At Agassiz I met the delegation of Scottish agriculturists and editors who were travelling through Canada.

CROSSING AND SELECTION OF CEREALS.

A few new crosses were made last summer, the most important being between Onega wheat (a very early variety from northern Russia) and Early Red Fife, and between Early Red Fife and Kubanka (perhaps the best of the durum wheats for bread or macaroni). Some crosses were also made between different strains of selected Red Fife wheat, to see if any noteworthy results can be obtained from such crossing within the limits of a single variety.

The selection of the most promising plants from the small plots of unfixed, cross-bred cereals was carried on as usual. There are now on hand over 300 new cross-bred varieties of wheat, oats and barley which are being propagated for test in larger plots. Among these are many sorts of remarkable interest.

The selections from the principal named varieties of cereals which have been made during the past few years were again subjected to careful study and comparison for the purpose of eliminating all but the very best strains.

METHODS OF SELECTION.

Attempts to improve cereals by some form of selection, either with or without the additional aid of cross-breeding, have lately attracted so much attention in Canada that some general review of the methods available seems desirable, as well as a clear statement of the procedure followed in the work of cereal breeding and improvement at this farm.

SELECTION WITHOUT PREVIOUS CROSS-BREEDING.

Ordinary varieties and commercial mixtures of grain show so much variation in character, when the individual plants or heads produced from them are carefully studied, that it is sometimes possible to obtain from them improved types or strains by some simple method of selection without having recourse, first of all, to cross-breeding to produce great variations.

The meaning of the term *variety* as applied to cereals is pretty well understood, but the word *strain* may need some explanation. This word is used to signify a subdivision of a variety. Even when we possess pure seed at the start, we may by selection obtain types which, though very clearly similar to each other, have certain points of distinction. These selections within a single variety are usually termed *strains*. If, however, the original seed with which we commence our selection experiments consists of a mixture of clearly distinct sorts, then selection if properly carried on will enable us to isolate these various types, some of which may never before have been grown in a pure state. Under such conditions we may obtain by selection new *varieties*.

Selection may be practised in two rather distinct ways. We may either carry on repeated selection year after year with a view to obtaining slight but repeated advances in some particular direction, or we may once for all pick out a number of specially promising plants or heads or seeds and propagate from each of these separately, without further selection, but retaining, after a few years' study of them, only that strain which has proved best. By one method we try to improve the whole mass as such; by the other we merely seek to discover, from the study of its descendants, which was the best plant in the whole original mass and to retain ultimately only the pure descendants of that plant, all the inferior strains being discarded.

The method of repeated selection is the same in principle whether we choose each year the largest or heaviest or hardest kernels or the largest or earliest heads—or on whatever character we may base it. At first sight this system seems so full of promise that one is not surprised at the number of experimentalists who have made use of it. It fits in so well with the Darwinian ideas which have dominated the whole realm of biology for so many years. If natural selection has done so much, why may not artificial selection accomplish even more and in far shorter periods of time? While no one can set the limits of what can be done by repeated selection in any direction, the results which have been obtained have proved that the advancement is usually much too slow for ordinary purposes. This method was most carefully tested in Sweden, at the famous experiment station at Svalof, but was finally abandoned as practically useless. Other workers elsewhere have been equally disappointed. While it certainly is of value in some cases, one must beware of expecting too much from it and must clearly recognize its sharp limitations and the dangers which always attend its use.

Of late years some new ideas in regard to the origin of species have been made prominent, especially by DeVries; and we have been led to think less of the importance of gradual changes in large masses of plants and more of the value of sudden changes in individuals. We now recognize that each plant has a measure of individuality, usually slight and unimportant, but occasionally so striking as to be easily observed. As these points of individuality are often transmitted to all the descendants of the original plant, we are generally able to obtain some strains of unusual value by keeping separate the progeny of each selected individual which was chosen because of some element of apparent superiority over the others. This second method of selection may perhaps not inappropriately be termed DeVriesian.

Personally I am a firm believer in the superiority of this method over the first, or Darwinian, whenever the original seed with which the work is commenced is in pure condition, true to name; because the method of repeated selection has some serious disadvantages, quite apart from the fact that the improvements effected by it are much too slow. In the first place one is obliged to decide every year, when the time for selection arrives, which are the best seeds or heads or plants (as the case may be), the decision being based on appearance or weight or some such characteristics; while one is unable to take into consideration that quality which is perhaps the most important of all, namely, the power of these selected individuals to transmit their own peculiarities to their progeny. Animal breeders know that the best looking animal does not always prove the most satisfactory parent.

In the second method of selection the original choice of a number of individuals is open to the same objections as were urged against the first method. But in the second method the original choice is only of a provisional nature, the final selection of the best strain not being made until after all the most promising strains have been propagated and studied for several years.

Both systems of selection have been used in the work of the Cereal Division, but the method of repeated selections for the improvement of varieties has been abandoned. A few years ago, when plots produced by the two methods were sometimes grown side by side, the difference in uniformity of appearance was strikingly in favour of the plots which had each been bred from a single plant.

The greatest danger in any form of repeated selection is that desirable qualities may be lost in one direction while a gain is being made in another. If, for instance, we always select the largest seeds, these may be the product of the plants with the smallest heads, and we may in time materially reduce the productiveness of the selected grain. If the largest heads are chosen, these may come from plants with unduly long straw, which may be undesirable. Earliest heads, if we are selecting for earliness, may be from plants of otherwise poor quality. Again, in wet seasons one necessarily selects those individuals which can best withstand an excess of moisture and in dry seasons one must choose the opposite class, the work of one year thus conflicting with that of another. The danger of selecting false heads or kernels of an undesired variety in mistake for unusually large heads or kernels of the desired sort is very great, when the work is being done by any one but a well-trained specialist.

The advocates of repeated selection may object, however, that undue emphasis is being laid on the dangers of this method, and that in actual practice it has been found to give excellent results in some cases. Of course it is true that striking improvement can easily be produced by the selection of heads, for instance, even for a single season, provided that the grain with which the experiment is started is badly mixed. Strictly speaking, however, this is not *improvement* but *purification*, and such instances can scarcely be said to furnish a fair argument. Purification of seed is of great importance, but a fair test in regard to the improvement of a variety cannot be begun until after pure seed has been obtained.

One other kind of instance should be mentioned. If for a long series of years we carefully select any particular type of head or seed we may finally reach a point where the greater part of our selected crop consists of the descendants of that plant which in the first year was the most productive of all those of the desired type. In other words, the selection of best typical heads year after year may ultimately bring us very close to the point which we could have reached by the other method of selection in a much shorter time and with very much less labour.

While fully admitting the value of the ordinary method of the selection of heads for the purpose of purifying mixed grain and for the maintenance of the seed in a high state of purity, it does not seem to me to be the best way to bring about real improvement in any variety. The selection of good typical heads, rather than of heads which are in any way unusual, seems to be the safest and best plan for farmers who wish to keep their seed quite true to name. If a strain of different type is being sought for it is best to breed a number of separate strains, each started from a single plant which appears to possess the desired qualities. One can thus usually obtain, at a single step, some distinct and permanent advantage and can make sure before the final choice of one particular strain is made that in effecting an improvement in one direction nothing essential has been lost in other ways.

The work which has been done in the Cereal Division with Red Fife wheat may serve as an illustration of the practical value of this method. It was desired to obtain a selected type of this wheat which should ripen earlier than the original variety but still retain its striking ability to produce strong flour. Early-maturing heads were, therefore, picked out, and from each of these a new strain was produced. For several years the new strains were studied in the fields, and having been at last reduced to four they were subjected to milling and baking tests. As a result of these tests it was made clear that the selections B, H and M, which are still being grown, are genuine Red Fife so far as baking strength is concerned. Strain M does not show any particular earliness, and H is only a trifle ahead of ordinary Red Fife, but B is distinctly earlier. Though the advantage of Red Fife B is usually only a few days, and under some conditions may be scarcely noticeable, it is likely to be of great importance for certain sections of Canada. This wheat is to be introduced under the name of Early Red Fife as soon as practicable.

SELECTION OF CROSS-BRED VARIETIES.

A full description of the method of cross-breeding in cereals was published in the annual report of last year. It is unnecessary, therefore, to give any of the details in this connection. It may be worth while, however, to point out that cross-breeding is usually essential for the production of radically new varieties, and that by this method we may fairly expect to produce any new combination we desire of the characteristics of existing sorts.

Cross-breeding must of course be followed by selection for several years in order to obtain fixed types. The best method of selection under these circumstances is similar in principle to that which has just been described. The seed of each original cross-bred plant is sown in a separate group. At harvest time the most promising plants in the group are selected. These are carefully studied during the winter months and those of least desirable character are rejected. The seed of each plant retained is sown the next season in a group by itself, and this process is repeated for as many years as may be necessary, until finally one or more fixed, uniform groups are produced from each original cross-bred plant. As many of these groups as are desired may be retained, but each must be propagated as a separate variety, for none will be exactly like any of the others.

Usually from four to six years elapse before groups are obtained which are quite fixed in regard to the eight or ten characters which are commonly observed in cereals. If the work were done on an enormous scale, some fixed types could be obtained at an earlier stage.

SEED SELECTION FOR FARMERS AND SEED GROWERS.

The task of producing new varieties of cereals or of isolating the best strains of older sorts seems to belong to the seed specialist; though certain parts of this work are perfectly feasible for any enthusiastic farmer who desires, and can spare the time, to make a hobby of it. Most seed growers, however, would probably do better by testing on their farms a few different varieties of grain, choosing those most suitable to their own conditions, and then confining their attention to the maintenance of the purity of each sort grown. This, of course, presupposes that at least a small quantity of seed of each sort can be obtained in pure condition to begin with. This can usually be done without very much difficulty.

For the maintenance of the purity of his grain some such method as the following—which will be found both easy and effective—may be followed. The farmer should choose a particularly clean and fertile piece of land for his special seed plot. In sowing the grain it is advisable to stop up about every eighth spout in the seed drill, so as to facilitate walking through the standing grain later in the season. If only a few pounds of pure seed are available the first season a small plot must be sown, but when a larger quantity of seed is on hand, one or two acres (or more) may be sown as a special seed plot—enough to provide all the seed required for the following year. The seed plot should be gone through once or twice during the growing season and everything that looks false to the desired type of grain should be removed. This should be done again just before the grain is cut. The task may appear formidable to any one who has not tried it; but it is really by no means difficult. If the special seed plot covers only a small fraction of an acre, it is imperative that the crop should be threshed by hand, as otherwise it will almost certainly be seriously mixed with other seed when passing through the threshing machine. For the threshing of larger quantities the machine should be cleaned out as thoroughly as possible before the operation is begun and the first few bushels of seed that pass through should be rejected. It is highly desirable to thresh the special plot after some totally distinct grain, so that if any seeds remain in the machine and are carried over into the special grain they may be easily seen and separated. Wheat, barley or oats could, for instance, advantageously follow peas. The seed grain should be well cleaned in a fanning mill, and as much of it as is to be used the next year for the special seed plot should be hand picked during the following winter: an easy matter considering the small quantity required.

The main portion of the seed may be used for the general farm crop of the next year without any further preparation than that given by the fanning mill.

In this way any farmer can keep his seed grain in excellent condition, and can maintain its purity with the minimum of labour and with no danger of altering the characteristics of the variety by errors in selection. This method will be found far more satisfactory in the great majority of cases than the time-honoured custom of a change of seed every few years, with its attendant dangers of new weeds and unsuitable types of grain.

SPECIAL DISTRIBUTION OF SEED GRAIN.

In order to meet the wishes of farmers who grow seed grain for sale (and who are specially interested in obtaining samples of seed of the highest possible degree of purity and of the very best strains, to serve as the foundation stock for their varieties) a limited distribution of the newest and choicest strains has been commenced, from the office of the Cerealist. The grain thus distributed is all produced by the most careful and scientific methods of selection available, and may be depended upon to exhibit a degree of purity practically unattainable when large quantities of different varieties are dealt with.

It should be distinctly understood that the quantity of this special seed on hand in any season will necessarily be very small, and that the distribution is intended only for farmers who are in the habit of growing seed grain for sale and who do not consider it 'too much trouble' to give particular care to seed of unusual value.

MILLING AND BAKING TESTS.

Tests of a number of varieties of wheat grown at the different Experimental Farms, and of wheat stored under varying conditions, were carried on during the past winter. The publication of the full results of these experiments is reserved for some future time, but a brief synopsis of some of the most important parts of the work is here given. A complete explanation of the methods by which these tests are carried on has already been given in Bulletins 57 and 60 of the Experimental Farm Series.

VARIETIES OF SPRING AND WINTER WHEAT.

Some of the most interesting varieties of ordinary spring wheat, durum wheat and winter wheat are reported upon in the following table. All the samples were grown in the year 1908.

The total yield of flour cannot readily be determined, with sufficient accuracy for publication, when a small experimental flour mill is used. The figures for break flour are given, however, as they furnish a fair guide as to the relative hardness of the different samples tested.

The colour of the inside of the loaf, given in the last column, has usually a fairly close relationship to the colour of the flour, especially when wheats of the same class are compared.

Milling Number.	Variety.	Where Grown.	Break Flour, per cent.	Baking strength of Flour.	Colour of bread, (inside).
	Spring Wheats.				
245	Red Fife H	Brandon	12	97	98
246	"	Indian Head	11	93	98
244	Marquis	Brandon	12	97	100
243	Chelsea	"	9½	83	95
251	Stanley A	Indian Head	9½	84	99
	Durum Wheats.				
230	Kubanka	Lethbridge (not irrigated)	4½	80	85
237	"	Indian Head	3½	96	81
	Winter Wheat.				
238	Kharkov	Lethbridge (irrigated)	11	90	96
239	"	" (not irrigated)	9½	96	97
240	Turkey Red No. 380	" "	10½	93	98
241	" (Commercial Seed)	Lacombe (after timothy sod)	12	82	85
242	" " "	" (after summer fallow)	11½	81	85

While too much weight must not be given to determinations of baking strength in any single season, since so many circumstances influence the quality of wheat, the above table furnishes some instructive details. The high position taken by Marquis wheat is noteworthy. In both strength and colour it was unsurpassed by Red Fife H, grown either at Brandon or Indian Head. Chelsea is somewhat disappointing in regard to strength this year, its rank in this respect having been considerably higher in some former tests. Stanley A is an improved strain of the original Stanley wheat. Though still of only medium (or sometimes above medium) strength, its rank for colour is with the very best varieties.

The sample of Kubanka grown at Lethbridge shows considerably less than the usual strength of this variety, the Indian Head sample being about normal. Of these two samples that grown at Lethbridge was the finer in appearance, and would have been expected to show superior baking strength.

The two samples of Kharkov wheat (which is undoubtedly the same variety as Turkey Red) show some difference in favour of that which was grown without irrigation. The two samples of Turkey Red grown at Lacombe under different conditions were practically identical, perhaps partly owing to the unusual rainfall which occurred in the early summer and which saturated all the land with moisture, no matter how it had been treated during the previous year.

EFFECT OF STORAGE ON WHEAT AND FLOUR.

A number of new tests carried on with samples of different kinds of wheat and flour confirmed in a general way the conclusions previously reached in regard to the effect of storage.

The special series of tests, which was commenced more than a year ago with perfectly fresh samples of wheat, has now reached a point where results of value are being obtained. Without entering into the full details, it may be explained that seven samples of wheat are being kept under ordinary conditions of storage, and three samples of flour (produced from three of the samples of wheat when they were fresh) are being kept under ordinary office conditions, i.e., without being subjected to severe cold in the winter. Portions of the seven lots of wheat are ground at intervals of several months and the whole ten samples of flour are tested together in the baking laboratory.

It has been established thus far that when the material is kept over in the form of flour there is a more rapid improvement in colour and in strength than when it is kept as wheat. The changes that occur are not always regular, and a few exceptional cases were found. In every instance, however, there was a gain in water-absorbing power, and as a rule this gain was considerable, amounting sometimes to more than four per cent after sixteen months of storage. There was also invariably an improvement in the shape of the loaf. In regard to volume of loaf some irregularities occurred for which no satisfactory explanation can be offered at present.

It is the intention to continue this investigation, and also to commence another series of tests, in the effort to obtain further light on some of the more obscure points.

DAMP WHEAT.

Wheat may be subjected to dampness under a great variety of conditions, and much research work will therefore be necessary before satisfactory answers can be given to all the questions which naturally arise in regard to the effect of dampness on the yield, colour and baking qualitiees of the flour made from damp wheat.

As a first study in this important matter, the experiments of which an account is here given were undertaken.

A quantity of pure Red Fife wheat (of the strain known as Red Fife H) grown on the Indian Head Experimental Farm last season was obtained in November. This wheat was an excellent sample of Red Fife, and would no doubt have graded No. 1 Hard. The whole quantity was cleaned for milling and the first portion (milling number 246) was taken out. On November 13 the remainder of the wheat was soaked in water for five minutes. The water was then drained off and a portion of the wet wheat was spread out in a thin layer to dry in an ordinary heated room. This constituted the second portion studied (milling number 247). The remainder of the wheat after being thoroughly drained was placed in a loose cotton bag and put into a covered vessel which was not quite air-tight. The wheat was examined almost every day, and was shaken up each time so that some fresh air might have access to it, but was not removed from the bag. A thermometer was kept with the wheat. During the following ten days the temperature of the wheat varied from 4 to 10 degrees Centigrade (about 40 to 50 degrees Fahrenheit), the average being about 7 degrees C. (45 degrees Fahr.). The quantity of moisture present in the wheat during this period was about 23 per cent. In spite of the presence of this large proportion of water no musty odour was developed. On November 23 a portion (milling number 248) of the wheat was removed and allowed to dry spread out in a thin layer in an ordinary, warm room. A little more water was then added to the wheat remaining in the closed vessel, and it was kept for ten days longer, until December 3, at a temperature of 7 to 14 degrees C. (about 45 to 58 degrees Fahr.), the average for the period being about 12 degrees C. (54 degrees Fahr.). The quantity of moisture present in the wheat during this second period was about the same as during the first. The temperature being higher, however, a slight musty odour was produced. This was noticed for the first time on November 30. On December 3 another portion (milling number 249) was removed and treated like the others. The remainder of the wheat was then kept for seven days longer, with the occasional addition of small amounts of water, until a very strong musty smell was developed and some signs of sprouting were observed. Moisture determinations, made in the chemical laboratory, showed that the amount of water present in the wheat during this period ranged from about 23 per cent, at the beginning, to over 28 per cent at the close. The kernels of wheat were so soft as to be easily cut in two with the thumb nail. The temperature during these last seven days varied from 8 to 10 degrees C. (about 47 to 50 degrees Fahr.). On December 10 the whole of the remainder of the wheat (milling number 252) was removed from the vessel and dried off like the other lots.

The five samples of wheat were kept under uniform conditions for some time and then ground. The samples of flour were stored together for several weeks and finally subjected to baking tests.

The table following gives some of the most important details brought out in the study of these samples.

No figures in regard to the flour yield are here given as the differences observed were very slight—quite within the limits of the possible experimental variations.

All the flours, before testing, contained not far from 8 per cent of moisture. The figures given in the table have been recalculated, where necessary, on the basis of 8 per cent of moisture.

Milling Number.	How Sample was Treated.	Weight of dry wheat, per measured bushel.	Water absorbed in making dough.	Water retained by bread, one hour after baking.	Volume of loaf from 100 grammes of flour.	Shape of loaf, (height divided by diameter).	Texture of loaf.	Strength of flour.
		Lbs.	p. c.	p. c.	c. c.			
246	Original sample	62½	65	40·5	454	·69	94	93
247	Wet for five minutes	61	64·5	40	471	·68	97	94
248	Damp for ten minutes	60¼	64·5	40·3	479	·68	97	96
249	Damp for twenty days	60	60·5	36·6	521	·72	98	100
252	Damp for twenty-seven days	58½	56	33·5	506	·68	76	86

The effect of the water in destroying the brightness and richness of colour of the wheat was very marked, the samples kept damp for the longer times having, when dried again, almost the appearance of soft wheats. They did not, however, show any noteworthy increase in the proportion of break flour obtained from them.

The action of the moisture, as shown in the table, caused a decided lowering of the weight per bushel, from the very beginning.

The later samples also show less water absorption in making dough, though the difference in this respect is trivial until No. 249 is reached. In regard to volume, shape and texture, the bread made from the damp wheats was better the longer they had been exposed to the (supposed) adverse conditions, until No. 249 was reached. After this there was a sudden falling off. The figures for baking strength (which are an attempt to express under one head the average conduct of the flour in all respects) show an unmistakable improvement up to No. 249. This sample, though slightly musty when very damp, showed no mustiness in the bread. Indeed the bread produced from it was distinctly the most attractive, except that it had perhaps a somewhat less rich flavour than the bread made from the samples with lower numbers. No. 248 was distinctly superior to the original sample and No. 247 slightly so. No. 252 produced very poor bread of rather dark colour and slight musty flavour. The colour of the bread from the other four samples was practically uniform. The baking tests were repeated several times and showed a striking agreement between the different bakings in regard to all the samples.

The conclusion which must be drawn from this series of experiments is that dampness in wheat although very injurious to its appearance does not necessarily injure, but under some conditions actually improves, the intrinsic value (to the baker) of the straight grade flour produced from it. No doubt injurious action of the moisture would commence earlier at higher temperatures than it did in this series of trials, but on the other hand it should be remembered that the amount of moisture present in the wheat in these tests was greater than that usually found in 'damp' or 'tough' wheat.

EFFECT OF VARIOUS INGREDIENTS IN BREAD.

The determinations of the baking strength of flour which have been made in this laboratory have always been based on what may conveniently be termed 'plain' bread. Nothing is added to the flour except water, salt and yeast, and a quantity of cane sugar so small that it is probably all decomposed by the action of the yeast before the fermentation of the dough is ended.

Most of the home-made bread produced in Canada is probably essentially 'plain,' but commercial bakers almost invariably add one or more ingredients to their dough either to produce some special effect on the lightness, colour or flavour, or to make their product comply with the requirements of the law so as to be sold as 'fancy' bread.

The question naturally arises, therefore: whether the relative positions of various flours in regard to strength will remain unchanged when other materials are added in bread making. Considerable work has been done, in this laboratory, on this problem; but it comes up in so many different aspects that it would be premature to draw many conclusions at present. In a general way it appears that most flours are affected similarly when any additional substance is added to the dough. There are cases, however, where one flour is improved in strength by the addition of some substance which produces little or no effect on another flour.

Among the substances, other than water, yeast, salt and sugar, which are sometimes added to the flour or dough in bread making, the following may be mentioned: Lard, butter, cotton-seed oil, milk, evaporated milk, malt flour, malt extract, diastase and potatoes.

All of these are quite unobjectionable, provided the bread produced satisfies the taste of the consumer.

SMALL PLOTS OF CEREALS, &c.

The small plots grown in 1908 included several hundred of cross-bred origin which were not quite fixed in character, as well as nearly 150 new cross-bred varieties of fixed type but not yet named. Many new, selected strains of older varieties were also grown. The small plots of new or little known named sorts were as follows:—

Spring wheat.—Barletta, Gyangtse, Onega, Red Cedar, Rust-free Russian and Seven Nations.

Durum wheat.—Iumillo and Pellissier.

Oats.—Chinese Naked and Victory.

Barley.—Early Indian, Gyangtse, Karim, Kars, Kutais, Leader, Leh, Taganrog and Vologda.

UNIFORM TEST PLOTS OF CEREALS, &c.

The most important varieties of cereals, field roots, &c., which are obtainable commercially are annually grown in test plots along with the cross-bred and selected

Early ripening varieties of Spring Wheat.
1. Marquis
2. Stanley (Selection A).
3. Early Red Fife.

5094—p. 208.

sorts produced at this farm and other varieties obtained from various sources. The objects of these tests are 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, in order to keep the list within as small bounds as possible.

The test plots of grain are one-sixtieth of an acre and those of field roots one-hundredth of an acre.

The number of these test plots grown during the past season was as follows: Spring wheat, 36; durum wheat, 4; winter wheat, 20; emmer and spelt, 10; oats, 55; six-row barley, 20; two-row barley, 25; peas, 22; spring rye, 2; winter rye, 3; field beans, 4; flax, 4; turnips, 13; mangels, 12; carrots, 6; sugar beets, 3; Indian corn, 26, making a total of 265 plots, and representing about 250 varieties.

For some years the number of plots has been steadily reduced by the elimination of the less desirable varieties. A large increase in the number will occur as soon as the new cross-bred varieties produced during the last few years begin to take their places in these larger plots.

WEATHER.

While the spring of 1908 was not perhaps unusually cold at Ottawa, so large a quantity of rain fell at short intervals throughout April and May that seeding was very seriously delayed. Warm weather followed almost as soon as the seed was in the ground, and the prevailing character of the summer was dry. Early autumn was very dry.

Such conditions were extremely unfavourable to cereals and distinctly adverse to almost all farm crops; so that the yields obtained were in many instances far below the average.

SPRING WHEAT.

The test plots of wheat could not be sown until May 6, owing to the continued wet weather. The seed was used at the rate of about 1½ bushels to the acre. The soil was a loam of variable character. Owing to the drought which followed the wet weather those portions of the field which were of a somewhat heavier character than the others became so hard that the growth of the young plants was almost stopped. The yields of the following varieties (which suffered most severely) are not published, as they would give no fair indication of their productiveness under average conditions: Alpha Selected, Aurora, Bobs, Downy Riga, Ebert Selected, Hungarian White, 7 E 3. Some of these plots were also injured by the larva of the Hessian fly.

The variety designated Early Red Fife is an early strain of Red Fife selected by the Cerealist in the year 1903 and propagated from a single plant. It was recorded in previous publications as Red Fife B.

Varieties without names are new cross-bred sorts produced by the Cerealist, but which are not yet ready for distribution. Those varieties which have a letter after the name are new strains propagated from single selected plants.

The yield per acre is expressed in pounds and also in bushels of 60 pounds.

The character of the straw is indicated by marks on a scale of 10 points, according to the proportion of the plot standing erect at harvest time.

* Varieties and selected strains produced at the Central Experimental Farm are marked with an asterisk.

SPRING WHEAT—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, Including Head.	Strength of Straw on a Scale of 10 Points.	Average Length of Head.	Yield per Acre.	Yield per Acre.		Weight per Measured Bushel after Cleaning.	Rusted.
				Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.	
1	Bishop A.*	Aug. 2.	88	36	10	3¼	1380	23	..	60¼	Badly.
2	White Russian	" 10.	96	36	10	3½	1320	22	..	60	Considerably.
3	Preston H.*	" 3.	89	34	10	3½	1290	21	30	59	"
4	Stanley A.*	" 7.	93	40	10	3½	1290	21	30	58	Badly.
5	Red Fern	" 10.	96	40	10	3¾	1260	21	..	62½	Considerably.
6	Percy A.*	" 7.	93	36	10	4	1230	20	30	60½	Badly.
7	Red Fife M.*	" 14.	100	38	10	3¼	1230	20	30	59¼	Considerably.
8	Yellow Cross*	" 1.	87	37	10	3	1230	20	30	62½	"
9	Chelsea*	" 3.	89	34	10	3½	1200	20	..	61½	"
10	Pringle's Champlain C.*	" 3.	89	33	10	3½	1200	20	..	61¼	"
11	Red Fife H.*	" 14.	100	38	10	3¼	1140	19	..	60½	"
12	White Fife C.*	" 14.	100	38	10	3¼	1140	19	..	60½	"
13	9 G.*	" 10.	96	39	10	3	1110	18	30	57	Badly.
14	Early Red Fife*	" 7.	93	36	10	3¼	1050	17	30	62	"
15	Yellow Queen*	" 3.	89	38	10	3¼	1020	17	..	61½	"
16	Spence Yellow*	July 29.	84	33	10	3½	930	15	30	63½	Slightly.
17	Yellow Fife*	" 29.	84	36	10	3	900	15	..	62	"
18	Prospect*	" 31.	86	32	10	3¼	840	14	..	60½	Considerably.
19	Huron Selected*	Aug. 6	92	30	10	3¾	780	13	..	59½	"
20	Gatineau*	" 20.	106	28	10	3½	750	12	30	59	Badly.
21	Marquis*	" 10.	96	36	10	3¾	750	12	30	60¾	Considerably.
22	Early Russian*	" 2.	88	32	10	3¾	720	12	..	62½	Badly.
23	Outlook*	" 10.	96	34	10	3¾	720	12	..	59½	Considerably.

Most Productive Varieties of Spring Wheat.—Excluding the durum wheats, which are considered separately, the following varieties of wheat have shown unusual productiveness for a series of years on this farm: Preston, Pringle's Champlain, Red Fern, Huron and Bishop. The first four of these are hard red wheats with bearded heads. Bishop is a very early white wheat and is beardless. Of the five varieties Red Fern and Pringle's Champlain are probably the best for the production of strong flour.

Somewhat lower in yield, but superior in the strength of their flour are Red Fife and White Fife, both beardless.

Among the varieties which have not yet been tested for many years in succession, but which have proved very productive, may be mentioned Chelsea and Marquis, both early, beardless sorts. Marquis* produces the stronger flour of the two for baking purposes.

Earliest Varieties of Spring Wheat.—Some of the very early kinds of spring wheat grown on this farm are not at present being distributed or recommended for general cultivation. Farmers applying for very early sorts should remember that extreme earliness is frequently associated with a rather small yield, short straw, liability to rust, or some other defect to which the more vigorous wheats are less subject.

The earliest wheats which are included in the regular distribution of seed grain from this farm are Marquis, Stanley and Chelsea (beardless and having red kernels), and Preston, Huron and Pringle's Champlain (bearded and having red kernels). Bobs and Bishop are early beardless sorts which are not generally distributed, because the pale colour of their bran would cause them to be graded below their actual value in the Manitoba Inspection Division. Bishop is perhaps the earliest of the eight varieties mentioned; but they are all earlier than Red Fife.

DURUM OR MACARONI WHEAT.

The different varieties of durum wheat are by no means identical in quality, though they are usually considered to be so. Some are particularly good for the making of macaroni, and excellent bread (of a rich yellowish colour) can be made from others, but some of the varieties are not very good for either of these purposes. Kubanka (probably identical with Beloturka) is one of the best for bread making and for macaroni.

The extreme hardness of these wheats and the yellowish colour of the flour produced from them make them quite unpopular at present with both millers and bakers.

Farmers who grow durum wheat should obtain one of the best varieties and should exercise great care to prevent the grain from becoming mixed with wheat which is to be sold for the making of ordinary flour.

As a rule the durum wheats suffer less from drought and from rust than other sorts. They may, therefore, prove useful in some cases, especially in any rather dry districts where rust is apt to be severe. They are not, however, to be recommended for damp climates. It should also be borne in mind that the market price of durum wheat is usually lower than that paid for varieties which are popular for milling purposes.

Several of the varieties which have been shown to be inferior to the others have been discontinued.

The plots of durum wheat were sown on May 6, the seed being used at such a rate as would be equivalent to 1¾ bushels per acre of seed of high vitality. The climate at Ottawa is usually too damp for these wheats and the seed saved is generally of rather low vitality. The soil was a loam of fair quality which, however, became very dry, soon after the young plants had appeared above the ground. On this account growth was seriously interfered with, and only a very small crop of grain was obtained.

The yield per acre is expressed in pounds and in 'bushels' of 60 pounds.

DURUM WHEAT—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a Scale of 10 points.	Average Length of Head.	Yield per Acre.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
				Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.	
1	Goose..................	Aug. 7.	93	30	10	2¼	750	12	30	62	Considerably.
2	Beloturka..............	" 10.	96	34	10	2½	630	10	30	62½	"
3	Kubanka................	" 10.	96	34	10	2½	570	9	30	61½	"
4	Roumanian..............	" 17.	103	26	10	2¼	570	9	30	61	Badly.

The variety called Roumanian has given the highest average yield during the past five years. It is, however, of poor quality for bread and probably also for macaroni and should not be grown for any but feeding purposes.

WINTER WHEAT.

The plots of winter wheat were sown on August 31, 1907, the seed being used at the rate of about 1¾ bushels to the acre. The soil was a rather light loam.

The young plants made good growth in the autumn, but some of the plots suffered rather severely during the winter and early spring. A good yield was obtained, however, from most of the varieties.

The yield per acre is expressed in pounds and also in 'bushels' of 60 pounds.

WINTER WHEAT—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a Scale of 10 points.	Average Length of Head.	Yield per Acre.	Yield per Acre.		Weight per measured bushel after clearing.	Rusted.
				Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.	
1	American Banner.	July 19.	323	52	10	3¼	3,480	58	..	61	Slightly.
2	Dawson's Golden Chaff	" 19.	323	53	10	2½	3,450	57	30	60	"
3	Jones' Winter Fife....	" 18.	322	54	10	3	3,420	57	..	62	"
4	Gold Coin............	" 20.	324	52	10	2½	3,270	54	30	61	"
5	Early Windsor........	" 19.	323	50	9	2¼	3,270	54	30	61	"
6	Egyptian Amber......	" 18.	322	53	10	2¾	3,090	51	30	62¾	"
7	Early Red Clawson. ..	" 19.	323	53	10	3	3,000	50	..	60	"
8	Abundance....	" 19.	323	50	10	2½	3,000	50	..	61	"
9	Imperial Amber	" 20.	324	54	10	3	2,850	47	30	62½	"
10	Invincible....	" 20.	324	52	10	3¾	2,670	44	30	61½	"
11	Red Chief...........	" 23.	327	54	10	3¼	2,670	44	30	61	Considerably.
12	Prosperity...	" 22.	326	52	10	3½	2,640	44	..	61	"
13	Reliable.......	" 23.	327	54	9	3½	2,520	42	..	63	"
14	Red Velvet Chaff.....	" 21.	325	53	10	3¾	2,490	41	30	61½	"
15	Silver Sheaf.........	" 22.	326	54	8	3¼	2,460	41	..	61¼	"
16	Tasmania Red........	" 23.	327	52	8	3	2,100	35	..	62½	Badly.
17	Kharkov.	" 22.	326	41	8	2¼	2,100	35	..	62¾	Considerably.
18	Turkey Red No. 380 ..	" 24.	328	46	10	3	1,740	29	..	61½	Slightly.

Recommended Varieties of Winter Wheat.—The climate of Ottawa being rather too severe for the regular production of good crops of winter wheat, the average yields obtained here would scarcely serve as a satisfactory guide for farmers in southern Ontario. Some recommendations in regard to varieties of winter wheat may, however, be given.

One of the best varieties in the field is Dawson's Golden Chaff (beardless). It has the disadvantage, however, of giving flour which is low in baking strength and therefore suitable for crackers, cakes, &c., but not for light bread. The gluten content of this variety is not high enough to make it quite satisfactory for the production of rolled wheat and other similar cereal products, though it is used for these purposes.

Turkey Red (bearded) yields the strongest flour, but does not as a rule give in Ontario as large a yield of grain per acre as some of the other sorts.

Egyptian Amber (bearded) and Tasmania Red (bearded) give good yields of grain and produce very good flour for bread making.

Imperial Amber (bearded) is another variety which can also be recommended both for its high yield and the very fair strength of its flour.

EMMER AND SPELT.

The plots of Emmer and Spelt were sown on May 6, the seed being used at the rate of about 120 lbs. (or four bushels by measure) to the acre. The soil was a rather stiff loam which became quite hard during the very dry weather. The yield of all the varieties was therefore very poor.

Common Emmer (often incorrectly called 'Speltz') is one of the best varieties, being less coarse and containing a larger proportion of kernel than most of the other sorts.

EMMER AND SPELT—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average length of straw including head.	Strength of straw on a scale of 10 points.	Average length of head.	Yield per Acre.	Weight per measured bush. after cleaning.	Rusted.
				Inches.		Inches.	Lbs.	Lbs.	
1	Double Emmer	Aug. 2	88	30	10	1¾	990	30¾	Considerably.
2	Common Emmer	" 2	88	28	10	1½	810	36	"
3	Smooth Spelt	" 20	106	24	10	4⅓	750	27	Badly.
4	Red Spelt	" 20	106	26	10	4¼	720	26½	"
5	Red Emmer	" 19	105	28	10	3	630	32½	"
6	Thick Emmer	" 21	107	26	10	2⅓	570	27	"
7	White Spelt	" 20	106	24	10	4⅓	390	25	"
8	White Emmer	" 26	112	30	10	3½	360	27	"
9	9 J 3	" 6	92	26	10	3	360	34	Considerably.
10	9 K 2	" 7	93	20	10	2	180	29½	"

OATS.

Owing to the wet weather the plots of oats could not be sown until May 15 and 16—much later than the usual time. The seed was used at the rate of about 2 bushels per acre for most varieties, but in greater quantities whenever the oats were of unusually large size. The soil was a rich loam.

Considering the unfavourable character of the season, a fair crop was obtained from most of the varieties. Slight variations in the character of the soil made, however, unusually large variations in the returns.

Abundance and Joanette were so unfortunately situated that the yields obtained from them were altogether misleading and are therefore omitted from the following table.

The yield per acre is expressed in pounds and also in 'bushels' of 34 pounds.

* Varieties and selected strains produced at the Central Experimental Farm are marked with an asterisk.

OATS—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield per Acre.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
				Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.	
1	Danish Island	Aug. 6.	83	39	10	7	3210	94	14	35	Badly.
2	Dinauer	" 10.	87	38	10	7	3090	90	30	33	"
3	Golden Beauty	" 10.	87	38	10	6¾	3090	90	30	33	"
4	Welcome	" 6.	82	44	10	7	3090	90	30	35½	"
5	Virginia White	" 6.	82	44	10	7	3030	89	4	35½	"
6	White Giant Selected*	" 8.	84	40	10	8	3030	89	4	32½	"
7	Twentieth Century....	" 6.	82	40	10	6½	3000	88	8	35½	"
8	Swedish Select	" 6.	83	38	10	5¾	2970	87	12	36½	"
9	Garton's Abundance ..	" 8.	85	40	10	7	2910	85	20	36	"
10	Pioneer (black)	" 5.	82	38	10	7½	2850	83	28	35½	"
11	Swedish Ligowo	" 5.	82	40	10	5¾	2820	82	32	35½	"
12	Improved American...	" 6.	83	34	10	6¾	2730	80	10	32½	"
13	Siberian	" 8.	85	36	10	6½	2730	80	10	34½	"
14	Thousand Dollar	" 6.	82	36	10	6	2700	79	14	35½	"
15	Daubeney Selected*...	July 29.	75	38	10	6½	2610	76	26	33	Considerably.
16	Fichtel Mountain	Aug. 10.	87	40	5	6	2580	75	30	33	Badly.
17	Whiting	" 6	82	34	10	7	2580	75	30	34	"
18	Early Ripe	July 30.	76	38	10	6½	2550	75	..	28½	"
19	Gold Rain	Aug. 5.	82	34	10	6	2520	74	4	37¼	"
20	Goldfinder	" 14.	91	45	10	7	2490	73	8	32½	"
21	Green Russian	" 6.	83	35	10	7½	2490	73	8	31½	"
22	Excelsior (black)	" 10.	87	42	8	7	2460	72	12	36	"
23	Improved Ligowo	" 5.	82	36	10	6	2430	71	16	34	Considerably.
24	Wide Awake	" 6.	82	35	10	6½	2430	71	16	35¼	Badly.
25	Tlola (black)	July 30.	75	41	10	7¼	2310	67	32	31½	"
26	White Wonder	" 31.	76	42	10	7¾	2280	67	2	40½	Considerably.
27	Irish Victor	Aug. 5.	82	36	10	7½	2190	64	14	31½	"
28	Mennonite	" 3.	80	30	10	7	2160	63	18	32¼	Badly.
29	Milford White*	" 5.	82	36	10	8	2130	62	22	35	"
30	Black Mesdag	July 29.	75	35	10	6¾	2070	60	30	32½	Considerably.
31	Banner B*	Aug. 6.	83	34	10	7½	2040	60	..	32	Badly.
32	Tartar King	" 5.	81	35	10	6½	2040	60	..	35	"
33	Bergs (black)	" 3.	80	33	10	6	1980	58	8	36½	"
34	Sixty Day	July 24.	70	30	10	6	1920	56	16	29½	Considerably.
35	Storm King	Aug. 5.	82	33	10	7	1890	55	20	37	Badly.
36	Golden Giant	" 17.	94	44	8	9	1830	53	28	31	"
37	Lincoln	" 6.	83	29	10	6½	1830	53	28	32	"
38	Colossal	" 8.	85	38	10	7	1710	50	10	35	"
39	Kirsche	" 6.	83	29	10	6¼	1530	45	..	32	"
40	Bell (black)	" 12.	89	38	10	6½	1440	42	12	31	"
41	Atlantic	" 3.	80	28	10	6	1410	41	16	33¾	Considerably.
42	Kendal White*	" 8.	85	29	10	6½	1260	37	2	35	Badly.
43	American Triumph ...	" 6.	83	27	10	5½	1080	31	26	33	"
44	Chinese Naked	" 8.	85	28	10	6	870	25	20	53	"

Most Productive Varieties of Oats.—Among the most productive kinds of oats which have been grown for several years at this farm the following varieties deserve special mention: Twentieth Century, White Giant, Garton's Abundance, Thousand Dollar and Banner among the white varieties. One or more of these kinds can be obtained from any good seedsman. Golden Beauty and Mennonite are very productive yellow oats, but do not seem to possess any points of superiority over the best white varieties. Among the black oats Excelsior and Pioneer, comparatively new varieties, have given large yields, but not so large as the most productive white sorts.

Earliest Varieties of Oats.—The varieties called Sixty Day and Early Ripe are extremely early in ripening, but cannot be recommended to take the place of the later, standard sorts. Selections from these two varieties are now being propagated in order to obtain types of fixed character. These may be useful in certain special cases.

Somewhat less early, but probably more satisfactory as a rule, are Daubeney and Tartar King. These oats are obtainable in commerce, but farmers will usually find some of the later and more productive varieties to be on the whole more profitable.

SIX-ROW BARLEY.

The plots were sown on May 7, the seed being used at the rate of about two bushels to the acre. The soil was a rather heavy loam.

The yield per acre is expressed in pounds and also in 'bushels' of 48 pounds.

* Varieties and selected strains produced at the Central Experimental Farm are marked with an asterisk.

SIX-ROW BARLEY—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	Number of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a Scale of 10 points.	Average Length of Head.	Yield per Acre.	Yield per Acre.		Weight per measured bushel, after Cleaning.	Rusted.
				Inches.		Ins.	Lbs.	Bush.	Lbs.	Lbs.	
1	Stella*	July 29.	83	35	10	3¾	2730	56	42	47	Slightly.
2	Manchurian A*	" 27.	81	30	10	3	2580	53	36	46¼	"
3	Odessa	" 27.	81	32	10	3½	2370	49	18	47	"
4	Trooper*	" 29.	83	32	10	3¼	2370	49	18	45	"
5	Oberbruch	" 29.	83	28	10	3¼	2340	48	36	47	"
6	Mandscheuri	" 27.	81	30	10	3	2220	46	12	46	"
7	Nugent*	" 27.	81	28	10	2¾	2220	46	12	46½	"
8	Claude*	" 25.	79	27	10	3¼	2160	45	..	45½	"
9	Champion (beardless)	" 23.	77	28	10	2½	2130	44	18	40	Considerably.
10	Escourgeon	" 25.	79	27	10	2¾	2130	44	18	48¼	Slightly.
11	Mensury	" 27.	81	30	10	3	2130	44	18	47	"
12	Small Blue Naked	" 31.	85	24	10	3	2040	42	24	57½	Considerably.
13	Yale*	" 31.	85	34	10	2½	1980	41	12	47	"
14	Empire*	" 27.	81	25	10	2½	1800	37	24	47	Slightly.
15	Mansfield*	" 29.	83	28	10	2¾	1800	37	24	47¼	"
16	Black Japan	" 25.	79	20	10	2	1710	35	30	47	Considerably.
17	Blue Long Head	Aug. 2.	87	26	10	3½	1560	32	24	40½	Badly.
18	Albert*	" 1.	86	24	10	3½	1440	30	..	45	Slightly.
19	Bere	July 31.	85	24	10	3½	1140	23	36	44	Considerably.
20	Eclipse	Aug. 3.	88	25	10	2½	810	16	42	48	Badly.

Most Productive Varieties of Six-row Barley.—Among the most productive sorts which have been tested for several years at this farm are Mensury, Odessa, Nugent and Stella. Mensury and Odessa are obtainable from most seedsmen in Canada.

Earliest Varieties of Six-row Barley.—The differences in earliness among the varieties of Six-row Barley are not very striking. Among the earliest sorts are Mensury and Odessa.

Beardless Six-row Barley.—Champion is the most productive variety of beardless barley that has been grown here. It ripens early, but usually gives a poor yield and is not to be recommended. It is obtainable in commerce.

Hulless Six-row Barley.—The most productive variety of hulless six-row barley which has been tested at this farm is Hulless Black. This is a bearded sort and can be obtained in commerce. It ripens early, but has weak straw and gives a small yield.

TWO-ROW BARLEY.

The plots were sown on May 7 and 11, the seeding being, unfortunately, interrupted by rain. The seed was used at the rate of about 2 bushels to the acre. The soil was a loam of rather heavy character.

The yield per acre is expressed in pounds and also in 'bushels' of 48 pounds.

* Varieties and selected strains produced at the Central Experimental Farm are marked with an asterisk.

Two-Row Barley—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a Scale of 10 points.	Average Length of Head.	Yield per Acre.	Yield per Acre.		Weight per Measured Bushel after cleaning.	Rusted.
				Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.	
1	Caucasian Hulless.....	July 27.	81	32	10	3¾	2430	50	30	61	Slightly.
2	Hannchen...........	" 31.	81	24	10	3¼	2130	44	18	49	Considerably.
3	Clifford*............	" 31.	85	42	10	4½	2040	42	24	46¾	"
4	Black Two-row.......	Aug. 10.	95	30	10	4	1890	39	18	47	Badly.
5	Swedish Chevalier....	" 8.	89	32	10	4¼	1860	38	36	48	"
6	Old Irish............	" 1.	82	28	10	3¾	1830	38	6	48½	Considerably.
7	Princess............	" 10.	91	27	10	4	1830	38	6	48¼	Badly.
8	Archer Chevalier......	" 12.	97	30	10	3½	1770	36	42	49	"
9	Beaver*............	July 31.	85	40	10	4¼	1770	36	42	45½	Slightly.
10	Canadian Thorpe.....	Aug. 10.	95	29	10	3	1740	36	12	48	Badly.
11	Early Chevalier*......	July 25.	75	36	10	4	1710	35	30	49	Slightly.
12	Sidney*...........	Aug. 3.	84	32	10	3¼	1650	34	18	48½	Considerably.
13	Danish Chevalier.....	" 10.	91	35	10	4½	1530	31	42	46½	Badly.
14	Primus............	" 13.	94	28	10	3¼	1530	31	42	49¼	"
15	Swan's Neck.........	" 8.	89	27	10	3¼	1530	31	42	46¾	"
16	Gordon*...........	July 30.	80	27	10	3	1500	31	12	47½	Considerably.
17	Brewer's Favourite....	Aug. 10.	95	27	10	3¼	1410	29	18	47	Badly.
18	Hofbrau............	" 10.	91	25	10	4½	1410	29	18	48	"
19	Standwell...........	" 13.	94	30	10	3¾	1410	29	18	49	"
20	French Chevalier.....	" 1.	82	30	10	3½	1380	28	36	49½	Slightly.
21	Jarvis*...........	" 3.	84	32	10	4	1260	26	12	46½	Considerably.
22	Jewel*............	" 14.	95	25	10	3¼	1230	25	30	48¼	Badly.
23	Invincible..........	" 13.	94	25	10	3¼	1170	24	18	48¾	"

Most Productive Varieties of Two-row Barley.—The following varieties are among the most productive: Hannchen (a Swedish selection of the famous Hanna barley), Swan's Neck, Standwell, Clifford, Canadian Thorpe, Invincible and the different strains of Chevalier.

Earliest Varieties of Two-row Barley.—The earliest sorts among those thoroughly tested at this farm are Hannchen, Beaver and Jarvis.

Beardless and Hulless Two-row Barley.—The varieties of beardless and of hulless two-row barley which have been tested at this farm have not, as a rule, shown sufficient strength of straw to make them profitable sorts for farmers to cultivate. This past season the variety known as Caucasian Hulless did very well, but the weather was of unusual character and this barley has not yet been grown here long enough to determine its strength and yield under average conditions.

PEAS.

The plots of peas were sown on May 14, the seed being used at the rate of two or three bushels to the acre, according to the size of the pea. The soil was a rather heavy loam.

The yield per acre is expressed in pounds and also in 'bushels' of 60 pounds.
* Varieties and selected strains produced at the Central Experimental Farm are marked with an asterisk.

PEAS—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Character of Growth.	Average Length of Straw.	Average Length of Pod.	Yield per Acre.	Yield per Acre.		Weight per Measured Bushel after Cleaning.	Size of Pea.
					Inches.	In.	Lbs.	Bush.	Lbs.	Lbs.	
1	Prussian Blue.	Aug. 13.	91	Strong....	58	2½	2280	38	..	62½	Medium.
2	Arthur Selected*......	" 11.	89	"	42	2¼	2220	37	..	63½	"
3	Paragon*............	" 17.	95	"	45	2½	2190	36	30	63½	"
4	Mackay*............	" 17.	95	"	34	2¼	2010	33	30	62½	"
5	Prince*............	" 17.	95	"	36	2¼	2010	33	30	62	Large.
6	White Marrowfat.....	" 21.	99	" ...	50	2¼	2010	33	30	62¼	"
7	Canadian Beauty	" 21.	99	"	65	2¼	1770	29	30	63	"
8	Chancellor....	" 10.	88	"	45	1¾	1770	29	30	63½	Small.
9	Victoria*............	" 20.	98	"	50	2¾	1710	28	30	63½	Medium.
10	English Grey.........	" 20.	98	"	55	2½	1650	27	30	61	"
11	Agnes*...............	" 21.	99	"	45	2½	1620	27	..	62½	Large.
12	Daniel O'Rourke.....	" 17.	95	"	50	2	1620	27	..	62½	Small.
13	Picton*............	" 17.	95	"	36	2	1590	26	30	62½	Large.
14	Wisconsin Blue. . ..	" 19.	97	"	48	2¼	1590	26	30	62½	Medium.
15	Black-eye Marrowfat..	" 21.	99	"	50	2¼	1530	25	30	62	Large.
16	Early Britain.........	" 20.	98	"	55	2¼	1530	25	30	60½	Medium.
17	Zulu.....	" 19.	97	" ...	48	2½	1440	24	..	58	Large.
18	Archer*......	" 21.	99	"	50	2	1410	23	30	63¼	Medium.
19	Golden Vine.........	" 20.	98	"	38	2	1230	20	30	63½	Small.
20	Gregory*........	" 22.	100	"	45	2¼	1020	17	..	63	Medium.

Most Productive Varieties of Peas.—Prussian Blue, Chancellor, Arthur and Golden Vine can be recommended as good, productive varieties of peas. During the past five years at this farm Prussian Blue has given the largest yield. Golden Vine has not done so well as usual during the last two or three years, but it is a variety which can usually be depended upon. One or more of the varieties here mentioned can be obtained from almost any seedsman.

Earliest Varieties of Peas.—Arthur, Chancellor and Prussian Blue are among the earliest sorts.

SPRING RYE.

Two plots of spring rye were sown on May 6, the seed being used at the rate of about 1½ bushels to the acre. The soil was a rather heavy loam.

The yield per acre is expressed in pounds and also in 'bushels' of 56 pounds.

SPRING RYE—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a Scale of 10 points.	Length of Head.	Yield per Acre.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
				Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.	
1	Ottawa Select........	Aug. 1.	87	54	10	3½	1,950	34	46	56	Slightly.
2	Common..	" 1.	87	54	10	3	1,800	32	8	57	"

WINTER RYE.

Three plots of winter rye were sown on August 31, 1907, the seed being used at the rate of about 1½ bushels to the acre. The rye made good growth in the autumn, stood the winter well, and gave a large crop of grain. The soil was a light loam.

The yield per acre is expressed in pounds and also in 'bushels' of 56 pounds.

WINTER RYE—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a Scale of 10 points.	Average length of Head.	Yield per Acre.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
				Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.	
1	Dominion.	July 20.	324	64	8	4½	4,590	81	54	58½	Slightly.
2	Mammoth White	" 20.	324	64	10	4½	4,320	77	8	58	"
3	Thousandfold	" 20.	324	60	10	4½	3,360	60	..	59½	"

OATS SOWN IN DIFFERENT QUANTITIES PER ACRE ON CLAY LOAM

The tests carried on in previous years having shown that less than two bushels and more than 2½ bushels per acre of Banner oats should not be sown on clay loam in this climate, the experiments were confined this past season to 2 and 2½ bushels only. The evidence thus far is in favour of using 2½ bushels of seed.

The results of the past season are here given.

The oats were sown on May 16, and were ripe August 6.

Name of Variety.	Quantity Sown per Acre.	Number of days from Sowing to Harvesting.	Yield per Acre.	
	Bushels.		Bush.	Lbs.
Banner oats	2	82	52	2
"	2½	82	55	20

FIELD BEANS.

Four plots of field beans, one-sixtieth of an acre each, were sown on May 27. The soil was a rather heavy loam.

The yield per acre is expressed in pounds and also in 'bushels' of 60 pounds.

Number.	Variety.	Distance between Rows.	Date of Ripening.	Number of Days Maturing.	Average Length of Plant.	Average Length of Pod.	Yield per Acre.	Yield per Acre.		Weight per Measured Bushel after Cleaning.
		Inches.		Days.	Inches.	Inches.	Lbs.	Bush.	Lbs.	Lbs.
1	Marrowfat	20	Aug. 31..	96	20	3½	1,770	29	30	64
2	Norwegian Brown	16	" 15..	80	13	4½	1,590	26	30	60
3	White Field	20	" 30..	95	18	4	1,500	25	..	63½
4	California Pea	16	" 26..	91	12	3½	1,230	20	30	65

FLAX.

The plots of flax were one-sixtieth of an acre. The seed was sown on May 28, at the rate of 60 pounds to the acre. The soil was a rather heavy loam.

The yield per acre is expressed in pounds and also in 'bushels' of 56 pounds.

Some of the varieties grown in previous years have been dropped, as new, selected strains derived from them are being propagated.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Plants.	Yield per Acre.	Yield per Acre.		Weight per Measured Bushel after Cleaning.
				Inches.	Lbs.	Bush.	Lbs.	Lbs.
1	Novarossick	Aug. 20	84	18	660	11	44	54½
2	White Flowering	" 10	74	22	630	11	14	55
3	Riga	" 10	74	22	510	9	6	56
4	Yellow Seed	" 17	81	23	480	8	32	54½

FIELD ROOTS.

The advantage of late pulling for field roots having been clearly proved by the experience of several years, comparative tests, by pulling on two different dates about two weeks apart, have been discontinued. All the roots were harvested at the one time, but the harvesting was left until quite late, so as to enable the roots to make as large a growth as possible.

The yield per acre of the field roots is calculated from the weight of the crop gathered from one-hundredth of an acre.

The soil on which the field roots were grown was a heavy loam.

It is probable that in some instances varieties which are mentioned in these tables under different names are identical in all essential respects.

In Canada the ton contains 2,000 pounds.

TURNIPS.

Two sowings were made of each variety, the first on May 22, and the second on June 5. The seed was used at the rate of about 4 pounds per acre. Before sowing, the land was made up in drills 2 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 3 inches high they were thinned out, leaving them about 7 inches apart in the rows.

The roots were pulled on October 24.

TURNIPS—Test of Varieties.

Number.	Name of Variety.	Yield per acre from 1st Sowing.		Yield per acre from 2nd Sowing.	
		Tons.	Lbs.	Tons.	Lbs.
1	Perfection Swede	32	1,300	21	——
2	Hall's Westbury	30	700	28	1,200
3	Hartley's Bronze	30	200	20	400
4	Halewood's Bronze Top	28	700	19	900
5	Magnum Bonum	28	600	22	——
6	Mammoth Clyde	27	1,300	21	900
7	Jumbo	27	200	20	1,500
8	Kangaroo	27	200	17	1,600
9	Good Luck	26	1,700	21	1,100
10	Skirvings	26	600	18	100
11	Bangholm Selected	24	1,500	16	300
12	Carter's Elephant	20	1,400	15	1,600

The average yield from the first sowing was 27 tons 1,033 lbs. per acre. The average yield from the second sowing was 20 tons 467 lbs. per acre.

MANGELS.

Two sowings were made of each variety, the first on May 22, and the second on June 5. The seed was used at the rate of about 6 pounds per acre. Before sowing, the land was made up in drills 2 feet apart and rolled with a heavy land roller to make a firm seed bed. When the young plants were about 3 inches high they were thinned out, leaving them about 7 inches apart in the rows. The roots were pulled October 21.

MANGELS—Test of Varieties.

Number.	Name of Variety.	Yield per acre from 1st Sowing.		Yield per acre from 2nd Sowing.	
		Tons.	Lbs.	Tons.	Lbs.
1	Half Sugar White	29	1,700	15	1,200
2	Selected Yellow Globe	26	1,100	21	300
3	Gate Post	25	200	14	1,700
4	Giant Yellow Globe	23	1,500	13	300
5	Perfection Mammoth Long Red	23	300	12	——
6	Yellow Intermediate	22	1,700	10	1,700
7	Giant Yellow Intermediate	22	200	14	——
8	Prize Mammoth Long Red	21	1,700	11	700
9	Mammoth Red Intermediate	20	1,600	12	300
10	Crimson Champion	17	900	11	900

The average yield from the first sowing was 23 tons 690 lbs. per acre.
The average yield from the second sowing was 13 tons 1,310 lbs. per acre.

CARROTS.

Two sowings were made of each variety, the first on May 22, and the second on June 5. The seed was used at the rate of about 6 pounds per acre. Before sowing, the land was made up in drills 2 feet apart and rolled with a heavy land roller to make a firm seed bed. When the young plants were about 3 inches high they were thinned out, leaving them about 5 inches apart in the rows. The roots were pulled October 22.

CARROTS—Test of Varieties.

Number.	Name of Variety.	Yield per acre from 1st Sowing.		Yield per acre from 2nd Sowing.	
		Tons.	Lbs.	Tons.	Lbs.
1	Ontario Champion	26	1,500	16	1,400
2	Mammoth White Intermediate	26	1,400	21	1,000
3	Giant White Vosges	22	600	17	1,400
4	Improved Short White	21	1,900	21	1,800
5	Half Long Chantenay	18	1,900	18	1,500
6	White Belgian	15	1,500	15	500

The average yield from the first sowing was 22 tons 133 lbs. per acre.
The average yield from the second sowing was 18 tons 1,267 lbs. per acre.

SUGAR BEETS.

Two sowings were made of each variety, the first on May 22, and the second on June 5. The seed was used at the rate of about 6 pounds per acre. Before sowing, the land was made up in drills 2 feet apart and rolled with a heavy land roller to make a firm seed bed. When the young plants were about 3 inches high they were thinned out, leaving them about 5 inches apart in the rows. The roots were pulled on October 23

SUGAR BEETS—Test of Varieties.

Number.	Name of Variety.	Yield per acre from 1st Sowing.		Yield per acre from 2nd Sowing.	
		Tons.	Lbs.	Tons.	Lbs.
1	Vilmorin's Improved	20	1,400	8	1,100
2	French Very Rich	18	200	13	1,800
3	Wanzleben	15	800	9	700

The average yield from the first sowing was 18 tons 133 lbs. per acre.
The average yield from the second sowing was 10 tons 1,200 lbs. per acre.

INDIAN CORN.

The corn was sown with the seed drill in rows 35 inches apart, and was also sown in hills 35 inches apart each way. When the plants were about 6 inches high they were thinned out, leaving them from 6 to 8 inches apart in the rows, and leaving four or five plants in each hill. The seed was sown June 2, and the corn was cut green for ensilage September 10. The yield has been calculated from the weight of crop cut from two rows, each 66 feet long. The soil was a heavy loam.

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 serious frost.

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	Superior Fodder....	Very Strong..	130	Very leafy	Late milk...	21	900	23	750
2	Mammoth Cuban.	" ..	120	" .	No cobs....	20	920	23	1300
3	Pride of the North.........	Strong...	120	" .	Late milk...	19	720	21	1780
4	Eureka....................	Very Strong..	132	" .	" ..	19	170	22	110
5	Salzer's All Gold..........	" ..	130	" .	" ..	18	1290	23	530
6	Champion White Pearl....	Strong........	120	Leafy	" ..	18	520	19	170
7	Selected Leaming..........	"	130	Very leafy	Early milk..	18	520	19	1160
8	Wood's Northern Dent.....	"	124	" .	Doughy	17	870	28	760
9	Early Mastodon	Very Strong..	127	" .	Late milk ..	17	650	18	1400
10	White Cap Yellow Dent...	Strong........	120	" .	Early milk..	16	1110	20	1800
11	Compton's Early	Medium......	115	Leafy	Late milk...	16	450	18	1400
12	Angel of Midnight.........	"	100	" .	Cobs glazed.	15	1570	16	450
13	North Dakota White.......	Strong........	110	" .	Late milk...	15	30	17	760
14	Longfellow..	Medium......	103	" .	Cobs glazed.	13	1170	15	1020

The average yield from the rows was 17 tons 1,348 lbs. per acre.
The average yield from the hills was 20 tons 1,242 lbs. per acre.

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 2, and the corn was cut for ensilage September 10. 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.	
	Inches.		Inches.		Tons.	Lbs.
Champion White Pearl	21	Strong	100	Late milk	21	1,659
" "	28	Very strong	122	" "	20	1,595
" "	35	" "	120	" "	18	520
" "	42	" "	132	" "	20	420
Selected Leaming	21	Strong	102	Early milk	19	1,123
" "	28	Very strong	115	" "	20	1,736
" "	35	" "	130	" "	18	520
" "	42	" "	127	" "	15	1,020
Longfellow	21	Strong	102	Glazed	16	508
"	28	"	102	"	18	96
"	35	"	103	"	13	1,170
"	42	"	114	"	16	1,370

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, the remaining space is usually filled 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. This season most of the plots were from about one-half to one and one-half acres in area.

The potatoes were planted May 23 to 29, and were harvested September 28 to October 3. The soil was chiefly a rather heavy loam.

On account of the very dry weather during the summer and early autumn the yield of potatoes was small.

The yield per acre (of sound potatoes only) is expressed in pounds and also in 'bushels' of 60 pounds.

Number.	Variety.	Time of Maturing.	Colour.	Yield, per Acre.	Yield, per Acre.
				Lbs.	Bushels.
1	Money Maker	Medium	White	14,520	242
2	Twentieth Century	Mid-season to late.	"	12,240	204
3	Gold Coin	" "	"	11,700	195
4	Dooley	" "	"	10,920	182
5	Rochester Rose	Very early	Pink	9,600	160
6	Carman, No. 1	Mid-season to late.	White	8,460	141
7	Dalmeny Beauty	Medium	"	8,280	138
8	Late Puritan	Mid-season to late.	"	7,680	128
9	Ashleaf Kidney	" "	"	6,840	114
10	Irish Cobbler	Early	"	6,720	112
11	Burpee's Extra Early	Very early	"	6,180	103
12	Early White Prize	" "	"	5,760	96
13	Early Manistee	Medium	Pink	4,980	83
14	Everett	Early	"	3,900	65

REPORT OF THE POULTRY MANAGER.

A. G. GILBERT.

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

SIR,—I have much pleasure in submitting to you the twenty-first annual report of the Poultry Division of the Central Experimental Farm.

Before giving a detailed description of the work of the past year, it may be well to note certain erroneous impressions, on the part of numerous correspondents, in regard to profitable poultry-keeping. Unless refuted, these incorrect conclusions are calculated to seriously retard the development of the poultry branch of farm work.

The correspondence of the past year also shows that, to be of benefit to the greatest number of inquirers, the experiments conducted here should be, to a great extent, of a practical nature.

It is hoped that the following report, while also dealing with other subjects, will correct the wrong conclusions referred to and afford information as to the latest and best methods of poultry management.

The experimental work of the year was of its usual varied character. Some new experiments were undertaken, while others were continued from previous years. In carrying on certain experiments, such as testing the efficiency of trap-nests as a reliable means of distinguishing good from poor laying fowls, conclusions reached are unavoidably slow. Interesting experiments are noted as follows:—

1. An experiment in feeding frozen and sound wheat to different pens of fowls. Results so far are in favour of the sound wheat. Details of the experiment will be found on a following page.

2. Continuation of experiment in keeping nineteen Buff Orpington hens in an unheated house with cotton front, with the object of ascertaining the suitability of a fowl-house of this pattern for the colder winter districts of Canada.

3. Results showing the decided advantage of having chickens hatched out early in the season.

4. Continuation of experiments showing the advantage in breeding from good rather than from poor egg-laying strains of fowls.

Several tables give results of other experimental work.

I have to acknowledge the receipt of incubators sent for trial from Wm Tamlin, Twickenham, London, England; from the Peerless Manufacturing Company, of Pembroke, Ontario, and from the C. J. Daniels Manufacturing Company, of Toronto. These machines are all heated by hot water. The Cyphers Manufacturing Company, of Buffalo, New York, sent an electro-bator and electro-hover, the first for hatching chickens and the second for rearing them, by electricity, the latter being taken from the wires supplying light to the main poultry building. The use of electricity marks an important step forward in the artificial hatching and rearing of chickens. The tests were very satisfactory.

I have again the pleasure of bringing to your attention the efficient discharge by my assistant, Mr. Victor Fortier, of the many duties devolving upon him during the past year. Many useful lines of experiment have been conducted by him, including artificial and natural incubation. He has also compiled the tables relating to experimental work to be found in the following pages. He has in addition carried on a large French correspondence and has attended numerous meetings of farmers' institutes and poultry shows in the province of Quebec, also being present at the Poultry Institute held at Guelph last February.

Mr. Summers was, as usual, careful and competent in recording results from the trap-nest system, and from the hatching of chickens by hens and incubators as well as in the feeding of different experimental rations.

Mr. Deavey was faithful and energetic in the care of the poultry and poultry houses, as well as in the other duties entrusted to him.

Ill-health on the part of the writer prevented him from attending several meetings during the winter season. He had, however, the pleasure of attending and speaking at the meeting of the Farmers' and Dairymen's Association of New Brunswick, held in Fredericton, N.B., during the month of March last.

The appointment of Mr. Ronald Pelletier as stenographer and typewriter, of English and French to this Division, has given greater opportunity for the quick despatch of replies to a large and rapidly increasing correspondence.

I have the honour to be, sir,

Your obedient servant,

A. G. GILBERT,

Poultry Manager.

REPORT OF THE POULTRY MANAGER.

The rapid development that is taking place in poultry-keeping, as a profitable branch of agriculture, is well instanced by the large and increasing demand on the part of farmers and others for information. This demand has been met with all possible despatch and liberality from our Division.

The favourable opinion of the farmers of the country towards the poultry branch of their farm work, is forcibly shown by the following quotations from an official publication entitled, 'Crops and Live Stock of Ontario,' which, for many years past, has been issued annually under the auspices of the Ontario Department of Agriculture. It gives the opinions of farmer correspondents, at different points of the province, on the value of poultry-keeping. In the issue of last year the opinions of fifty-three individuals are given. Of this number fifty speak favourably of poultry-keeping. Some of these favourable comments are as follows:—

The correspondent at Harwick, Kent, Ont., says: 'Poultry are the best paying thing on the farm, but they take careful looking after.'

The correspondent at Sydenham, Grey, says: 'Poultry are selling high. In fact the economically-kept poultry farm is the best money-maker just now, the cost of equipment being taken into consideration.'

The report from Minto, Wellington, says: 'Good, well-bred poultry, if properly attended to, will give their owner a clear profit of one dollar per hen. We get $4 apiece for our Bronze turkey cockerels, and $3 for pullets, and so on.'

Many more quotations might be given, but the foregoing are sufficient to show the farmers' appreciation of poultry-keeping as a profitable branch of farm work.

SOME USEFUL LESSONS LEARNED FROM A VARIED CORRESPONDENCE.

The careful reading of this correspondence leads to the conclusion that the great majority of those who intend to begin poultry-keeping, or who ask as to its possibilities, have a very imperfect conception of how profitable poultry-keeping should be conducted. It may be beneficial to many such inquirers, as well as to those who have recently commenced poultry-keeping, to note and comment upon some of these erroneous impressions. The more common of these impressions are noted as follows:—

ERROR NO. 1 AND COMMENT THEREON.

That poultry-keeping, unlike other branches of business, can be successfully undertaken without any previous knowledge of it.

Comment thereon.—A thorough knowledge of the latest and best methods of poultry-keeping by the intending poultry keeper, particularly if he aims to be a specialist, is requisite to success. The two following letters may serve to illustrate right and wrong estimates of poultry-keeping. The first reads: 'Dear Sir,—Kindly send me all information as to the most up-to-date methods of keeping poultry. I intend to take up the business when I know something about its proper management.'

The second correspondent says: 'Dear Sir,—I have just purchased 100 Barred Plymouth Rock pullets. Please tell me how to manage them, for I know nothing about poultry-keeping.'

It is plain that the first correspondent, who appreciates the necessity of a certain amount of previous knowledge, is more likely to succeed than the second, who has purchased one hundred birds without knowing how to properly manage them.

The question of how or where a knowledge of poultry-keeping can be acquired is frequently asked. It may be gained in the following ways:—

A. By beginning with a few birds, of an approved type, and learning slowly but surely from experience, aided by the practical instruction supplied by the Poultry Division of the Experimental Farms' System and by the agricultural press.

B. By attending a course of poultry-keeping at one of the agricultural colleges.

C. By serving an apprenticeship at a paying poultry plant.

The farmer beginning poultry-keeping has a decided advantage over others, for he has been more or less accustomed to poultry on the farm from his earliest years, and probably has a certain knowledge of their management. He should find both A and B easy and congenial methods. To judge from letters received from such, what they most need is to learn the great difference there is—from an economic standpoint—between the pure-bred bird and the nondescript, with latest and best methods of poultry housing and management. These details have been described in reports of this division for some years past, and are taken up to a certain extent in the following pages. Too many farmers think that good results may be obtained from any kind of fowl, with little or no care. Specialists, however, fully realize the necessity of having pure-bred stock and of caring for them in the best possible way. But who are the specialists, and wherein do they differ from the farmer?

As a rule specialists reside near enough to the city to have ready access to the best paying customers there. Specialists are to be found in all classes of the community; some are clerks, others mechanics and not a few storekeepers. All are expert in obtaining eggs in winter and many in rearing chickens of the most approved market types. In winter they sell their eggs and in the summer or the fall a superior quality of poultry, at the highest prices, because their eggs are strictly new-laid and their poultry carefully killed and plucked, thus presenting an inviting appearance. Many specialists take prizes at different fall and winter shows throughout the Dominion for the best-dressed specimens of poultry. In many instances they buy birds from farmers, fatten them for a short time and win prizes with them. It will at once be evident that the specialist, as described, enters into lively competition with the farmer, who, in too many cases, instead of following the example of his rival, sells his eggs or chickens for a price frequently much below that paid to the former. A well-known specialist, who resides near the city limits, informed the writer that during the past two winters he had had no difficulty in obtaining 60 cents per dozen for new-laid eggs during the short period when very high prices prevailed. 'In fact,' he said, 'many people came to me and were glad to get the eggs at that high price, because they knew they could be relied on as being strictly new-laid.' In too many cases the farmer saves up his eggs until he has enough to make it worth while to take them to market. This practice prevents his receiving the highest price. By the time enough are saved most of the eggs are stale. Storekeepers and private purchasers suspect such to be the case and value them accordingly.

On several occasions during the past winter of 1908-9, 50 cents per dozen was paid on the markets of this city for strictly new-laid eggs. In the case of poultry, the most carefully killed, plucked and dressed birds were in the best demand. Some one may say that it is not easy for the purchaser to distinguish new-laid from stale eggs. But the market buyer of to-day is much more expert in detecting the difference between the stale and the fresh, than was the buyer of past years when new-laid eggs in winter were comparatively unknown and a superior quality of poultry a scarce article.

The advantage in cost of production is with the farmer.—But the farmer has a distinct advantage over the specialist, for he has his grain, straw and roots at cost. All these the specialist has to buy. In addition, farmers situated near cities have exceptional advantages, as they are not only in a position to obtain the same high values as the specialist by producing an equally good article, but should make a larger margin of profit.

Recapitulation.—Farmers should be keenly alive to the following points, viz.:—

1. That pure-bred fowls, of the utility varieties, are better for their purposes than nondescripts.
2. That these fowls require proper housing and management.
3. That farmers near good markets have exceptional opportunities to obtain the highest prices for strictly new-laid eggs and the superior quality of poultry.
4. That farmers are able to enter into favourable competition with any rivals.
5. That whether near a city market or not, the new-laid eggs should be sold as quickly as possible. Special effort should be made to do this in winter or in summer.
6. That clean-looking and neatly put-up new-laid eggs and well-dressed poultry, of good quality, will sell better than any other kind.

SECOND ERRONEOUS IMPRESSION, AND COMMENT THEREON.

The second erroneous impression on the part of many poultry keepers is, that having secured a prolific egg-laying strain of fowl, no effort is necessary to perpetuate the excellence of that strain.

Comment.—Experience has clearly shown that continued careful and skilled breeding is necessary to retain or develop prolific egg-laying characteristics. The term prolific is not used as referring to those phenomenal egg-layers with records of 200 to 210 eggs per year each—rare specimens of which are sometimes exploited—but to refer to hens, from which, by selection, we may obtain an average of from 100 to 120 eggs each per year. It may be claimed that many fowls, under ordinary conditions, lay that number of eggs. But the experience gained in many years, by breeding from layers selected by trap-nest tests, does not verify that assertion. There is reason to believe that, in numerous cases, the number of eggs laid by a specially good hen or two in a pen, have been noted and the laying qualities of the remainder have been rated as of the same exceptional merit.

The remark may be frequently heard, from an enthusiastic but inexperienced poultryman, 'I have a hen which I believe lays an egg every day.' But what about the merits of the other fowls in the same pen? The impression conveyed is that all the other inmates of the pen are equally extraordinary layers. The trap-nest, with its mechanically correct record, is the surest means of proving which are the best, the worst and the indifferent layers. Only fowls of one of the varieties which have been shown to be good layers of large eggs, as well as of correct market type, should be selected, and these should be carefully mated before being placed in the breeding pen. It is of paramount importance that the male bird, mated with the selected layers, should also come from a family of proved prolific layers, as otherwise there might be retrograde rather than progressive influence. Careless or haphazard mating of old, young or untried birds is not likely to result in success.

In establishing a strain of prolific layers of large eggs—in combination with good market type—the following breeds may be suggested, viz.:—

For eggs and flesh.—Select one of the best utility types, such as Barred Plymouth Rocks, White Wyandottes or Buff Orpingtons.

For eggs only.—A choice may be made of any of the following: White Leghorns, Black Minorcas, Andalusians or Black Hamburgs.

A rule important to observers is that none but the best layers of the varieties named, should be chosen. Where it is possible to make a selection by trap nests, such fowls should be preferred.

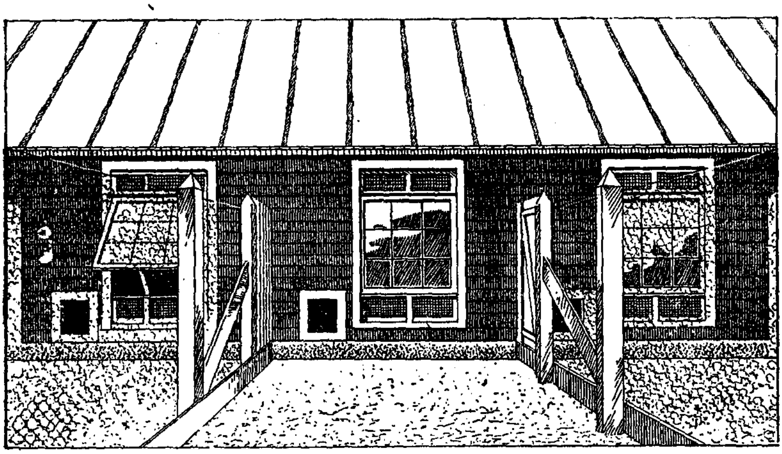
Careful selection of cock bird necessary.—Too much care cannot be taken in selecting a cock-bird to head the breeding pen. The mistake is frequently made of purchasing a cock-bird derived from a family of inferior layers to mate with hens of proved merit. Such action is surely detrimental.

Hens rather than pullets.—Unless absolutely unavoidable, pullets should not be used to breed from. They are really undeveloped fowls, and no such immature specimen should be found in a breeding pen.

ERRONEOUS IMPRESSION NO. 3, AND COMMENT THEREON.

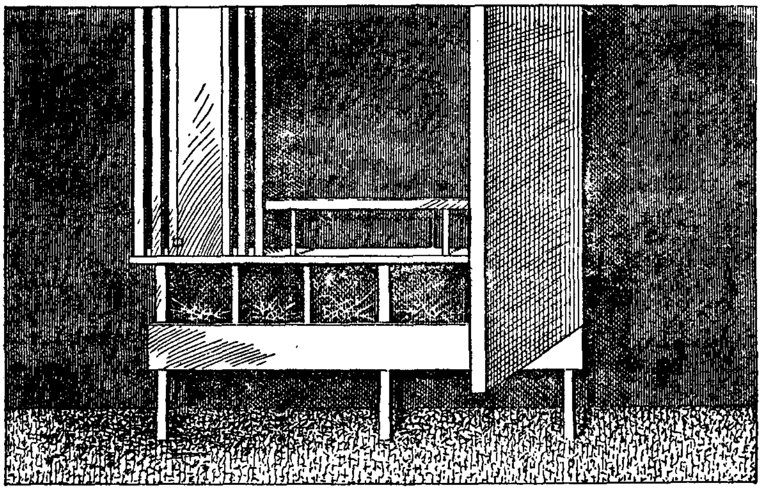
A third erroneous impression—especially common among the farming community—is that any sort of building is good enough for the housing of poultry.

Comment thereon.—As a result of this impression poultry-houses dilapidated, lice-infested, ill-ventilated, unclean and improperly furnished are sometimes met with. It is hardly necessary to remark that in such cases the birds are unprofitable. Poultry-houses are now made which are easy and cheap of construction, while of the most approved patterns. Plans of different styles of poultry-houses have been published from time to time in previous reports of this Division. Perhaps the most inquired for is the house with cotton front, as shown by frontispiece illustration in report of last year and the house with cotton above and below the window. Both houses face south. The interior fittings of both are very much the same. A circular showing diagrams of the first named pattern of house with directions as to construction is in course of preparation. When issued it will prove a useful guide to those who contemplate the erection of a structure on this plan. The second style of house is also much inquired about. The following illustration shows the cotton frames above and below the windows of one of the houses of the Pembroke, Ont., Poultry Plant, where it has been severely tested for four years with satisfactory results.



This illustration shows the cotton panels above and below the windows, at the plant of the Poultry Yards of Canada, Pembroke, Ont.

The following illustration shows the interior arrangement of one of the compartments an outside view of which is given above.



Showing cotton frame in front of roosting place, held partly open; also showing roosts, dropping board and nests.

The inside plans of both patterns of house are very similar, the greatest difference being in the arrangement of the cotton, used as a means of securing ventilation by diffusion of air, rather than by draught. In the first style of house the whole front is cotton; in the second the cotton is placed above and below the windows.

FOURTH WRONG IMPRESSION, AND COMMENT THEREON.

That little or no change in the composition of rations is necessary during the winter season.

Comment.—This is, unfortunately, a very common error among poultry keepers. In previous reports of this Division the necessity of variety in rations, and of moderate exercise, especially during the winter period of close confinement, has been forcibly pointed out. Experience has emphasized the need of these for the following reasons:—

1. As a means of keeping the birds in good health.
2. As an incentive to egg production.
3. As a preventive of feather-picking and egg-eating.
4. As likely to strengthen the germs of early spring eggs used for hatching purposes.

Fowls confined to limited quarters and fed with unvarying monotony during the winter season on one or two kinds of grain only, are frequently attacked with inflammation of the intestines. Perhaps there is no ailment more frequently described and a remedy asked for by correspondents during the winter and early spring months. A brief description of the symptoms of this ailment may be useful. The affected fowl, apparently in good health a short time before, is noticed lying on its side, unable to use its legs, which are stretched out. There is spasmodic flapping of the wings. The bird has an anxious and distressed appearance. It has high fever and, frequently, diarrhoea. From this disease, many recover. An effective remedy is a change of food and locality. The diet of all the remaining fowls should also be at once changed.

We are frequently advised to take our cue from natural conditions in the winter-housing and feeding of our birds. It would doubtless be well for both the poultry and the poultry keeper if this good advice were more extensively practised. A hen running at large during the summer season supplies herself with a variety of food. She supplies herself with all that is requisite to make the egg, egg-shell, to grind up the food in her gizzard and to keep herself in robust health. In picking up this variety of diet, she has to make some effort, which means exercise. She keeps her body almost free from lice by vigorously dusting in dry and fine earth, preferably road dust. She exhibits a decided preference for roosting in the branches of trees, where she can have plenty of fresh air, rather than going into a stuffy poultry house. And we should learn our lesson from the foregoing, as to the proper feeding, treatment and housing of our birds. It is evident that the nearer we come to the natural, in the treatment of our fowls, the greater will be our success. The following information is given in response to numerous inquiries for the same:—

A PROPER RATION FOR USE DURING WINTER.

A frequent request received is for a suitable ration for use during the winter season. The following will be found to give satisfactory results, whether given by the hopper or by other methods—:

Morning.—Wheat, or at times buckwheat, in quantities of 8 to 10 pounds to 100 hens. Scatter in the litter on the floor of poultry-house or scratch-shed.

Noon.—Steamed lawn clippings or clover hay three or four times per week. If thought necessary, give 5 pounds of oats to 100 hens. Scatter in litter on floor of the pen or house.

Afternoon.—Mash composed of such ground grains as are in most abundance. Mix these with hot water and feed when cool, in quantities of 3 or 4 ounces to each hen. The following ground grains have been found to be effective when mixed into mash, with one part of meat meal:

Shorts	2 parts.
Ground oats	1 "
Cornmeal	1 "

The above ground grains mixed in the proportions specified, will be found suitable for feeding by the hopper method also. A full description of this method was given in the report of 1906. The usual practice is to intimately mix the ground grains and to put them into one compartment of a hopper, usually divided into three parts. The second division of the hopper is frequently filled with ground oyster shells and grit, and the third with beef scrap, a coarser form of the meat-meal used in the wet mash.

The following whole-grain ration has been found an effective egg-producer during the past two winters, viz.: One-third wheat, one-third buckwheat, one-third oats. The grains were fed in conjunction with roots, cut bone and grit—at the rate of 3 to 5 pounds per day to 24 hens.

PROPER FOOD AND TREATMENT FOR YOUNG CHICKENS.

As pointed out in many previous reports, the farmer who hatches out his chickens during the first week in May will get the best results in steady growth and early maturity of the chicks. The following method of feeding will be found suitable for hen or incubator-hatched chickens:—

For the first thirty-six hours after hatching, little or no food should be given. The chicks require careful brooding more than anything else. Much depends upon their vitality. Some may be the better of a little food; if so, a few stale bread crumbs may be given.

Second and third days.—Stale bread soaked in skimmed milk and squeezed dry, or one part of finely-chopped hard-boiled egg and three parts of stale bread crumbs. Feed no more than the chickens will eat up without waste. If the chicks are hearty, feed every two or three hours. Continue this for a day or two, and then add granulated oatmeal. Continue the stale bread soaked in milk and granulated oatmeal for ten days, when finely-crushed corn may be added to the foregoing with advantage. After fourteen days give whole wheat, in small quantity at first.

As the chicks grow older, they should be given a mash composed of stale bread, shorts, oatmeal, ground meat, &c. Finely-cut bone or meat will be found a great incentive to growth at this stage.

On the chickens becoming eight weeks of age, their feeds may be reduced to three times per day. Care should be taken that they are generously fed the last time for the day. For drink give them skimmed milk and water. When the hen-hatched chickens are fully feathered, their mothers should be removed from them. The chickens will be found to return to their coops as usual, where they may be allowed to remain until removed to more commodious quarters in colony houses. On the incubator-hatched chickens becoming too large for the brooders they should be removed to colony houses.

MOULTING OF THE HENS IN SUMMER.

How the hens may be made to moult during the summer months is a question that is frequently asked, particularly at the beginning of the summer season. The following treatment has been successful here for several years. During the early part of July—after the breeding season is over—the fowls were placed on half the usual rations for 15 or 20 days. The effect of this treatment was the stoppage of egg production and the loosening of the old feathers. At the end of 15 or 20 days, the full rations were resumed. A little linseed meal may then be added to the mash with benefit. Before the beginning of operations to bring on the moult, the cock-birds were removed from the breeding pens and placed in compartments by themselves. The hens were then allowed to run in small fields where they could find insects, clover, grass, &c. In the feeding of the fowls during moult, care should be observed that they do not become too fat. The fowls are more apt to become over-fat from too generous feeding during the moult than after they have recommenced laying.

EXPERIMENTAL WORK OF THE YEAR.

The close of the fiscal year ending March 31, 1908, found different pens of fowls selected and mated for breeding purposes, as follows:—

	Male.	Females.
No. 1 house, pen 1—White Plymouth Rocks	1	16
" " 2—Buff Orpingtons	1	14
" " 3—White Leghorns	1	16
" " 4—White Leghorns	1	16
" " 5—Black Minorcas	1	12
" " 6—White Orpingtons	1	12
" " 7—Faverolles	1	12

House No. 2 contained spare cockerels for breeding purposes, also a pen of Black Hamburg hens and three pens of White Leghorns.

	Male.	Females.
House No. 3, pen 20—Light Brahmas	1	4
" " 24—Mixed	1	11
" " 25—White Leghorns	1	7
" " 26—White Plymouth Rocks	1	10
" " 27—S. G. Dorkings	1	11

Cotton front house No. 32, without scratch-shed and unheated.—Contained 1 cockerel; 7 pullets and 13 hens, Buff Orpingtons.

No. 1 Double house with scratch-shed, unheated.—Containing pens 33 and 34. In pen 33, were 1 cockerel and 24 hens, Barred Plymouth Rocks. In pen 34, were 1 cock and 22 hens, White Wyandottes.

No. 2 Double house, unheated.—Containing pens 35 and 36, with scratch-shed of cotton. Pen 35 held 1 cockerel and 20 pullets, Barred Plymouth Rocks. Pen 36 contained White Wyandottes: 1 cockerel and 17 pullets. For full description of this house, see Bulletin No. 54, figure 44.

Many of these birds had laid well during the previous winter, and continued to do so, while others commenced only on the approach of spring weather. The records, which in all cases were secured by the use of trap-nests, are published in the tables following.

EGGS SOLD FOR HATCHING PURPOSES.

As usual, in the spring there was a greater demand for eggs for hatching purposes than could be supplied. The eggs, which were sold at one dollar per setting, were carefully packed in small boxes designed for safe carriage. The purchaser paid express charges. In most cases the eggs arrived in good order. One hundred and eighty-four settings of eggs were sold during the season.

HATCHING OF CHICKENS BY NATURAL AND BY ARTIFICIAL MEANS.

As in previous years, chickens were hatched by both natural and artificial means. The results corroborated those of many previous years, and showed that when the germs of the eggs are weak neither hens nor incubators will satisfactorily hatch them out. It has been said by unthinking enthusiasts, in favour of natural means, that a hen will hatch out a weak germ that an incubator will not. Experience gained by the writer, in many years of careful investigation, leads to the conclusion that one of the greatest drawbacks to successful poultry-keeping is breeding from constitutionally unsound parent stock. If the incubator does nothing else than kill weak germs, it is indispensable to the best interests of up-to-date poultry-keeping.

IMMATURE SPECIMENS SHOULD NOT BE BRED FROM.

There is reason to conclude that injurious, rather than beneficial, results follow the too common practice of breeding from pullets, and that still more hurt is done when young cockerels are mated with them. Pullets and cockerels are immature specimens, and as such should not be placed in a breeding pen. Those who desire the best and earliest layers and the meatiest cockerels for early market, should breed only from well-matured and vigorous specimens.

WEAK OFFSPRING THE RESULT OF WEAK BREEDING STOCK.

It is safe to express the opinion that, if more attention were given by poultry keepers throughout the country to the proper housing and feeding of their poultry during the winter season, following this in spring by the mating of none but robust and well-matured birds, there would be fewer cases of so-called White, or other kind of Diarrhoea. The experience of each year emphasizes the opinion, so freely expressed on previous occasions, that if the farmers would allow their fowls a run outside in spring before commencing to save their eggs for hatching purposes, better results would follow. Chickens hatched during the first week of May are certainly the best for farmers.

The following tables give the results of hatching by natural and artificial methods during the spring and early summer of last year:—

TABLE No. 1.—Number of Chickens Hatched by Hens.

Date Eggs were Set.	Description of Eggs.	No. of Eggs. Set.	Broken by hens.	Clear.	With dead germ.	Chickens. Dead in shell.	Hatched.	Percentage hatched of total eggs set.	Remarks.
1908.								p. c.	
April 17....	B. P. Rocks and White Wyandottes..	43	6	14	2	9	12	28	Eggs were laid by hens kept in unheated and in warmed houses.
" 23....	B. P. Rocks, White Leghorns and White Wyandottes..........	73	1	9	6	18	39	53½	
" 25....	Black Minorcas, Buff Orpingtons, Faverolles, Light Brahmas, White Wyandottes..........................	69	4	6	2	13	44	63¾	
May 2....	Black Minorcas, Black Hamburgs, Faverolles and S. G. Dorkings.....	60	0	9	7	11	33	55	

TABLE No. 2.—Number of Chickens Hatched by Incubator.

Date Eggs were placed in Incubator.	Description of Eggs.	No. of Eggs. Set.	Clear.	With dead germs	Chickens. Dead in shell.	Hatched.	Percentage hatched of total eggs set.	Remarks.
1908.							p.c.	
April 22....	Barred and White Plymouth Rocks, White Wyandottes, Buff Orpingtons and White Leghorns..........	215	48	38	36	93	43¼	Eggs were laid by hens kept in unheated and in warmed houses.
" 23....	Barred and White Plymouth Rocks, White Wyandottes, White Leghorns, S. G. Dorkings............	177	46	15	11	105	59¾	
" 30....	Barred and White Plymouth Rocks, White Leghorns, White Wyandottes, S. C. Dorkings...	153	32	24	34	63	41¼	

GROWTH OF THE CHICKENS.

The naturally-hatched chickens were placed with their mother hens, in coops outside; if hatched in an incubator, they were put into brooders. With food and treatment as outlined in a preceding page, they made satisfactory progress. It was a noticeable feature that there was only one case of White Diarrhoea among the incubator-hatched chickens. Previous to use, the incubators and brooders were sprayed with a well-known disinfectant. Care had also been taken, after the chickens came out of the shells, to prevent them falling from the tray of the incubator to the nursery below, where the temperature was several degrees lower, as there was reason to suspect that this gave them a chill, which past observations point to as a predisposing cause of White Diarrhoea. Precautions against chill were continued after the chickens were placed in the brooders.

Further close observation is being made and interesting results are expected.

DEMAND FOR SPARE STOCK.

Towards the fall, the chickens were well matured and the spare birds were sold for breeding purposes. The birds sold numbered 66 males and 69 females of different varieties.

WHEN THE PULLETS COMMENCED TO LAY.

The first pullets to begin to lay were all hatched during the first week in May. They laid their first eggs as follows:—

Buff Orpington pullet, first egg on October 28, 1908.
Barred Plymouth Rock pullet, first egg on November 26, 1908.
White Leghorn pullet, first egg on November 27, 1908.
White Wyandotte pullet, first egg on December 7, 1908.
White Orpington pullet, first egg on December 17, 1908.

NUMBER OF EGGS LAID DURING YEAR.

The following is a list of the number of eggs laid during the different months of the year:—

1908—	
April	2,837
May	2,433
June	1,015
July	1,690
August	1,084
September	801
October	179
November	48
December	620
1909—	
January	1,122
February	1,463
March	2,119
	15,411

EXPERIMENTS IN FEEDING FROZEN WHEAT (WHOLE AND GROUND) TO POULTRY.

With the view of ascertaining the value of frozen as compared with sound wheat, when fed to poultry, the following experiment was conducted from February 20 to

October 31 of last year. Two varieties of fowls, namely, White Plymouth Rock pullets and White Orpingtons, were selected, 22 of the former being taken, and 10 hens and 4 pullets of the latter. The White Plymouth Rocks were again divided into two groups of 11 each and the White Orpingtons were also divided into two groups of 5 hens and 2 pullets each, one group of each variety receiving frozen and the other sound wheat. The different groups were kept in separate pens. The frozen wheat was fed both whole and ground fine. When given whole, it was scattered in the litter on the floor of the poultry-house; when ground, it was made a part of their mash. Experience had shown, that when fed alone, the frozen wheat sometimes caused looseness of bowels, therefore the frozen grain, when whole, was mixed with oats. The mixture of whole grains then stood, half frozen wheat and half sound oats, with the ground frozen wheat mixed with cornmeal and ground oats. Details of the experiment will be found in the following tables, which show the number of eggs laid by the different groups per month; average number of eggs laid per fowl during the experiment, and the gain or loss in weight by the different groups, the whole making an interesting and instructive experiment. The four tables of results are as follows:—

TABLE 3.—Showing Results from Feeding Frozen Wheat, Whole and Ground, to 11 White Plymouth Rock Pullets, from February 20 to October 31, 19 8.

Year.	Months.									Total of eggs laid.	Weight of Birds at dates named.	Remarks.
1908.	February.	March.	April.	May.	June.	July.	August.	September.	October.		February 20..74½ lbs March 6......73½ " " 20......71 " April 6. .....70 " October 30. ..51 "	Two pullets died during the experiment in month of May. An average of 42½ eggs per pullet.
Number of eggs laid..	16	59	147	113	34	52	39	9	....	469		

This table should be compared with No. 4, showing results from birds fed on sound grain only.

RATIONS FED TO ABOVE GROUP OF FOWLS.

Whole grain; one-half frozen wheat, one-half oats, mixed. Fed morning and evening thrown in litter on the floor of the house.

Wet mash, every third day at noon.

Cut bone, every third day at noon.

Beets, every third day at noon.

Grit, broken oyster shells, and roots in regular supply.

The composition of the wet mash was as follows:—

Ground frozen wheat..............................	1 part.
" oats..............................	1 "
" barley..............................	1 "
" Corn..............................	1 "

Beef scraps took the place of cut green bone from April 24.

The birds were given, at each time of feeding, all the food they could eat.

TABLE 4 (Continuation of Frozen Wheat experiment).—This table shows the results from 11 White Plymouth Rock pullets fed on sound grain only. This table should be compared with No. 3.

TABLE 4.—Results from 11 White Plymouth Rock Pullets fed on Sound Grain only from February 20 to October 31, 1908.

Year.	Months.									Total of eggs laid.	Weight of Birds at dates named.	Remarks.
1908.	February.	March.	April.	May.	June.	July.	August.	September.	October.		February 20..73 lbs. March 6......74 " " 20 .. ..73½ " April 3.......74 " October 30....68 "	One pullet died in month of May. An average of 60 eggs per pullet.
Number of eggs laid..	29	108	162	122	43	76	49	43	25	657		

With the exception of substituting sound wheat for frozen, the ration in this case was the same as that shown in No. 3 table.

More eggs were laid by this group of pullets fed on sound grain than the first group with frozen wheat as a part of the ration.

TABLE 5 (Frozen Wheat experiment continued).—Showing results from 7 White Orpingtons (5 hens, two years old, and 2 pullets), which were fed frozen wheat as part of their rations, as described in No. 1 table. Compare with table 4 following.

TABLE 5.—Results from 7 White Orpingtons: 5 hens, two years old, and 2 pullets, fed with frozen wheat from February 20 to October 31, 1908.

Year.	Months.									Total of eggs laid.	Weight of Birds at dates named.	Remarks.
1908.	February.	March.	April.	May.	June.	July.	August.	September.	October.		February 20..34½ lbs March 6......28½ " " 20......23 " April 3.......22 " October 30....19 "	One hen died in month of May. Average of 26 eggs per hen.
Number of eggs laid..	21	42	46	32	6	13	14	7	0	181		

TABLE 6 (Continuation of Frozen Wheat experiment).—Showing results from a group of 4 White Orpington hens and 3 pullets fed on sound grain. Compare this with preceding table.

TABLE 6.—Results from a group of 4 White Orpington hens and 3 pullets fed on sound grain from February 20 to October 31, 1908.

Year.	Months.									Total of eggs laid.	Weight of the Birds at different dates during experiment.	Remarks.
1908.	February.	March.	April.	May.	June.	July.	August.	September.	October.		February 20..40 lbs March 6.....39½ " " 20.....38½ " April 3.....39½ " October 30...34½ "	One hen died during the month of May. Average 30½ eggs per hen.
Number of eggs laid..	18	58	61	30	15	27	0	5	0	214		

DEDUCTIONS FROM ABOVE EXPERIMENT.

The birds fed on sound wheat laid the greater number of eggs. The birds on frozen wheat (fed whole and ground as described) lost weight.

The fowls fed on sound grain presented a more healthy appearance towards the end of the experiment.

EXPERIMENT WITH COTTON-FRONT HOUSE CONTINUED FROM 1907.

The report of last year gave results for five months of egg-laying by 19 Buff Orpington pullets which were placed during November, 1907, in a recently constructed poultry-house with a cotton front. This small structure faced south, and, at the time of its construction, was of advanced type. Views of this building, with an explanation of its interior, will be found in the report of 1907-8. The following table gives the results in egg-laying for the complete year, and also shows the average monthly maximum and minimum temperatures, as noted by self-registering thermometers, for the winter months.

TABLE 7.—Cotton-front Poultry-house, unheated. Contained 19 Buff Orpington hens, hatched between April 25 and May 28, 1907. Details of egg-laying, temperatures and composition of rations. Compare this table with No. 8.

Months.	Eggs laid.	Average temperature of house.		Average temperature of roosting room.		Remarks,
		Maximum.	Minimum.	Maximum.	Minimum.	
1907.						
November.....	34	No record..	No record..	No record..	No record..	2 hens laid fewer than 50 eggs each.
December.....	125	" ..	" ..	" ..	" ..	10 hens laid over 50 eggs each.
1908.		above zero.	above zero.	above zero.	above zero.	7 " 100 " 1 hen laid 31 eggs.
January ...	230	35·3	8·5	34·5	22·8	1 " 144 eggs.
February.....	160	42·2	7·8	30	29·6	
March........	222	52·3	21·7	52·1	32·5	
April.........	221					
May..........	193					
June..........	126					
July..........	138					
August......	136					
September....	141					
October......	39					
Total.....	1,765	or 93 eggs per hen.				

RATIONS FED TO ABOVE FOWLS.

Morning and evening.—Whole grain: ½ wheat, ½ oats. Thrown in litter on floor of house.

Noon.—Ground grain: 1 part corn, 1 part barley, 1 part oats, 1 part wheat bran.
2. Every third day: Ground raw bone. After April 24 replaced by meat scrap.
3. Every third day: (In winter) raw vegetables.
There was a constant supply of gravel and oyster shell.

QUANTITIES OF FOOD CONSUMED FOR THE YEAR.

Whole grain	1,060	pounds.
Ground grain	255	"
Vegetables	228	"
Ground raw bone	82	"
Gravel	50	"
Oyster shell	40	"

NOTES ON FOREGOING EXPERIMENT.

The birds were in perfect health during the winter. There was not a case of frost bite in the coldest weather. This, doubtless, was due to the cotton-covered frame which was let down, in front of the roosting place, on cold nights.

The number of eggs laid was greater than that from hens of the same variety, age and strain, kept in a warmed house.

The eggs, in early spring, were more fertile than those from hens kept in warmed houses.

When the weather was unusually severe the fowls were given snow instead of water.

TABLE 8 (Heated house).—Showing the egg laying of 11 Buff Orpington hens, one-year old, from November, 1907, to end of October, 1908.

Months.	Eggs laid.	Temperature of the house.		Average temperature of the house.	
		Maximum.	Minimum.	Maximum.	Minimum.
1907.					
November	44	No record	No record	No record	No record
December	76	"	"	"	"
1908.		above zero.	above zero.	above zero.	above zero.
January	112	54	24	46·8	34·5
February	64	56	22	47·3	35·2
March	84	58	30	49·8	39
April	108				
May	44				
June	29				
July	58				
August	38				
September	29				
October	0				
Total	686	or 62⅓ eggs per hen.			

The birds in this experiment were kept in a warmed house.

The average monthly maximum and minimum temperatures of the building during the winter months are also given. This table (8) should be compared with the foregoing table 7, when results will be found in favour of the system of keeping poultry in unheated, well-ventilated houses.

NOTES ON ABOVE EXPERIMENT.

Rations fed to the above fowls were the same as given to the birds in the cotton front house, as shown in table No. 7.

The experience gained in this case is clearly in favour of the unheated house system of poultry-keeping.

The experiment also shows a gain of 10 eggs per hen over the same number of fowls of 1907. This may, however, be the result of breeding from the best layers, as shown by the trap-nest.

BENEFIT OF TRAP-NEST SELECTION.

EXPERIMENT IN UNHEATED HOUSE, HAVING TWO DIVISIONS WITH SCRATCH-SHED ATTACHMENT TO EACH DIVISION.

The following experiment was carried on in an unheated house, divided into two compartments, with a scratch-shed attachment to each. The compartments were numbered 35 and 36, respectively. The first contained 14 Barred Plymouth Rock hens, the second 10 White Wyandottes. Details are shown in the following table of results:—

TABLE 9—Pen 35.—Showing results ascertained by trap-nets, from 14 Barred Plymouth Rock hens, two years of age.

Hen (No. of Leg-band).	1907.		1908.										Total of eggs laid.	Remarks.
	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.		
1	....	....	....	....	13	7	4	11	7	9	....	....	51	
3	....	....	1	6	5	7	7	....	3	11	....	....	40	
4	....	....	....	6	13	14	9	11	4	2	....	....	59	
5	....	13	6	1	9	20	17	4	....	....	....	....	70	
11	....	10	21	17	15	10	7	10	8	11	16	....	125	
13	....	7	16	18	19	17	20	18	19	18	21	....	173	
14	....	18	21	11	7	12	....	....	....	....	....	....	69	Died May 20.
29	....	3	....	....	17	4	16	4	15	....	....	....	59	
32	....	18	3	16	8	16	9	11	10	5	7	10	113	
42	....	8	18	15	18	3	9	9	13	8	5	....	106	
50	....	....	....	5	11	1	7	7	6	....	....	....	37	
51	....	6	....	8	20	6	18	8	11	7	15	....	99	
68	....	14	19	2	19	16	18	12	....	9	8	....	117	
82	....	....	1	13	8	4	2	6	6	4	....	....	44	
Total.	....	97	106	118	182	137	143	111	102	84	72	10	1,162	or 83 eggs per hen.

The rations given to above fowls were the same as shown in Table 7.

QUANTITY OF FOOD CONSUMED.

Whole grain..	864	pounds.
Ground grain, made into mash..	203	"
Vegetables, &c..	186	"
Cut bone..	87	"
Ground oyster shells..	43	"
Grit..	43	"

REMARKS ON ABOVE TABLE.

The gain in the number of eggs, by breeding from stock selected by trap-nest records, is shown to be 13 eggs per fowl over the results for 1907-8.

TABLE 10—Pen 36.—This pen was one of the two compartments in the heated house mentioned in preceding table 9. This compartment had also a scratch-shed attached, and contained 10 White Wyandotte hens, two years of age.

Hen (No. of Leg-band).	1907. November.	1907. December.	1908. January.	1908. February.	1908. March.	1908. April.	1908. May.	1908. June.	1908. July.	1908. August.	1908. September.	1908. October.	Total of eggs laid.	Remarks.
20	3	16	11	10	13	14	6	12	14	8	19	....	126	
21	2	....	....	10	18	12	....	....	19	8	19	7	95	
23	5	3	18	14	9	10	16	2	....	....	....	....	77	Died August 18. Acute inflammation of crop.
26	....	1	5	3	19	19	4	10	9	13	9	3	95	
28	....	14	16	9	20	19	18	3	13	11	20	2	145	
55	....	14	19	5	9	10	1	8	....	4	....	....	70	
65	....	....	....	4	14	10	10	14	7	7	4	....	70	Sick during December, 1907.
72	....	....	....	8	18	18	17	8	21	3	....	....	93	
78	2	11	16	9	....	12	17	...	9	20	21	12	129	
81	....	....	....	....	12	16	16	3	12	....	11	....	70	" " 1907.
Total.	12	59	85	72	132	140	105	60	104	74	103	24	970	Average number of eggs laid per hen—97.

The rations fed to above pen of fowls were the same as those described in Table 7.

QUANTITY OF FOOD CONSUMED.

Grain	531	pounds.
Mash of ground grains	127	"
Cut bone	56	"
Beets	127	"
Ground oyster shells	30	"
Grit	29	"

BENEFIT OF BREEDING FROM SELECTED STOCK.

TABLE 11—Pen 34.—Showing the number of eggs laid by 27 White Wyandotte pullets hatched in May, 1907, under observation from November, 1907, till October, 1908. The parent stock from which these pullets were bred laid an average of 62¾ eggs each per year.

27 White Wyandotte Pullets.	1907. November.	1907. December.	1908. January.	1908. February.	1908. March.	1908. April.	1908. May.	1908. June.	1908. July.	1908. August.	1908. September.	1908. October.	Total of eggs laid during the year.	Remarks.
Total of eggs laid per month	....	96	195	165	236	300	348	94	315	192	160	50	2,151	7 hens laid over 100 eggs each. 12 hens laid over 50 eggs each. 8 hens laid less than 50 eggs each. Best hen laid 157 eggs. Poorest hen laid 27 eggs. Average 80 eggs. A gain of 5¼ eggs per pullet over 1906-7 birds.

The pullets, in this instance, show an average of 80 eggs per year each, a gain of 5 eggs per pullet over the number of eggs laid by their parent stock. Incidentally the advantage of breeding from trap-nest-proved good layers is made evident.

RATIONS.

The rations fed were the same as those shown in table 7, pen 32.

QUANTITY OF FOOD CONSUMED.

Grain	1,338	pounds.
Mash	321	"
Cut bone	109	"
Beets	263	"
Ground oyster shells	45	"
Grit	42	"

LATE-HATCHED CHICKENS UNDESIRABLE.

The following experiment shows the inferiority of late-hatched chickens. It is a continuation of the experiment described in table 21, page 260, of last year's report, which showed the unsatisfactory egg-laying on the part of 8 Barred Plymouth Rock and White Wyandotte pullets, hatched in July, 1907. The record of these fowls for last year, when they were hens, is shown in the following table, and is almost as unsatisfactory as that of the previous year. The experience gained emphasizes what has frequently been stated in previous reports, that late-hatched chickens are not likely to be profitable to farmers. Details are as follows:—

TABLE 12—Pen 22.—Warmed house. Record of eight Barred Plymouth Rock and White Wyandotte hens. They were late-hatched chickens.

Description of fowls.	1907.		1908.										Total of eggs laid during the year.	Remarks.
Barred Plymouth Rock and White Wyandotte hens	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.		1 hen died May 26, 1908.
Total of eggs laid each month	3	43	41	41	39	36	17	4	15	42	2	0	283	Average 40 3/7 eggs per hen.

BREEDING FROM GOOD AND POOR EGG-LAYING STRAINS OF FOWLS.

An experiment to find out whether good and poor egg-laying characteristics are transmitted from parents to their progeny, was commenced in the spring of 1905. At that time two small groups of good and bad layers—proved so by trap-nests—were selected and put into separate pens, which were side by side. The results of the experiment on these birds, as pullets and hens, for two years and six months are given in the report ending March 31, 1908. Trap-nests were used to procure correct records. Results for year ending October 31, 1908, are shown in the two following tables:—

TABLE 13.—Results from five White Leghorn pullets, descendants of a good egg-laying strain. These pullets were hatched on May 26, 1907; they are the third generation from a parent stock of good layers.

Hen No.	1907.		1908.										Total of eggs laid by each hen.	Remarks.
	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.		
53	0	0	3	14	19	18	16	8	16	12	....	....	106	
66	0	8	19	15	18	11	10	6	4	...	....	....	91	
83	0	3	1	15	18	16	9	3	13	.. .	....	....	78	
84	0	[illegible]	2	11	17	13	9	1	13	....	....	....	66	
96	0	[illegible]	16	15	19	19	16	6	....	11	.. .	....	107	
Total of eggs laid each month.....	0	16	41	70	91	77	60	24	46	23	0	0	418	Average of 89⅗ eggs per hen.

Rations given were of such a nature as to induce egg laying, particularly during the winter season.

TABLE 14.—Results from five White Leghorn pullets, descendants of a poor egg-laying strain. Pullets were hatched May 26, 1908. The third generation from parent stock of poor layers.

Hen No.	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	Total of eggs laid by each hen.	Remarks.
	1907		1908											
1	0	8	6	10	[illegible]	11	16	3	....	....	....	....	66	
6	0	16	5	8	4	7	14	7	12	2	....	....	75	
13	0	0	0	5	17	15	12	....	....	....	....	...	49	
25	0	0	0	7	14	14	8	3	....	....	...	....	46	
51	0	0	0	0	4	13	10	....	....	....	...	. .	27	
	0	24	11	30	51	60	60	13	12	2	0	0	263	Average 52⅗ eggs per hen.

Rations and temperature of house were same as those given to the good layers.

NOTES ON THE RESULTS OF THIS EXPERIMENT.

Results so far ascertained show the progress made in breeding from the two different strains of fowls. The development of the good and bad characteristics was not as pronounced, owing to delay in obtaining suitable male birds to match with the original pullets selected by trap-nest. After two years' careful selection, male birds, bred from our own females of proved merit as egg layers, are now available. When mated with our own pen of proved good layers, these male birds will, doubtless, prove factors in building up strains of great excellence. The great importance of having the male birds which are to be so used, the descendants of prolific egg-laying parentage was noted in report of last year. A male bird bred from a poor egg-laying strain is also available for mating with a pen of poor layers next breeding season. Results in this case also will be of interest.

LIST OF STOCK ON HAND MARCH 31, 1908.

Pen No.	Breed.	Cocks.	Hens.	Cockerels.	Pullets.	Total.	Remarks.
1	White Plymouth Rocks	....	16	.....	..	16	
2	Buff Orpingtons	....	5	.....	9	14	
3	White Leghorns	......	.	......	16	16	
4	"	......	10	......	6	16	
5	Black Minorcas	....	5	......	7	12	
6	White Orpingtons	....	4	......	8	12	
7	Faverolles	......	7	....	5	12	
13	Black Hambargs	....	4	......	3	7	
16	White Leghorns	......	5	.....	5	10	Poor egg laying strain.
17	"	....	5	....	5	10	Good " "
18	"	......	.	..	5	5	
20	Light Brahmas	....	2	......	2	4	
24	Mixed Pullets	......	......	..	11	11	
25	White Leghorns	......	......	.....	7	7	
26	White Plymouth Rocks	......	....	.....	10	10	
27	S. G. Dorkings	....	4	......	7	11	
32	Buff Orpingtons	......	13	.....	7	20	Unheated house.
33	Barred Plymouth Rocks	......	23	....	......	23	" "
34	White Wyandottes	......	22	......	....	22	" "
35	Barred Plymouth Rocks	.. ..	....	....	20	20	" "
36	White Wyandottes	......	......	......	17	17	" "
	Capons	......	.....	2	......	2	In different pens.
	For breeding and eating purposes	10	...	24	......	34	
	Totals	10	125	26	150	311	

VISITORS.

Among the numerous visitors to our department during the year, we had the pleasure of receiving calls from Mr. Alex. Prain, of Homolea, Perthshire, Scotland. Mr. Prain, who was a member of the delegation of Scottish agriculturists visiting Canada last summer, is a leading expert and judge, and owner of a large poultry plant. He, with other members of the commission, was very much interested in noting the evolution from the old method of housing poultry during the winter season in a closed and partially heated building, to the unheated house with a front of cotton rather than of boards. Mr. Prain, on his return to Scotland, was kind enough to send us several settings of eggs from his best pens of White Orpingtons. Another visitor was Miss Fried, a young poultry expert of Russia, who was sent by the Russian Department of Agriculture to inquire into Canadian methods of poultry-keeping. Miss Fried speaks excellent English, and her two visits to our Poultry Division were most enjoyable, and, I trust, mutually beneficial. A third visitor was Miss Edwards, of England, a specialist in Buff Orpingtons, who was attending the Women's International Congress which met in Toronto. We also had the pleasure of a visit from Mr. Wm. Brown, son of Prof. E. T. Brown of the Poultry College, Theale, Eng. Mr. Brown is making a close examination of poultry-keeping from both Canadian and American standpoints. Many other poultry-keepers who arrived with different excursions of farmers were interested visitors.

EXAMINATION OF SICK BIRDS.

Several ailing birds were sent for examination to Dr. Higgins, Pathologist of the Veterinary Laboratory, Experimental Farm. With his usual kindness, Dr. Higgins gave us his opinion of, and in several cases reported on, the different ailments of the birds examined by him.

EXPERIMENTAL FARM FOR THE MARITIME PROVINCES.

NAPPAN, N.S., March 31, 1909.

To Dr. WM. SAUNDERS, C.M.G.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith my report of the operations on the Experimental Farm for the Maritime Provinces, at Nappan, N.S., for the year ending March 31, 1909.

The summer season of 1908 was not particularly favourable, being notable for its extremes, in both wet and dry weather.

Beginning in the spring with a long cold and wet period, all spring-sown crops were more or less late in being sown, which is always a disadvantage. The weather was, however, quite suitable for the hay crop, which is of first importance in this locality, and which in 1908 gave the best yield obtained in many years. Midsummer was extremely dry, with the result that most of the grain and root crops were below the average, although some of the early sown grain was fully up to the average. The latter part of the summer was again quite wet, and resulted in good growth of aftermath, and pasture was better than usual. The season ended with the most remarkably fine weather seen for many years, which gave the farmers a better opportunity for getting all their fall farm work completed, than is usually the case, the latter being important, on account of the shortness of the season.

The apple crop was better than usual, both as to quantity and quality of fruit.

It is again my pleasure to acknowledge the services of Mr. Thomas Coates, farm foreman, and Mr. Robert Donaldson, herdsman, who have well and faithfully performed the tasks allotted to them during the past year.

WEATHER.

April, 1908, opened with a snowstorm which continued until the night of the 2nd, 7 inches of snow falling during those two days. Snow fell on the 3rd, 8th, 19th and 21st; 2 inches falling on this latter date.

Rain fell on the 7th, 9th, 15th, 18th, 19th, 28th and 29th, the heaviest rainfall being on the 19th, when 1·01 inches fell.

From 1° to 22° of frost was registered every night this month until the 26th, when the thermometer went to 41°. No frost was registered after this date.

May was an unusually wet month, rain falling on 14 different dates, the heaviest fall being on the 27th, when ·95 inches fell. From the 19th to the 26th the weather was fine. Seeding was begun on the 20th of this month. The thermometer registered frost on the 7th, 12th, 16th and 20th.

The first week of June was wet, rain falling on the 1st, 2nd, 3rd and 4th, and again on the 12th, 13th, 14th, 16th, 17th, 20th and 22nd, the weather from this date being fine until the night of the 30th, when a light rain fell. On the 7th, the thermometer registered 78°, on the 8th 79°, on the 9th 78°, on the 10th 79°, and on the 11th 80°, dropping on the 12th to 59°.

July was very warm, with no rain in the early part of the month. The thermometer registered above 80° on 11 different dates, going as high as 91° on the 8th. The rainfall was very heavy during the latter part of the month, rain falling on 10 different dates, the heaviest being on the 20th, when 1·31 inches fell.

August.—The first half of this month was very wet, 4·48 inches of rain falling up to the 16th; the heaviest rain being on the 2nd, when 2·07 inches fell. The thermometer registered 80° on the 11th and 14th, respectively.

September was fine and fair practically all the month, 1·65 inches of rain falling, the heaviest being on the 3rd, when ·91 inches fell. The weather was favourable for harvesting, and very good for the growth of roots. No frost was registered during this month.

October opened with a two days' rain. The balance of the month was fine and dry until the 30th, when 1·27 inches of rain fell. On the 5th, 6th, 13th, 21st and 22nd, 6°, 4°, 4°, 12° and 7° of frost were recorded, respectively.

November was a dry month, the total precipitation being 1·1 inches. Rain fell on the 12th, ·41 inches falling, and 6 inches of snow fell on the night of the 18th. Frost was registered from the 1st to the 8th, and again from the 13th to the end of the month, 8° being the lowest recorded on the night of the 8th and again on the 18th.

The first half of December was stormy. Rain or snow fell on seven different dates previous to the 16th. The heaviest rainfall was on the 12th, 1·11 inches falling. The heaviest snowfall was on the 14th, when 4 inches fell. The thermometer dropped to zero on the 6th, and on the 23rd and 24th, 5° and 8° below were registered, respectively. Frost was recorded every day during this month.

Janauary, 1909.—This was a month of fine winter weather. Rain fell on 3 different dates and snow on 6 different dates. The heaviest snowfalls being on the 26th and 31st, 6 inches falling on each day. The rainfall on the 6th spoilt the sleighing until the 23rd, on and after which date, 15 inches of snow fell.

February.—The weather during this month was quite seasonable, with more than usual intense cold, being notable for its sudden changes in temperature, varying from 26° below zero to 49° above within a period of a very few days. The most sudden change was from 23° below on the 4th to 49° above on the 6th. Snow fell on 3 different dates, the heaviest fall being 12 inches, on the 16th.

March was a very fine month, the mercury dropping only once below zero, being 5° below on the 2nd. With the exception of a very few light rainfalls, the weather was clear until the 24th, when 10 inches of snow fell, making sleighing for only one day. A light rain on the 26th took the snow away. The ground was about bare practically all the month.

METEOROLOGICAL RECORDS.

Month.	Degrees of Temperature F.					Sunshine.
1908.	Highest.	Date.	Lowest.	Date.	Mean.	Hours.
April	64·0	30	10·0	2	33·96	
May	74·0	24	27·0	7	49·03	
June	80·0	11	23·0	4	58·15	
July	91·0	8	40·0	28	65·31	
August	80·0	11	36·0	29	61·44	248·5
September	79·0	11	35·0	20	58·04	256·0
October	73·0	16	20·0	21	48·43	176·5
November	55·0	4	20·0	22	35·63	115·0
December	52·0	7	—8·0	24	21·00	118·0
1909.						
January	55·0	6	—13·0	17	16·40	83·0
February	49·0	6	—26·0	2	17·58	102·0
March	50·0	5	—5·0	2	28·59	124·5

The record of sunshine was taken only from August 1.

PRECIPITATION.

Month.	Rain Fall.	Snow Fall.	Total Precipitation.
1908.	Inches.	Inches.	Inches.
April	2·07	13·	3·37
May	3.08	....	3·08
June	2·41	....	2·41
July	4·73	....	4·73
August	5·35	....	5·35
September	1·65	....	1·65
October	2·73	....	2·73
November	·41	6·	1·01
December	3·14	11·	4·24
1909.			
January	1·61	19·	3·51
February	2·45	14·	3·85
March	2·09	20·	4·09
Totals	31·72	83·	40·02

EXPERIMENTS WITH OATS.

Experiments were again conducted this year with the leading varieties of oats, which were grown in uniform test plots of one-fortieth acre each. Twenty-four varieties were included in this test. The plots received the same treatment and were on soil practically uniform throughout.

The ground was a clay loam on which turnips were grown the previous year (1907), for which crop twenty-five loads of barn-yard manure per acre were applied with the manure-spreader. The land was ploughed in the fall (1907) and harrowed in the spring (1908) with the spring-tooth and smoothing harrows, until a fine tilth was made. The seed was sown on May 21 with the seed drill at the rate of 2½ bushels per acre.

This ground was also seeded down to clover and timothy at the rate of 7 lbs. Mammoth Red clover, 3 lbs. Alsike clover and 12 lbs. Timothy seed per acre, by means of a grass seed attachment to the grain seeder.

The seed was from selected heads of the previous season's crop, cut from the various plots at harvest time.

No additional fertilizer was used on these plots this season. The grain started well, as did also the grass seed, but owing to the heavy rains in the latter half of July, and first half of August, the grain was beaten down and consequently did not fill. The straw showed a slight amount of smut.

The following yields were obtained:—

OATS—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.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.
				Inches.		Inches.		Lbs.	Bush.	Lbs.	Lbs.
1	Wide Awake	Aug. 24.	95	44 to 46	Stiff	6 to 7	Branching	4,280	74	4	32
2	Goldfinder	" 31.	102	38 " 43	"	6 " 7	Sided	5,000	71	26	30
3	White Giant	" 27.	98	40 " 44	"	6 " 8	Branching	4,800	71	6	32
4	Storm King	" 24.	95	36 " 40	"	6 " 7	Sided	4,400	70	00	35
5	Banner	" 26	97	42 " 46	"	6 " 7	Branching	4,120	68	28	32
6	Abundance	" 27.	98	40 " 44	"	6 " 7	"	4,040	68	8	31½
7	Irish Victor	" 27.	98	36 " 40	"	6 " 8	"	4,200	67	2	32½
8	Danish Island	" 27.	98	42 " 46	"	6 " 8	"	3,680	65	30	33
9	Golden Giant	Sept. 4.	106	32 " 36	"	6 " 8	Sided	3,840	65	30	30
10	Thousand Dollar	Aug. 24.	95	34 " 38	"	6 " 7	Branching	3,240	64	24	32
11	Kendal White	" 27.	98	40 " 43	"	6 " 8	Sided	2,920	64	4	30
12	Siberian	" 26.	97	34 " 36	Medium	6 " 7	Branching	4,320	63	18	28
13	Milford White	" 27.	93	40 " 44	Stiff	6 " 8	Sided	3,040	62	32	34
14	Golden Beauty	" 26.	97	34 " 38	"	6 " 7	Branching	3,200	62	12	32
15	Twentieth Century	" 24.	95	38 " 42	"	6 " 7	"	3,120	61	26	30
16	Pioneer	" 24.	95	32 " 38	"	6 " 7	"	4,400	61	6	34
17	Lincoln	" 26.	97	32 " 36	"	5 " 7	"	4,600	60	20	32
18	American Triumph	Sept. 5.	107	44 " 48	"	6 " 8	"	3,920	59	14	33
19	Improved American	Aug. 31.	102	42 " 46	"	6 " 8	"	3,320	58	28	31
20	Improved Ligowo	" 24.	95	36 " 40	"	6 " 7	"	2,920	57	22	30
21	Tartar King	" 26.	97	38 " 42	"	6 " 7	Sided	3,720	55	30	32
22	Virginia White	" 24	95	36 " 40	Medium	6 " 7	Branching	3,800	52	32	30
23	Joanette	" 24.	95	32 " 36	"	6 " 7	"	3,720	49	14	32
24	Swedish Select	" 24.	95	36 " 40	Stiff	5 " 7		3,080	47	2	29

EXPERIMENTS WITH BARLEY.

Twenty-four varieties of barley were sown (thirteen of six-rowed and eleven of two-rowed), in uniform test plots of one-fortieth acre each. The land was a clay loam on which turnips were grown the previous year (1907), for which crop twenty-five loads of barn-yard manure per acre were used. No manure or other fertilizer was used for this crop. The land was ploughed in the fall of 1907, thoroughly worked up in the spring, and sown May 21, with seed selected from picked heads of the previous year's crop, sown at the rate of 2 bushels per acre.

Seven pounds Mammoth Red clover, 3 lbs. Alsike clover and 12 lbs. Timothy seed per acre was sown at the same time. Slight smut was noticeable.

Following were the yields obtained:—

SIX-ROWED 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.	Weight of Straw.	Yield of Acre.		Weight per measured bushel after cleaning.
				Inches.		Inches.	Lbs.	Bush.	Lbs.	Lbs.
1	Nugent	Aug. 19	90	32 to 36	Stiff	2 to 3	3,880	45	40	47
2	Stella	" 20	91	36 " 40	"	2 " 2½	4,240	45	20	48
3	Odessa	" 17	88	30 " 36	Medium	2 " 2½	2,680	43	16	47½
4	Mensury	" 20	91	33 " 36	"	2 " 3	4,000	42	44	47
5	Blue Long-head	" 20	91	34 " 38	"	2 " 2½	3,400	42	24	41
6	Trooper	" 17	88	30 " 34	Stiff	2 " 2½	2,600	41	32	49
7	Mansfield	" 20	91	36 " 38	"	2 " 3	3,600	41	32	47
8	Oderbruch	" 17	88	30 " 36	Medium	2 " 2½	3,200	40	40	48
9	Claude	" 17	88	30 " 34	"	1¾ " 2¼	2,440	40	20	47
10	Albert	" 19	90	36 " 38	Stiff	2 " 3	2,800	38	16	47½
11	Champion	" 15	86	41 " 45	Medium	2½ " 3	3,080	37	24	40
12	Yale	" 20	91	26 " 30	Stiff	1½ " 2	3,000	36	32	46
13	Empire	" 19	90	35 " 38	"	2 " 3	3,120	34	8	46

TWO-ROWED 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.	Weight of Straw.	Yield of Acre.		Weight per measured bushel after cleaning.
				Inches.		Inches.	Lbs.	Bush.	Lbs.	Lbs.
1	French Chevalier	Aug. 21	92	32 to 36	Medium	3 to 4	3,080	57	40	48½
2	Danish Chevalier	" 21	92	30 " 34	"	2½ " 4	3,680	50	20	50
3	Beaver	" 21	92	30 " 33	"	3 " 3½	3,800	49	8	48½
4	Jarvis	" 20	91	35 " 38	Stiff	2 " 2½	3,920	48	16	47½
5	Gordon	" 19	90	30 " 34	"	2 " 2½	3,000	47	24	46
6	Invincible	" 20	91	30 " 33	"	2 " 2½	2,800	43	16	47½
7	Standwell	" 21	92	36 " 40	"	2 " 2½	3,240	42	44	47
8	Clifford	" 21	92	36 " 40	"	2½ " 3½	2,600	42	24	48
9	Swedish Chevalier	" 21	92	26 " 30	Medium	2½ " 3½	2,720	40	40	48
10	Sidney	" 21	92	32 " 36	Stiff	2 " 3	2,680	40	00	48½
11	Canadian Thorpe	" 21	92	32 " 38	"	2½ " 3	2,480	35	20	47½

EXPERIMENTS WITH SPRING WHEAT.

Fifteen varieties of spring wheat were sown in uniform test plots of one-fortieth acre each, on a clay loam soil on which turnips were grown the previous year (1907). The land was ploughed in the fall, thoroughly worked up in the spring, and sown May 20, at the rate of 1¾ bushels per acre, together with 7 lbs. Mammoth Red clover, 3 lbs. Alsike clover and 12 lbs. Timothy seed per acre.

The seed wheat used was from selected heads of the previous year's crop.

The grain made very good growth and ripened well.

The straw was clean and no smut or rust was noticed.

The following were the yields obtained:—

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.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.
				Inches.		Inches.		Lbs.	Bush.	Lbs.	Lbs.
1	White Russian	Sept. 5	108	36 to 40	Stiff	2½ to 3½	Beardless	4,480	44	00	60½
2	Red Fern	" 2	105	38 " 42	"	3 " 3½	Bearded	4,600	43	20	60
3	Percy	" 2	105	36 " 40	"	2½ " 3	Beardless	3,640	42	00	61
4	White Fife	" 5	108	38 " 42	"	3 " 4	"	4,120	41	20	60
5	Huron	Aug. 31	103	35 " 40	"	2 " 3	Bearded	4,400	40	40	60
6	Chelsea	" 28	100	36 " 40	"	2 " 3	Beardless	3,880	39	20	61
7	Marquis	" 31	103	40 " 40	"	2 " 3	"	4,280	39	00	60
8	Pringle's Champlain	" 28	100	38 " 42	"	2 " 3	Bearded	3,800	38	40	61½
9	Bishop	" 26	98	42 " 46	"	2 " 3	Beardless	4,020	36	40	60
10	Riga	" 26	98	38 " 42	"	2 " 3	"	3,720	36	20	61
11	Hungarian White	" 31	103	36 " 40	"	2 " 3	Bearded	4,000	36	00	61
12	Preston	" 31	103	36 " 40	"	3 " 3½	"	3,240	35	20	60
13	Red Fife	Sept. 2	105	36 " 40	"	2 " 3	Beardless	3,480	34	40	61
14	Stanley	" 4	107	44 " 48	"	2½ " 3	"	4,320	33	00	59
15	Bobs	Aug. 31	103	36 " 40	"	2 " 3	"	3,760	32	40	61

EXPERIMENTS WITH DURUM OR MACARONI WHEAT.

Four varieties of Durum wheat were grown in uniform test-plots of one-fortieth acre each. The land was similar in character to, and received the same treatment as, the spring wheat plots, and was sown May 20.

Following were the yields obtained:—

MACARONI OR DURUM 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.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.
				Inches.		Inches.		Lbs.	Bush.	Lbs.	Lbs.
1	Goose	Sept. 2	105	34 to 38	Stiff	1½ to 2	Bearded	3,200	28	00	60
2	Roumanian	" 2	105	40 " 43	"	2 2½	"	3,400	26	40	60
3	Yellow Gharnovka	" 5	108	36 " 40	"	2 2½	"	2,600	25	20	58
4	Mahmondi	" 4	107	32 " 36	"	1½ " 2		2,840	21	20	58

EXPERIMENTS WITH EMMER AND SPELT.

Two varieties each of Emmer and Spelt were sown May 20, in plots of one-fortieth acre each. The land was similar to that on which the other spring wheats were sown, and received the same treatment.

The yield from these plots is given in pounds, as, with the ordinary threshing, the chaff is not separated from the kernels and the result cannot well be compared with the other sorts of wheat which are threshed clean.

Following were the yields obtained:—

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.	Kind of Head.	Yield per Acre.
				Inches.		Inches.		Lbs.
1	Common Emmer	Aug. 28	99	30 to 36	Stiff	1 to 1½	Bearded	2,240
2	Red Spelt	Sept. 10	112	40 " 46	"	3 " 4	Beardless	2,000
3	Red Emmer	" 8	110	36 " 40	"	1½ " 2	Bearded	1,560
4	White Spelt	" 10	112	36 " 40	"	3 " 4	Beardless	1,480

EXPERIMENTS WITH PEAS.

Eighteen varieties of peas were sown in uniform test plots of one-fortieth acre each, on a clay loam soil on which turnips were grown the previous year (1907). The land was ploughed in the fall, well worked up in the spring, and sown on May 22, with the seed drill, at the rate of 2 to 3 bushels per acre. The ground was also seeded down to clover and timothy at the rate of 7 lbs. Mammoth Red clover, 3 lbs. Alsike and 12 lbs. Timothy seed per acre.

The following yields per acre were obtained:—

PEAS—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Character of Growth.	Average Length of Pod.	Size of Pea.	Yield per Acre. Bush.	Yield per Acre. Lbs.	Weight per measured bushel after cleaning.
					Inches.		Bush.	Lbs.	Lbs.
1	Arthur	Sept. 8	109	Fair	2 —2½	Medium	20	..	62
2	Daniel O'Rourke	" 5	106	Poor	1½—2	Small	18	40	61½
3	Picton	" 8	109	Fair	2 —2¾	Medium	18	..	62
4	Prince	" 7	108	"	1½—2	"	16	40	61
5	Agnes	" 8	109	"	2 —2½	"	15	20	61
6	White Marrowfat	" 5	106	"	2 —3	Large	14	40	61
7	Mackay	" 9	110	"	2 —3	"	14	20	61
8	Chancellor	" 5	106	Poor	1½—2	Small	14	..	61½
9	Archer	" 8	109	Fair	2 —2½	Medium	13	20	60
10	Gregory	" 9	110	Poor	2 —2½	"	12	40	60½
11	Wisconsin Blue	" 7	108	"	2 —2¼	"	12	..	60
12	English Grey	" 5	106	"	2 —2½	"	11	20	61
13	Black-eye Marrowfat	" 8	109	Fair	2 —2½	"	10	40	60
14	Paragon	" 7	108	Poor	1¾—2¼	"	9	20	60
15	Prussian Blue	" 7	108	"	1½—2	Small	8	..	61
16	Golden Vine	" 4	105	"	1¼—2	"	7	40	62
17	Victoria	" 8	109	"	2 —2½	Medium	7	..	60
18	Early Britain	" 5	106	"	2 —2½	"	6	40	60

EXPERIMENTS WITH BUCKWHEAT.

Five varieties of buckwheat were sown in uniform test-plots of one-fortieth acre each. The land was a clay loam that had been in corn the previous year (1907), and had received a dressing of barn-yard manure in the fall of 1906. The seed was sown on June 18 and cut on September 4. No manure or fertilizer was used for this crop.

The following yields were obtained:—

BUCKWHEAT—Test of Varieties.

Number.	Name of Variety.	Character of Soil.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Yield per Acre.		Weight per measured bushel after cleaning.
						Inches.	Bush.	Lbs.	Lbs.
1	Tartarian	Clay loam	June 18	Sept. 4	78	34—38	41	32	48
2	Rye Buckwheat	"	" 18	" 4	78	36—40	40	..	48
3	Japanese	"	" 18	" 4	78	36—40	28	16	48
4	Grey	"	" 18	" 4	78	35—38	21	24	48
5	Silver-hull	"	" 18	" 4	78	38—42	19	8	48

FIELD CROPS OF GRAIN.

Four acres of field grain were sown in one-acre lots. The land was a clay loam and had been in roots the previous year, for which crop, manure at the rate of twenty cart loads per acre had been applied. This land was ploughed in the fall and sown May 22. Clover and timothy seed were sown with this crop.

The results obtained are as follows, allowing 40 lbs. per bushel for mixed grain, 48 lbs. per bushel for barley and 34 lbs. per bushel for oats:—

Crops.	Yield per Acre.		Weight per Bushel.
	Bush.	Lbs.	Lbs.
1 acre Waverley oats	45	..	34
1 " Pioneer oats	50	10	34
1 " Odessa barley	35	24	48
1 " Mixed grain	38	10	40

FIELD CROP OF MIXED GRAIN.

Six acres of mixed grain were sown. The land was a clay loam in only a fair state of fertility, the previous crop having been clover hay with a light aftermath, turned under in the fall. This was sown on May 26 with a mixture of Waverley oats, 2 bushels; Odessa barley, 1 bushel, and Prussian Blue peas, ½ bushel, sown at the rate of 3 bushels per acre.

The yield was 43 bushels per acre, at 40 lbs. per bushel.

FIELD CROPS OF BUCKWHEAT.

Two acres of buckwheat were grown on a clay loam in a good state of fertility, the previous crop having been ensilage corn. The variety used was Silver-hull. The land was sown June 18, and yielded 36 bushels 24 lbs. per acre.

FIELD CROPS OF GRAIN ON MARSH.

Fifteen acres of oats were sown on ordinary marsh (or dyke) soil of a rather sandy nature, on which timothy hay had been grown for a term of years, yielding an average crop of about 1 to 2 tons per acre. This was sown with three different varieties of oats, Pioneer, Sensation and Black Tartarian at the rate of 3 bushels per acre. The land was not by any means uniform, making a comparison of varieties uncertain. The total yield was 692 bushels 32 lbs., an average of 47 bushels per acre.

EXPERIMENTS WITH INDIAN CORN.

Fifteen varieties of Indian corn were sown in uniform test-plots. The land was a clay loam on which clover hay had been grown the previous season, the aftermath having been left on the ground, on top of which, in the fall of 1907, was spread stable manure at the rate of about 20 tons per acre, and was ploughed in the spring of 1908 after a fairly good growth of grass had started. This was well worked up, but not deeply, and complete fertilizer at the rate of 400 lbs. per acre was added, sown broadcast and harrowed in. On June 6 this was sown in rows 36 inches apart and also in hills 36 inches apart each way, harrowed over with a smoothing harrow before coming up, and again just as some of the first plants were coming through the ground. From this on, a one-horse cultivator was used about once each week, until the corn was three to four feet high. When the plants were about six inches high, they were thinned out in the rows from 4 to 6 inches apart, and from 3 to 6 plants left per hill where in hills, the hand hoeing necessary being done at this stage. This crop made very good growth throughout the season and was very satisfactory, being harvested September 28.

Following were the results obtained:—

CORN—Test of Varieties.

Number.	Name of Variety.	Height.	Leafiness.	When Tasselled.	In Silk.	Condition When Cut.	Weight per acre grown in rows.		Weight per acre grown in hills.	
		In.					Tons.	Lbs.	Tons.	Lbs.
1	Wood's Northern Dent..	94	Very leafy..	Aug. 20.	Sept. 5.	Late milk...	26	470	25	1,150
2	North Dakota White....	81	" ..	" 20.	" 3.	Soft glazed..	26	250	21	1,230
3	Champion White Pearl..	102	Fairly leafy.	Sept. 5.	....	Watery.....	25	1,700	23	1,300
4	Mammoth Cuban......	84	" ..	....	....	"	25	1,150	26	30
5	Superior Fodder........	92	" ..	....	....	"	25	50	22	1,650
6	Angel of Midnight......	82	Leafy	Aug. 15.	Sept. 1.	Glazed.....	24	1,170	21	900
7	Salzer's All Gold........	92	Fairly leafy.	....	....	Watery.....	24	950	23	750
8	Early Mastodon	99	" ..	Sept. 3.	....	Early milk..	23	1,850	24	400
9	Longfellow............	88	Very leafy..	Aug. 15.	Sept. 1.	Glazed.....	23	1,300	21	570
10	Eureka...............	96	Med. leafy..	Sept. 3.	....	Watery....	23	1,080	22	1,870
11	Pride of the North......	86	Fairly leafy.	....	....	"	23	200	22	1,430
12	Selected Leaming.......	83	" ..	Aug. 20.	Sept. 3.	Late milk...	22	1,650	20	1,800
13	White Cap Yellow Dent.	80	" ..	" 20.	" 5.	Watery....	21	1,450	22	1,980
14	Compton's Early........	80	Very leafy..	" 15.	" 1.	Glazed....	21	900	24	1,500
15	Early Butter...........	85	Fairly leafy.	" 20.	" 5.	Late milk...	21	570	22	1,100

INDIAN CORN SOWN AT DIFFERENT DISTANCES APART.

In this experiment, the soil and its treatment were identical with the previous test, except that no commercial fertilizer was added. Sown June 8, and harvested September 28, with the following results:—

Name of Variety.	Distances Apart.	Yield per Acre.	
	Inches.	Tons.	Lbs.
Longfellow	42	26	170
"	35	23	750
"	28	23	200
"	21	25	1,300
Champion White Pearl	42	23	530
" "	35	25	1,700
" "	28	26	1,200
" "	21	24	600
Selected Leaming	42	23	60
"	35	23	200
"	28	24	300
"	21	25	1,600

FIELD CROP OF INDIAN CORN.

Two acres of Indian corn were grown as a field crop in three lots, one of 1 acre and two of ½ acre each. This land was also a clay loam in a good state of fertility, having grown clover hay the previous year. This was manured on the sod in the fall of 1907 at the rate of about 20 tons per acre, and left until about June 1, 1908, when a fairly good growth of grass had started, when it was ploughed, well cultivated and sown in rows 36 inches apart.

This was gone over twice with a smoothing harrow before the corn was up, and cultivated with a one-horse cultivator at intervals of one week for four weeks. This was sown June 6 and cut September 30 to October 1: 1 acre of Longfellow yielded 20 tons 1,000 lbs; ½ acre of Dakota White at rate of 22 tons 1,375 lbs per acre, and ½ acre Leaming at rate of 26 tons per acre.

EXPERIMENTS WITH TURNIPS.

Twelve varieties of turnips were sown in uniform test plots on June 8, and a duplicate set on June 22. The land on which this crop was grown was a heavy clay soil in rather poorer condition than generally used for this experiment, which had been in hay the two previous years. This was ploughed in the fall of 1907, and again in the spring of 1908, well cultivated, and barn-yard manure applied at the rate of 20 tons per acre. This was ploughed under and again thoroughly cultivated. Complete fertilizer at the rate of 500 lbs. per acre was sown broadcast and harrowed in, and the field rowed up into rows 24 inches apart. The plants were thinned out to 1 foot apart in the rows as soon as they were sufficiently matured. On account of the continued wet weather, hoeing was very difficult, and cultivation was not by any means as thorough as usual. The crop was pulled on October 24, with the following results:—

TURNIPS—Test of Varieties.

Number.	Name of Variety.	Yield per Acre.							
		1st Plot.				2nd Plot.			
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Magnum Bonum	28	1,750	962	30	23	860	781	..
2	Kangaroo	28	1,420	957	..	24	675	811	15
3	Jumbo	28	1,255	954	15	22	55	734	15
4	Mammoth Clyde	28	925	948	45	23	200	770	..
5	Derby	28	595	943	15	22	1,705	761	45
6	Pefection Swede	28	430	940	30	22	550	742	30
7	Halewood's Bronze Top	28	100	935	..	23	1,025	783	45
8	Bangholm Selected	27	1,770	929	10	20	1,250	687	30
9	Hall's Westbury	27	1,275	921	15	23	1,850	797	30
10	Hartley's Bronze	27	450	907	30	23	530	775	30
11	Good Luck	24	675	811	15	23	530	775	30
12	Skirvings	23	1,355	789	15	21	75	701	15
13	Carter's Elephant	23	1,025	783	45	19	1,600	660	..

FIELD CROP OF TURNIPS.

Six acres of turnips were grown as a field crop in lots of 1 acre each. The land varied from heavy clay to light sandy soil, including some black muck, about an equal proportion of each being in each different acre. This land was ploughed in the fall of 1907, well worked up in the spring of 1908, manure at the rate of 20 tons per acre spread on the surface and ploughed under. It was again thoroughly cultivated and sown in rows 24 inches apart. To one-third of each acre was added complete fertilizer (Bowker's Square Brand) at the rate of 500 lbs. per acre, to another third complete fertilizer at the rate of 250 lbs. per acre, the remaining third of each acre having manure only. On account of the continued cold, wet and backward weather, this crop was only finished sowing June 23; from this time on for the next three weeks extreme drought was experienced, which resulted in slower growth of this crop than usual. Then, just when thinning and hoeing for the first time, such heavy and continued rains were experienced as to make it quite impossible to work on the field for some weeks, with the result that practically all this crop received only one hoeing and one cultivating before attaining such growth as to render further cultivation impracticable, and the land was thus left in a baked and unsuitable condition, somewhat weedy. From this time out, the season was particularly good for growth, but owing to the baked and otherwise poor state of the soil, this crop did not make nearly as good growth at this season of the year as usual, when conditions are favourable. The following table shows the dates of sowing, harvesting and yield of varieties:—

Field Crops of Turnips.

Name of Variety, How Fertilized, Size of Plot.		Yield per Acre.		Yield per Acre.	
		Tons.	Lbs.	Bush.	Lbs.
Purple Top Swede—(Pulled October 26).					
1/3 acre. Manure and fertilizer, 500 lbs. per acre		21	372	706	12
1/3 " " " 250 "		23	368	772	48
1/3 " " only		22	1,990	766	30
Cost per acre of 500 lbs. fertilizer at $30 per ton	$ 7 50				
Value per acre in crop over manure only, 60 bush. 18 lbs. at 6c.	3 62				
Loss per acre	$ 11 12				
Cost per acre of 250 lbs. fertilizer at $30 per ton	$ 3 75				
Value per acre in crop over manure only, 6 bush. 18 lbs. at 6c.	0 38				
Loss per acre	$ 3 37				
Kangaroo—(Pulled October 28).					
1/3 acre. Manure and fertilizer, 500 lbs. per acre		20	812	680	12
1/3 " " " 250 "		20	371	672	51
1/3 " " only		18	610	643	30
Cost per acre af 500 lbs. fertilizer at $30 per ton	$ 7 50				
Value per acre in crop over manure only, 37 bush., 42 lbs. at 6c.	2 24				
Loss per acre	$ 5 26				
Cost per acre of 250 lbs. fertilizer at $30 per ton	$ 3 75				
Value per acre in crop over manure only, 29 bush. 20 lbs. at 6c.	1 76				
Loss per acre	$ 1 99				
Magnum Bonum—(Pulled November 3).					
1/3 acre. Manure and fertilizer, 500 lbs. per acre		21	692	711	36
1/3 " " " 250 "		19	1,816	663	36
1/3 " " only		24	426	707	06
Cost per acre of 500 lbs. fertilizer at $30 per ton	$ 7 50				
Value per acre in crop over manure only, 4 bush. 30 lbs. at 6c.	0 27				
Loss per acre	$ 7 23				
Cost per acre of 250 lbs. fertilizer at $30 per ton	$ 3 75				
Value per acre in crop over manure only, 43 bush. 30 lbs. at 6c.	2 61				
Loss per acre	$ 1 14				
Invicta—(Pulled November 4).					
1/3 acre. Manure and fertilizer, 500 lbs. per acre		23	556	776	06
1/3 " " " 250 "		23	224	770	24
1/3 " " only		19	1,472	657	52
Cost per acre of 500 lbs. fertilizer at $30 per ton	$ 7 50				
Value per acre in crop over manure only, 118 bush. 14 lbs. at 6c.	7 09				
Loss per acre	$ 0 51				
Cost per acre of 250 lbs. fertilizer at $30 per ton	$ 3 75				
Value per acre in crop over manure only, 112 bush. 32 lbs. at 6c.	6 75				
Gain per acre	$ 3 00				

FIELD CROPS OF TURNIPS—*Concluded.*

Name of Variety, How Fertilized, Size of Plot.		Yield per Acre.		Yield per Acre.	
		Tons.	Lbs.	Bush.	Lbs.
Hartley's Bronze—(Pulled November 10).					
$\frac{1}{8}$ acre. Manure and fertilizer, 500 lbs. per acre		22	1,414	756	54
$\frac{1}{8}$ " " " 250 "		21	1,650	727	50
$\frac{1}{8}$ " " only		21	174	702	54
Cost per acre of 500 lbs. fertilizer at $30 per ton	$ 7 50				
Value per acre in crop over manure only, 54 bush. at 6c.	3 24				
Loss per acre	$ 4 26				
Cost per acre of 250 lbs. fertilizer at $30 per ton	$ 3 75				
Value per acre in crop over manure only, 24 bush. 56 lbs. at 6c.	1 50				
Loss per acre	$ 2 25				
Halewood's Bronze Top—(Pulled November 13).					
$\frac{1}{8}$ acre. Manure and fertilizer, 500 lbs. per acre		22	1,864	764	34
$\frac{1}{8}$ " " " 250 "		21	966	716	06
$\frac{1}{8}$ " " only		19	1,968	666	18
Cost per acre of 500 lbs. fertilizer, at $30 per ton	$ 7 50				
Value per acre in crop over manure only, 98 bush. 6 lbs. at 6c.	5 89				
Loss per acre	$ 1 61				
Cost per acre of 250 lbs. fertilizer at $30 per ton	$ 3 75				
Value per acre in crop over manure only, 49 bush. 48 lbs. at 6c.	2 99				
Loss per acre	$ 0 76				

EXPERIMENTS WITH MANGELS AND SUGAR BEETS.

Ten varieties of mangels and four varieties of sugar beets were sown in uniform test plots, in duplicate lots two weeks apart.

The land chosen for this experiment was a light clay loam with some sand, in a very moderate state of fertility, the previous crop having been potatoes. This was ploughed in the fall and, having been well cultivated in the spring, 20 one-horse cart-loads of barn-yard manure per acre were spread on the surface and ploughed under. This was again well cultivated, and complete fertilizer (Bowker's Square Brand) at the rate of 500 lbs. per acre sown broadcast and harrowed in. The land was run into rows 24 inches apart and the first series of plots were sown May 25. Owing, we believe, to the extremely cold and wet weather, this series of plots started very badly, in fact but few plants came up until three or four weeks after sowing, when it was considered advisable to harrow up this crop and replant. In the meantime the series of plots that will hereafter be termed '1st sowing' were sown June 8. These started fairly well. A duplicate plot was sown June 22. This was planted with a Planet Jr. seed drill in bunches 12 inches apart in the rows, and from four to six seeds in each bunch, and, later on, thinned out, leaving one plant in each spot. This crop was pulled October 20, and the yield calculated in each case from the weight of roots gathered from two rows, each 66 feet long.

The following are the results obtained:—

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	Prize Mammoth Long Red	21	570	709	30	13	1720	462	..
2	Mammoth Long Red	20	1910	698	30	13	1225	453	45
3	Gate Post	20	755	679	15	15	360	506	..
4	Yellow Intermediate	19	1105	651	45	16	1660	561	..
5	Giant Yellow Intermediate	18	1620	627	..	15	1845	530	45
6	Mammoth Red Intermediate	17	815	580	15	11	770	379	30
7	Half Long Sugar White	16	835	547	15	14	1040	484	..
8	Crimson Champion	15	1350	522	30	13	730	445	30
9	Giant Yellow Globe	14	1535	492	15	12	915	415	15
10	Selected Yellow Globe	13	1735	462	15	11	935	382	15

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	Vilmorin's Improved	16	505	541	45	11	1760	396	..
2	Jumbo	15	1845	530	45	15	360	506	..
3	Wanzleben	12	90	401	30	11	110	368	30
4	French Very Rich	11	1430	390	30	10	615	343	45

EXPERIMENTS WITH CARROTS.

Six varieties of carrots were sown in uniform test-plots. These plots were alongside of, and sown under the same conditions as the mangel and sugar-beet plots. The following are the yields obtained:—

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	Improved Short White	21	1725	728	45	15	855	514	15
2	White Belgian	21	1100	718	20	14	545	475	45
3	Ontario Champion	20	1150	687	30	17	485	574	45
4	Giant White Vosges	18	465	607	45	17	1640	594	00
5	Half Long Chantenay	17	1475	591	15	15	380	506	20
6	Mammoth White Intermediate	16	175	536	15	11	1925	398	45

EXPERIMENTS WITH POTATOES.

Twenty-five varieties of potatoes were grown in uniform test plots. The land was a heavy clay from which soiling crops had been cut for the two previous seasons. Barn-yard manure at the rate of 20 loads per acre had been applied in the summer of 1907. This was ploughed in the fall of that year, well worked up, ploughed again in the spring of 1908, again worked up, and complete fertilizer (Bowker's Square Brand) at the rate of 400 lbs. per acre applied. It was run in rows 30 inches apart, and the sets planted one foot apart in the rows. The drills were harrowed down and rowed up twice before the plants came up. Bordeaux mixture (mixed with Paris green) was sprayed on three times during the season.

There was no blight or scab, but a considerable quantity of rot. The potatoes were planted June 13 and dug October 8. The yield per acre has been calculated from the crop obtained from two rows each 66 feet long.

The following are the yields obtained:—

Potatoes—Test of Varieties.

Number.	Name of Variety.	Total Yield per Acre.	Yield per Acre of Sound.	Yield per Acre of Rotten.	Yield per Acre of Market-able.	Yield per Acre of Unmarket-able.	Form and Colour.
		Bush. Lbs.	Bush. Lbs.	Bush. Lbs.	Bush. Lbs.	Bush. Lbs.	
1	Rochester Rose......	448 48	448 48	....	319 00	129 48	Oblong, Dark, Pink.
2	Everett............	444 24	422 24	22 00	277 12	167 12	Round, Flat, White.
3	Ashleaf Kidney......	424 36	411 24	13 12	308 00	116 36	" "
4	Money Maker.......	404 48	380 36	24 12	204 36	200 12	Long, White.
5	Empire State........	391 36	380 36	11 00	257 24	134 12	"
6	Reeves' Rose	389 24	380 36	8 48	224 24	165 00	Dark, Pink.
7	Vermont Gold Coin. .	380 36	378 24	2 12	283 48	96 48	Oval, White.
8	Vick's Extra Early ..	378 24	378 24	....	255 12	123 12	Long, White.
9	Dooley	376 12	376 12	....	286 00	90 12	Flat, Round, White.
10	Early Manistee	360 48	354 12	6 36	286 00	74 48	Oblong, Pink.
11	Holborn Abundance..	343 12	323 24	19 48	222 12	121 00	Round, White.
12	Canadian Beauty	332 12	314 36	17 36	173 48	158 24	Long, Pink.
13	Carman No. 1........	314 36	314 36	....	222 12	92 24	Flat, Round, White.
14	American Wonder....	310 12	310 12	....	189 12	121 00	Long, White.
15	Dreer's Standard.....	301 24	290 24	11 00	162 48	138 36	Round, White.
16	Burnaby Mammoth..	299 12	292 36	6 36	173 48	126 24	Long, Pink
17	Irish Cobbler...	297 00	297 00	....	180 24	116 36	Round, White.
18	Late Puritan........	290 24	283 48	6 36	178 12	112 12	Long, White.
19	Country Gentleman..	277 12	251 48	15 24	171 36	105 36	Oblong, Pink.
20	State of Maine.......	275 00	266 12	8 48	178 12	88 00	Round, White.
21	Uncle Sam.........	272 48	253 00	19 48	169 24	83 36	Oblong, White.
22	Early White Prize....	250 48	242 00	8 48	198 00	44 00	Long, White.
23	Morgan Seedling.....	239 48	226 36	13 12	132 00	94 36	Oblong, Pink.
24	Twentieth Century...	237 36	235 24	2 12	176 00	59 24	Oblong, White.
25	Dalmeny Beauty....	226 36	224 24	2 12	160 36	63 48	Round, White.

CLOVER EXPERIMENTS.

Experiments were again conducted this season, to determine the gain, if any, from growing clover with grain crops for the purpose of ploughing under the growth of clover made during the season, for the benefit of future crops. The ground chosen was the land on which similar clover experiments had been carried on for the past three seasons. The soil was a clay loam in a fair state of fertility. Three kinds of grain in twelve plots of one-fortieth acre each were grown, and each of these series of plots was treated in the same way. Six plots were seeded down at the time the grain was sown, June 20, and six plots with grain alone. These plots were sown in a similar manner last season, and those seeded to clover this year had been seeded to clover the previous season also, and those not seeded to clover this year had not been seeded to clover the previous year. No fertilizer had been used except the clover turned under. Each of the two previous years had a particularly light crop, both seasons being unsuited to clover growing.

CLOVER EXPERIMENTS.

No.	Name of Variety and how seeded.	Yield per Acre.	
	Pringle's Champlain Wheat—(Sown June 8. Cut Sept. 14th).	Bush.	Lbs.
1	Without Clover	13	40
2	With Clover	14	40
3	Without Clover	14	00
4	With Clover	17	40
	Odessa Barley—(Sown June 8th. Cut Sept. 1st).		
1	Without Clover	16	32
2	With Clover	22	24
3	Without Clover	21	32
4	With Clover	31	12
	Pioneer Oats—(Sown June 8th. Cut Sept. 11th).		
1	Without Clover	34	04
2	With Clover	45	10
3	Without Clover	44	24
4	With Clover	51	06

EXPERIMENTS WITH INOCULATED CLOVER AND ALFALFA.

Experiments were again conducted with clover and alfalfa, sown side by side, each treated and un-treated with nitro culture to determine the value to be derived from nitro culture as compared with untreated seed, and also to compare the value of clover and alfalfa as grown in this section. Four half-acre plots were used for this experiment, the land being in a rather poor state of fertility and not having previously had manure. These plots were sown June 20. No difference was found in the plots treated and untreated in either case. A small portion, running right across all four plots, that had received a dressing of air-slaked lime previously, showed a decided improvement over the other parts, indicating that, on this particular piece of land, the application of lime would probably have been beneficial. A poor stand was obtained on all the plots, and at date of writing the crop would appear to be entirely killed out. An extreme and prolonged drought immediately after this crop was sown, may account to some extent for the poor stand of both.

This experiment was duplicated in a small way in the season of 1907, with one-fortieth acre plots each, on clay soil in a good state of fertility, under-drained and with a good supply of humus. In this case both clover and alfalfa, treated and untreated, grew well and passed the winter fairly well, some parts of the plots being fairly good, while others were entirely killed out. This was cut three times in the season of 1908, giving a light crop at each cutting. In neither case were there any noticeably good effects from the use of the nitro culture.

EXPERIMENTS WITH RUN-OUT LAND.

With a view to determine the practicability of restoring land badly run-out, where a very limited amount of manure is available, this experiment was commenced in the season of 1906, on a field of 8 acres of heavy clay, with some little loam, particularly deficient in humus. This field had grown grain and been sown to grass sixteen years ago, since when it had been lying in so-called pasture, growing extremely little after the first few years. This field was practically a square block, and had been used for pasture, where animals had been getting the better part of their feed in the stables. Consequently the corner nearest the buildings received considerably more droppings from the cattle during this time than the opposite corner, at least they showed the two extremes in condition. With a view to making each plot as nearly equal in fertility as possible, the field was divided into eight parts of 1 acre each, and numbered 1 to 8. Nos. 1 and 8 being designated plot 1 (2 acres); Nos. 2 and 7 plot 2 (2 acres); Nos. 3 and 6 plot 3 (2 acres), and Nos. 4 and 5 plot 4 (2 acres).

On plot 1 no fertilizer was used, on plot 2, 300 lbs. complete fertilizer per acre was used. On plot 3, 600 lbs. complete fertilizer (Bowker's Square Brand) per acre was used, and on plot 4, 10 one-horse cart-loads of manure were used.

In the season of 1906, this field was sown with peas, oats and vetches mixed together and sown at the rate of 3 bushels per acre. They were allowed to grow until about August 1, when the entire crop was ploughed under. This was repeated in 1907. In 1908 (this season) it was sown with Waverley oats, Odessa barley and Prussian Blue peas, mixed together and sown at the rate of 3 bushels per acre, together with clover and timothy at the rate of 10 lbs. clover and 12 lbs. timothy seed per acre. This field has now the appearance of being in a fairly good condition for crop growing. The take of clover and timothy is quite good, and will be left for clover hay this following season, the intention being to continue growing crops of grain and clover hay alternately for a term of years, without any addition of fertilizer of any kind.

The yield obtained this season was as follows:—

No. of Plot.	How Fertilized.	Yield per Plot (2 acres).		Weight per Bush.
		Bush.	Lbs.	Lbs.
1	No fertilizer used	61	04	40
2	300 lbs. fertilizer per acre	78	08	40
3	600 " "	82	05	40
4	10 one horse cart loads manure	95	04	40

EXPERIMENTS WITH FERTILIZERS ON MARSH.

The land used for these experiments was the ordinary marsh (or dyke) soil on which hay (timothy and June grass) had been grown for at least ten years. It was ploughed the fall previous, well worked up and sown June 9, with oats, the variety used being 'Sensation,' at the rate of 3 bushels per acre. Two acres were used and numbered No. 1 and No. 2. On each acre was a series of 36 plots of one-thirty-sixth acre each.

On both acres the lime was used alike, air slaked, sown on the surface and harrowed in. On acre No. 1 all the fertilizers were sown separately on the surface and harrowed in. On acre No. 2, all fertilizers (excepting lime) were sown on the surface after seeding and not harrowed in.

The following were the results obtained:—

Size of Plot 1/36 Acre.	Fertilizer Per Acre.	Fertilizer Harrowed in Yield Per Acre.		Fertilizer not Harrowed in Yield Per Acre.	
No.	A.	Bush.	Lbs.	Bush.	Lbs.
1	3 casks lime, 100 lbs. muriate of potash	58	8	79	32
2	3 " 100 lbs. sulphate "	59	10	72	..
3	3 " 100 lbs. muriate of potash, 500 lbs. basic slag	63	18	80	16
4	3 " 100 lbs. sulphate " " "	72	18	70	32
5	3 " only	70	32	69	30
6	3 " 200 lbs. muriate of potash	64	20	75	6
7	3 " 200 lbs. sulphate "	50	28	74	4
8	3 " 200 lbs. muriate of potash, 500 lbs. basic slag	72	..	79	14
9	3 " 200 lbs. sulphate " 500 "	73	2	86	28
10	3 " 100 lbs. muriate " 500 lbs. bone meal	67	26	83	22
11	3 " 100 lbs. sulphate " 500 "	65	22	84	24
12	3 " only	74	22	85	26
	B.				
13	No lime, 100 lbs. muriate of potash	51	30	56	4
14	" 100 lbs. sulphate "	49	26	52	32
15	" 100 lbs. muriate " 500 lbs. basic slag	64	20	63	18
16	" 100 lbs. sulphate " 500 "	66	24	68	28
17	Check. No fertilizer used	61	14	55	2
18	No lime, 200 lbs. muriate of potash	63	18	64	20
19	" 200 lbs. sulphate "	62	16	72	..
20	" 200 lbs. muriate " 500 lbs. basic slag	67	26	73	2
21	" 200 lbs. sulphate " 500 "	66	24	74	22
22	" 100 lbs. muriate of potash, 300 lbs. bone meal	65	22	75	..
23	" 100 lbs. sulphate " 500 "	61	14	74	..
24	Check. No fertilizer used	69	30	75	24
	C.				
25	300 lbs. fertilizer, 100 lbs. muriate of potash	55	2	70	14
26	300 " 100 lbs. sulphate "	55	8	67	8
27	300 " 100 lbs. muriate " , 500 lbs. basic slag	63	18	73	20
28	300 " 100 lbs. sulphate " , 500 "	61	32	72	..
29	300 " only	67	18	69	30
30	300 " 200 lbs. muriate of potash	66	24	67	26
31	300 " 200 lbs. sulphate "	70	32	79	14
32	300 " 200 lbs. muriate " , 500 lbs. basic slag	76	8	80	16
33	300 " 200 lbs. sulphate " , 500 "	77	10	82	2
34	300 " 100 lbs. muriate " , 500 lbs. bone meal	76	26	82	20
35	300 " 100 lbs. sulphate " , 500 "	81	..	81	18
36	300 " only	84	24	83	22

FURTHER EXPERIMENTS WITH LIME AND COMMERCIAL FERTILIZERS ON MARSH OR DYKE LANDS.

This experiment, which has been carried on for the past two years, was repeated this season. The land was ploughed in the fall of 1907, and sown in the spring with Sensation oats. It was divided into 12 parts of one-twelfth acre each. Clover and timothy seed was sown at the rate of 10 lbs. clover and 12 lbs. timothy seed per acre on all the plots, while lime (air-slaked), and commercial fertilizer (Bowker's square brand) was applied as below.

EXPERIMENTS with Fertilizers on Marsh Land.

Size of Plot 1/10 Acre. No.	Fertilizers Per Acre.	Yield Per Acre. Bush.	Lbs.
1	3 casks lime, 800 lbs. basic slag	52	20
2	3 " 400 lbs. bone meal	62	28
3	3 " only	60	..
4	3 " 400 lbs. Bowker's fertilizer (square brand)	67	2
5	No lime, 800 basic slag	49	14
6	" 400 bone meal	59	22
7	Check, no fertilizer used	53	18
8	No lime, 400 lbs. Bowker's fertilizer (square brand)	63	30
9	6 casks lime, 800 lbs. basic slag	51	30
10	6 " 400 lbs. bone meal	61	02
11	6 " only	60	24
12	6 " 400 lbs. Bowker's fertilizer (square brand)	61	14

The casks of lime used were the ordinary casks in which lime is sold in this vicinity, weighing about 400 lbs. or 5 bushels.

CROP OF HAY on Marsh, 1908, where above Experiment with Fertilizers had been carried on in 1907.

	Fertilizers per Acre Used Previous Year, 1907.	Yield per Acre, Hay. Tons.	Lbs.
1	3 casks lime, 800 lbs. basic slag	2	1,280
2	3 " 400 lbs. bone meal	2	1,400
3	3 " only	2	1,000
4	3 " 400 lbs. Bowker's fertilizer (square brand)	2	1,075
5	No lime, 800 lbs. basic slag	2	776
6	" 400 lbs. bone meal	2	752
7	Check, no fertilizer used	1	1,816
8	No lime, 400 lbs. Bowker's fertilizer (square brand)	2	105
9	6 casks lime, 800 lbs. basic slag	2	980
10	6 " 400 lbs. bone meal	2	1,040
11	6 " only	2	440
12	6 " 400 lbs. Bowker's fertilizer (square brand)	1	1,720

SPECIAL EXPERIMENTS WITH FERTILIZERS.

Experiments having been carried on for five years previous to 1904, without any change of fertilizer per plot for the entire period, it was decided to discontinue the use of fertilizers, with a view to determine to what extent the fertilizers already applied would continue to supply plant-food for the crop.

The field was seeded to grain, two series of plots each, oats, barley, wheat, peas and mixed grain; each series running across the various plots where different fertilizers had been used. With each kind of grain was sown Mammoth Red clover at the rate of 10 lbs. per acre; on the other series of plots the grains were sown alone without clover. This was the fifth crop since receiving any fertilizer. The ground was ploughed in the spring and cultivated thoroughly. The plots were one-eighth of an acre each. The following yields were obtained from these plots:—

SPECIAL Experiments with Fertilizers.

	Fertilizer Used each Year per Acre Previous to 1904.	SENSATION OATS.				PRINGLE'S CHAMPLAIN WHEAT.				LOGAN BARLEY.				MIXED GRAIN.			
		With Clover.		Without Clover.		With Clover.		Without Clover.		With Clover.		Without Clover.		With Clover.		Without Clover.	
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush	Lbs.	Bush.	Lbs.
1	Manure, 30 tons	52	32	66	06	25	00	24	10	52	04	50	00	37	20	57	20
2	Manure, 15 tons ; fertilizer, 250 lbs.	67	22	67	22	16	40	18	20	47	44	35	20	45	00	52	20
3	Complete fertilizer, 1,000 lbs.	60	10	58	28	18	20	17	30	37	44	37	44	50	00	42	20
4	" 500 lbs.	58	28	55	30	13	20	17	30	35	20	33	16	47	20	45	00
5	Check, no fertilizer used.	52	32	47	02	12	30	20	00	31	12	29	08	43	30	37	20
6	Bone meal, 1,000 lbs.	47	02	45	20	11	40	13	20	29	08	27	04	42	20	41	10
7	" 500 lbs.	50	00	48	18	17	30	11	40	28	06	20	40	41	10	38	30
8	Ashes, 2,500 lbs.	61	26	52	32	18	20	15	50	35	20	25	00	36	10	30	00
9	Manure, rotted, 20 tons	47	02	44	04	20	00	17	10	38	26	29	08	45	00	40	00
10	Check, no fertilizer used.	38	08	35	10	10	00	7	30	32	44	22	44	35	00	37	20
11	Land plaster, 500 lbs.	50	00	48	18	15	60	9	10	25	00	27	04	38	30	35	00
12	Salt, 500 lbs.	58	28	54	14	15	50	11	40	30	10	29	08	32	20	33	30
13	Marsh mud, 100 tons	66	06	55	30	16	40	10	50	29	33	31	12	47	20	40	00
14	Manure, green, 20 tons	69	04	61	26	20	00	15	50	39	28	35	20	52	20	50	00

HAY CROP.

The hay crop was unusually good both on upland and marsh, the season being quite suitable. Thirty-three acres on upland, yielded 67 tons 975 lbs.; 32 acres on marsh yielded 60 tons 950 lbs.

SUMMARY OF CROPS GROWN, EXCLUSIVE OF UNIFORM TEST PLOTS OF GRAIN AND POTATOES.

Hay.

	Tons.	Lbs.
Upland hay	67	975
Marsh hay	60	950
	127	1,925

Grain.

	Bush.	Lbs.	Lbs.
Mixed grain	613	21	24,541
Oats	962	21	32,729
Barley	61	24	2,952
Buckwheat	73	..	3,504
			63,726

Turnips.

	Bush.	Lbs.	Tons.	Lbs.
Turnips (field crop)	4,298	43	128	1,923
Turnips (test plots)	128	40	3	1,720
	4,427	23	132	1,643

Mangels.

	Bush.	Lbs.	Tons.	Lbs.
Mangels (test plots)	65	10	1	1,920

Corn.

	Tons.	Lbs.
Corn (field crop)	48	1,625
Corn (test plots)	6	960
	55	585

GRAIN AND POTATO DISTRIBUTION.

As in past years, grain and potatoes were distributed to farmers on application. The following number of 3-lb. sample bags were sent to the various applicants:—

Oats	240
Barley	54
Wheat	80
Buckwheat	40
Potatoes	329
Total	743

HORSES.

No change has been made in the number of horses in the past year. All are in good condition, and consist of three teams of draft horses, one express horse and one driver.

CATTLE.

The stock, at present, consists of 53 grade Shorthorn steers and one grade Shorthorn milch cow.

The steers were purchased in November and put under experiment on November 16. After fasting over night, and before receiving any feed on the morning of the 16th, they were weighed and found as stated below. They are still on hand, having been under experiment 135 days to date, March 31. They are expected to be ready for market in the latter part of May or first of June.

They were fed large quantities of roots and clover hay at first, with a view to getting them in proper condition to make the best use of meal feeds, and were freed as to lice and dirt.

No meal was fed for the first three weeks, after which they began to receive one pound per day, which was increased from month to month, at the same time decreasing the quantity of roots, until at the finish they will receive seven pounds of meal per day per steer, a few pounds of corn ensilage (instead of roots), and all the hay they will eat, about 15 lbs. each per day.

	Lbs.
Total live weight of 53 steers, Nov. 16, 1908..	56,400
Total live weight of 53 steers, March 31, 1909..	66,420
Increase..	10,020
Average daily gain per steer..	1·40

COMPLETION OF STEER FEEDING EXPERIMENT OF 1908.

Finished since last Report.

On making my report to March 31, 1908, the 68 steers under experiment were still on hand. The following is a continuation and conclusion of said experiment:—

Experiment with Steers, 1908, Unfinished in last Report.

	Lbs.
Total live weight of 68 steers, Nov. 16, 1907..	67,875
Total live weight of 68 steers, March 15, 1908..	78,355
Increase to March 15, 1908..	10,480
Total live weight of 68 steers, April 30, 1908..	81,785
Increase to April 30, 1908 (total)..	13,910

Financial Results.

Original weight of 68 steers, 67,875 lbs., at 4²⁶⁄₁₀₀c. per lb.	$2,891 47
Weight at finish, 68 steers, 81,785 lbs., at 5⁸⁵⁄₁₀₀c. per lb..	4,784 42
Balance..	$1,892 95
Cost of feed for lot 165 days..	1,570 80
Net profit..	$ 322 15

Daily rate of gain per steer. 1·23 lbs.
Cost of 1 lb. gain, 11·20 cents.
Cost of feed per day per steer, 14 cents.
Profit per steer, $4.73.

SHEEP.

Sheep are not kept in large numbers, only 23 being now in the pens. Two breeds are kept, namely, Shropshires and Leicesters, and their grades.

There are 11 Shropshires, as follows: 10 aged ewes and 1 ewe lamb.

There are 7 Leicesters, as follows: 6 aged ewes and 1 aged ram.

There are also 4 aged grade ewes and 1 grade ewe lamb.

Owing to the small area of pasture the flock has not been materially increased, only the desirable ewe lambs have been kept, the others were sold.

POULTRY.

The breeds of poultry on the farm consist of Barred Plymouth Rocks, White Wyandottes, White Leghorns, Black Minorcas and Buff Orpingtons.

The pens are made up as follows:—

	Cocks.	Hens.
8 B. P. Rocks	704	88
W. Wyandottes	1	4
W. Leghorns	1	10
Blk. Minorcas	1	6

The number of eggs laid by the different breeds during the year is as follows:—

	Eggs.	Average.
8 B. R. Rocks	704	88
4 W. Wyandottes	300	75
6 W. Leghorns	444	74
3 Blk. Minorcas	210	70
4 B. Orpingtons	268	67

BEES.

This past winter the bees did not do well. The mild weather in the early winter kept the temperature of the cellar above 50° until February, causing more or less disturbance among the bees, producing dysentery, with which all hives were more or less affected, and forcing us to put them on their summer stands at the first opportunity. This was done on March 24, one month earlier than is usual with us. Abundant stores were in most of the hives, yet, although containing a good number of bees when put out, during the latter part of April and May, a great many bees died, leaving us ill-prepared to take advantage of one of the best clover seasons we have had in Nova Scotia for many years, the month of July being especially fine bee weather. From five hives, spring* count, 210 lbs. honey was sold and some kept on hand to stimulate the bees at brood-rearing time, if needed.

To gather some data on the difference between wintering bees on the coarser honeys stored by them in the fall, compared with sugar syrup, six colonies were experimented on for this purpose.

Three colonies were left alone with their own stores, and three colonies had their stores extracted and had sugar syrup fed them, by a Miller feeder.

At the present time, March 31, all colonies are quiet, and notes will be taken on the effect of the different feeds during the early spring and brood-rearing time.

On a bright mild day in early March, the colonies were all taken from the cellar and given a cleansing flight and put back in the cellar the same day.

APPLES.

Last season proved favourable for fruit trees. The absence of spring frosts was followed by a good setting of fruit, and the open fall assisted in the ripening of the late varieties. The apple crop on the farm was a fairly good one, the fruit was clean, well coloured and of good size, especially the winter varieties.

* Not mentioned above.

STRAWBERRIES.

The strawberry plants came through the winter well and a fair crop of fruit was picked.

The size of the plots of each variety was 16½ x 5 feet.

Following are the yields from 20 of the most productive varieties:—

Variety.	Dates when Picked and Yield.					Yield per Plot.	Yield per Acre
	July 4.	July 8.	July 11.	July 14.	July 23.		
	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.
John Little	3	7	12	6	2	30	15,840
Clyde	....	8	13	7	1	29	15,312
Pocomoke	1	6	9	10	....	26	13,728
Princess	3	7	11	2	2	25	13,200
Swindle	....	2½	7	10	4	23½	12,408
Capt. Jack	....	6	11	6	....	23	12,144
Beder Wood	3	8	9	2	1	23	12,144
Warfield	3	10	7	3	....	23	12,144
Hood River	2	5	11	3	1	22	11,616
Crescent	3	6	10	1½	1½	21	11,088
James Vick	....	2	8	7	2	19	10,032
Sen. Dunlap	4	7	4	2	1½	18½	9,768
Beverly	½	4	7	6	1	18½	9,768
Glen Mary	1	5½	6	5	1	18½	9,768
H. W. Beecher	....	6	6	5	1	18	9,504
Williams	....	3	5½	4	4½	17	8,976
Parker Earle	1	6	6	3	1	17	8,976
Bomba	4	6	3	4	....	17	8,976
Lovett	1	4	7	4	1	17	8,976
Barton	½	4	8	4½	....	17	8,976

GARDEN PEAS.

Ten varieties of what we consider the best garden peas were sown in plots each 33 feet long by 2½ feet wide. The seed was sown in rows 2½ feet apart, 2 inches deep and 2 inches apart in the rows. As each variety became ready for use the date was recorded and the yields of green pods from the several pickings entered.

The yields were as follows:—

Variety.	Date of Picking and Yields.				Total Yield from Plots.	
	August 7.		August 14.			
	Lbs.	Ozs.	Lbs.	Ozs.	Lbs.	Ozs.
Prosperity	11	8	3	0	14	8
Gradus	12	0	1	8	13	8
Thomas Laxton	10	8	2	8	13	0
Champion	9	4	3	4	12	8
Station	9	8	2	0	11	8
Telephone	9	6	4	0	13	6
American Wonder	10	4	3	0	13	4
Stratagem	10	8	1	8	12	0
Earliest of All	8	0	3	0	11	0
Notts Excelsior	7	8	2	8	10	0

GARDEN BEANS.

On June 9 six varieties of beans were planted in rows 36 feet long, dropped 2 inches apart in the row. A duplicate plot of each variety was planted and allowed to ripen.

The following yields of green beans were obtained:—

Variety.	Date of Picking and Yields.						Total Yield from Plots.	
	Aug. 5.		Aug. 10.		Aug. 18.			
	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.
Golden Skinless	12	0	3	8	2	8	18	0
Dwarf Wax	10	8	4	0	1	0	15	8
" Matchless	11	0	4	0	2	8	17	8
" Extra Early	10	8	2	4	1	0	13	12
Fame of Vitry	10	0	4	0	3	8	17	8
Emperor of Russia	8	0	4	0	2	0	14	0

TOMATOES.

The seed for the test plots was sown in the hot-bed on March 30. The plants were transplanted to strawberry boxes on April 24, and planted in the open, 4 feet apart each way, on June 6. There were 20 varieties planted and eight plants of each used.

The yields were as follows:—

Number.	Variety.	Ripe Fruit.	Green Fruit.	Yield per Plot.
		Lbs.	Lbs.	Lbs.
1	Spark's Earliana (C.E.F.)	188¼	185½	373¾
2	Earlibelle	162¾	186	348¾
3	First of All	131	131	262
4	Ponderosa	87	171	258
5	Chalk's Early Jewel	53½	203½	257
6	Earliana	99	156	255
7	Early Atlantic Prize	47½	199	246½
8	Imperial	66¾	177½	244¼
9	Golden Queen	47	186	233
10	Spark's Earliana (Graham Bros.)	117	107¼	224¼
11	Early Hustler	83	141	224
12	Perfection	30½	145½	176
13	June Pink	58¾	114	172¾
14	Success	29	127	156
15	Livingstone's Globe	52¼	97	149¼
16	Plentiful	44	100	144
17	Beefsteak	62	72	134
18	Beauty	30	104	134
19	Dwarf Champion	31	85	116
20	Mikado	31	65	96

CORRESPONDENCE.

During the year 2,965 letters were received and 2,700 sent out, exclusive of reports and circulars mailed with samples of grain.

AGRICULTURAL MEETINGS.

During the year I attended and delivered addresses at the following meetings:—

Sussex Dairy School, April 1 to 3, 1908; Caledonia, N.S., April 8, 1908; Kempt, N.S., April 9, 1908; Maitland, N.S., April 9, 1908; W. Caledonia, N.S., April 10, 1908; Brookfield, N.S., April 11, 1908; Greenfield, N.S., April 13, 1908; Pleasant River, N.S., April 13, 1908; New Germany, N.S., April 14, 1908; Barss Corner, N.S., April 14, 1908; Bridgewater, N.S., April 15, 1908; Hebeville, N.S., April 15, 1908; Blockhouse, N.S., April 16, 1908; Middle Stewiacke, N.S., June 29, 1908; Norton, N.B., July 9, 1908; Middleton, N.S., December 15 to 17, 1908; Pugwash, N.S., December 21, 1908; Wallace Bay, N.S., December 22, 1908; Fox Harbour, N.S., December 23, 1908; Middleboro, N.S., December 24, 1908; Summerside, P.E.I., March 9 to 12, 1909; Fredericton, N.B., March 17 to 20, 1909; Sussex Dairy School, March 22 to 25, 1909; Chatham, N.B., March 26 to 29, 1909.

I also travelled with the Scotch Agricultural delegation from August 14 to 22, 1908.

EXHIBITIONS.

An exhibit of farm products was made at the N. S. Provincial Exhibition at Halifax, at the Chatham Exhibition, Chatham, N.B., and also at the P.E.I. Exhibition at Charlottetown. I also attended the Musquodoboit Agricultural Society's Exhibition, the Pictou County Exhibition, the Antigonish Agricultural Society's Exhibition, the Sackville and Westmoreland County Exhibition and the Kentville Exhibition.

VISITORS.

The usual round of visitors, in groups varying in number from a few to 500 or 600 visited the farm during the past summer.

I have the honour to be, sir,

Your obedient servant,

R. ROBERTSON,

Superintendent.

EXPERIMENTAL FARM FOR MANITOBA

BRANDON, March 31, 1909.

DR. WM. SAUNDERS, C.M.G.,
Director of Experimental Farms,
Ottawa.

SIR,—I have the honour to present herewith the twenty-first annual report of the Experimental Farm for Manitoba at Brandon, giving the results of experiments undertaken during the past year.

The winter of 1907-8 in Manitoba, was one of the mildest on record. The weather in the fall continued mild and open until about the first of December, and, although during that month the temperature dropped below zero on several occasions, the weather was particularly pleasant and free from storms. January gave us the only severe weather of the winter, when, for a week, the temperature varied from 18° to 46° below zero. The snowfall was usually light, and there was scarcely a continuous ten days of good sleighing all winter.

Spring opened about the first of April, and, the light snowfall being general throughout the west, there was an absence of floods and the land dried off rapidly. Work on this farm started on April 13, but in some parts of the province it was general nearly a week earlier. Seeding conditions have seldom been more favourable in Manitoba than they were in 1908. There was an abundance of moisture to start germination, the soil warmed up immediately, and occasional showers maintained a strong healthy growth. Throughout April and May the crop prospects could not have been brighter, and they continued so in some districts until well into the summer. In other parts, very little rain fell for two months after seeding, and the crop was seriously affected. Throughout Manitoba, the yields of wheat, oats and barley, the principal crops, were well up to the average of recent years. In some of the northern districts considerable damage was done by early frosts, but this was not serious except in limited areas. The first frost to be registered here was on August 14, when two degrees was recorded. There was no perceptible damage done except to corn on low land, and to some of the tenderest garden plants. On August 22, the temperature fell to 29 degrees, but again there was very little damage done. Some of the latest wheat showed a little sign of frost, probably received on this date, but the injury was very slight. After this date the weather got much warmer, and during the first half of September, unusually high temperatures prevailed with no further frost until September 23, when we had nine degrees. By this time all crops were safe from danger. During harvest and the early part of the threshing season, the weather was ideal, and most of the crops were harvested in excellent condition. Even smutty grain was very little tainted, as the grain was in such excellent condition when threshed.

On the Experimental Farm, harvest started on August 11, three weeks earlier than the year previous. Most crops were not as heavy as in 1907, but were harvested with less expense and were quite satisfactory. The unusually warm weather experienced just as grain was starting to ripen, no doubt reduced the yield considerably and in some cases injured the quality.

Late fall weather was open and the ground being well supplied with moisture in Manitoba more than the usual amount of fall ploughing was done. The year throughout has been a good one for the Manitoba farmer; the yield of grain has been well up to the average, the season was favourable to securing it in good condition, and prices for all classes of grain were highly satisfactory.

EXPERIMENTS WITH WHEAT.

Sixteen varieties of wheat were sown April 18, on uniform plots of one-twentieth of an acre each. The land was a clay loam, summerfallowed in 1907, and in excellent condition at the time of sowing. The grain was sown at the rate of one and a half bushels per acre. Weather and soil conditions were ideal throughout most of the growing season, and an excellent growth was the result, with very little rust, no smut, and very little lodging.

Several varieties are included this time for the first year. Marquis and Chelsea are cross-bred varieties that promise well as early wheats of good quality. Minnesota No. 188 is a strain of Preston that has given particularly good results in Minnesota. Registered Red Fife is a strain of Red Fife that has been selected for seven years by a member of the Canadian Seed Growers Association.

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.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after Cleaning.	Rusted.
					In.		In.		Lbs.	Bush.	Lbs.	Lbs.	
1	Marquis	Aug.	12	116	41	Stiff	3¼	Bald	4,550	49	10	64½	Very slightly.
2	Chelsea	"	12	116	42	Fair	3½	"	4,170	45	30	61½	Slightly.
3	Preston	"	13	117	45	Stiff	3½	Bearded	4,990	45	10	61	Considerably.
4	Red Fife II	"	18	122	38	"	3	Bald	4,610	41	30	63	Very slightly.
5	Registered Red Fife	"	18	122	38	"	3¼	"	5,150	40	50	61	"
6	Bishop	"	14	118	46	"	3½	"	4,700	40	..	60	Slightly.
7	White Russian	"	19	123	42	"	3¾	"	4,840	39	20	61	"
8	White Fife	"	20	124	41	"	3¼	"	5,030	37	50	62½	"
9	Huron	"	12	116	43	"	3½	Bearded	4,930	37	50	59½	Considerably.
10	Percy A	"	15	119	47	"	3½	Bald	4,740	37	40	59	"
11	Pringle's Champlain	"	13	117	38	"	3¼	Bearded	4,850	37	30	61	Slightly.
12	Stanley	"	16	120	47	"	3½	Bald	4,270	37	10	59	Considerably.
13	Red Fern	"	15	119	46	Fair	3½	Bearded	4,990	36	50	62½	"
14	Riga	"	14	118	45	Stiff	3	Bald	4,210	36	30	60	Slightly.
15	Minnesota 188	"	14	118	42	"	3½	Bearded	4,440	36	..	59	Considerably.
16	Hungarian White	"	13	117	40	"	3	"	4,830	34	30	61	"

WHEAT—TEST OF VARIETIES.

AVERAGE OF FIVE YEARS.

Following is a list of a number of the leading varieties of wheat and their average yield on this farm for the past five years.

Variety.	Average Days Maturing.	Average Yield per Acre.	
		Bush.	Lbs.
Preston	122	42	18
Red Fife	125	41	30
Huron	120	39	54
White Fife	126	38	52
Pringle's Champlain	122	37	56
Stanley	121	35	56
Percy	121	35	42
White Russian	124	35	20
Red Fern	122	30	52

STANDARD AND COMMERCIAL GRADES OF WHEAT.

There is, every year, a proportion of the grain of this province that, if sold, grades low, and in consequence the price is greatly reduced. On account of the small price that it will bring on the market, there is always a temptation to use the low-grade grain for seed and sell the grain of good quality, as there is an opinion, still quite prevalent, that badly frozen grain, or grain that for other reasons grades low, makes almost, if not quite as satisfactory seed as high-class grain.

In order to get some more definite information on this matter, seed of all the commercial grades was secured from the Chief Grain Inspector, Winnipeg, and sowings were made of each under uniform conditions. The conditions for growth, as regards weather and soil, were ideal, and the results that we secured this year may be considered as representing what might be expected under the most favourable conditions. There was a marked difference in yield between the No. 1 Hard and No. 2 Feed—the two extremes. Experiments of this kind require to be conducted for several years before the results are of much value, and it will, therefore, be repeated before drawing any definite conclusions.

EMMER AND SPELT.

These wheats which are unsuitable for milling, but are used to a limited extent as feed for stock, have been grown here for a number of years. The average yield for the last four years of Common Emmer was 3,405 lbs. per acre; Red Spelt, 2,655 lbs.; Red Emmer, 2,552 lbs.; while White Spelt produced only 1,955 lbs. The grain grown through the country by the name of Spelt or Speltz, is, properly speaking, Common Emmer, by far the best of this class of wheats. Common Emmer alone was grown this year on the Experimental Farm, the yield being at the rate of 2,210 lbs. of grain per acre.

SMUT PREVENTIVES.

During the past twenty years, various chemicals have been tested to secure one for the prevention of smut in grain crops. Little difficulty has been experienced in controlling this disease in wheat or oats, but no practicable method has yet been introduced that will entirely prevent it in barley. The formalin treatment has been found, after numerous trials, to be highly satisfactory. Formalin can now be secured almost everywhere; it is inexpensive, the solution is easily prepared, and its efficiency, when properly applied, is beyond doubt. One pound of formalin is sufficient to make thirty-two gallons of solution, and this quantity will easily cover forty bushels of wheat, or about twenty-eight of oats. Dipping and sprinkling have given equally good results, but carelessness in either method of treatment is sure to bring disappointment.

Bluestone has also been found effective as a re-agent for destroying smut, but its use has not been attended with quite as satisfactory results as formalin. A bluestone solution of the proper strength is prepared by dissolving one pound of bluestone in six gallons of soft water. As with the formalin solution, it makes no difference how this solution is applied so long as every kernel of grain is thoroughly moistened.

Other treatments that have been on trial as preventives of smut include those with sulphide of potassium, sulphate of iron, agricultural bluestone, massel powder, anti-fungi, salt, and hot water. None of these have proven to be nearly as effectual as either formalin or bluestone. The hot water treatment and sulphide of potassium both effectively prevented the disease, but the methods of application are too tedious to permit of either treatment coming into general use. Agricultural bluestone and anti-fungi are both mixtures of copper sulphate and iron sulphate, and their effectiveness is dependent upon the proportion of sulphate of copper that they contain, sulphate of iron being of little value as a fungicide.

The wheat that was used in the tests this year was not very smutty, and even the untreated grain shows a very small proportion of smut.

Following are the results of this year's tests:—

Treatment.	Smutty Heads in 9 sq. feet.	Good Heads in 9 sq. feet.	Yield per Acre.	
			Bush.	Lbs.
Formalin dipped	none	490	40	10
" sprinkled	"	566	40	20
Bluestone dipped	"	499	39	20
" sprinkled	"	495	38	50
Anti-Fungi dipped	"	405	38	50
Not treated	4	492	38	50

FIELD CROPS OF WHEAT.

Variety.	Number of Acres.	Preparation of Land.	Days Maturing.	Yield per Acre.		Total Yield.	Weight per Bushel.
				Bush.	Lbs.	Bush.	Lbs.
White Fife	4·43	Fall ploughing	102	31	36	140	63
Percy	3·	"	99	27	20	82	60¾
Stanley	4·78	Summerfallow	115	27	12	130	59
Red Fife (1)	9·71	"	123	35	32	345	60
" (2)	4·43	"	123	29	21	130	....
Preston (1)	6·1	"	117	35	15	215	61¼
" (2)	12·	Fall ploughing	117	24	..	288	....
Pringle's Champlain.	4·83	Summerfallow	119	36	13	175	58

EXPERIMENTS WITH OATS.

Twenty-six varieties of oats were grown under uniform conditions on plots of one-twentieth of an acre. Although good yields were secured, they would have been greater but for the extremely hot weather experienced during the ripening season.

The Registered Banner oats were secured from a member of the Canadian Seed Growers Association who had been selecting them for eight years.

The seed was sown May 7, on clay loam summerfallowed in 1907.

OATS—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.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
					In.		In.		Lbs.	Bus.	Lbs	Lbs.	
1	Registered Banner...	Aug.	19	104	53	Stiff....	9½	Branching	4,135	119	19	36	Very slightly.
2	White Giant......	"	18	103	48	"	8½	" ..	3,935	116	21	35	"
3	Danish Island......	"	19	104	50	"	9	" ..	4,295	115	15	36	Slightly.
4	Improved American.	"	17	102	49	"	8	" ..	4,775	115	15	35	Very slightly.
5	Banner..........	"	19	104	51	"	9	" ..	5,250	113	33	36	"
6	Irish Victor.........	"	18	103	49	"	7½	" ..	4,325	111	1	35	Considerably.
7	Abundance..........	"	19	104	49	Fair....	8	" ..	4,575	109	19	36½	Very slightly.
8	Lincoln............	"	17	102	48	"	7½	" ..	4,235	107	27	37½	"
9	Siberian...........	"	21	106	48	"	8½	" ..	4,135	107	27	35½	Slightly.
10	Wide Awake........	"	18	103	48	Stiff....	8	" ..	3,985	106	11	37	Very slightly.
11	Twentieth Century..	"	18	103	48	"	7½	" ..	4,715	105	15	38	"
12	American Triumph..	"	18	103	49	Fair....	8½	" ..	4,535	104	29	35½	"
13	Virginia White......	"	18	103	49	Stiff....	8	" ..	3,935	104	29	39	Slightly.
14	Goldfinder.........	"	29	114	50	"	8½	" ..	4,420	102	12	35½	Badly.
15	Improved Ligowo...	"	16	101	49	Fair....	8	" ..	4,095	100	5	39	Very slightly.
16	Golden Beauty......	"	26	111	48	Stiff....	8	" ..	3,460	98	8	37	Slightly.
17	Kendal White.......	"	20	105	58	Weak....	9	" ..	3,960	98	8	37	Considerably.
18	Thousand Dollar....	"	17	102	51	Fair....	8	" ..	3,975	97	27	39	Very slightly.
19	Daubeney..........	"	10	95	44	Stiff....	7	" ..	2,685	97	17	37½	Slightly.
20	Swedish Select......	"	18	103	49	Fair....	7½	" ..	4,195	97	7	40½	Considerably.
21	Joanette...........	"	21	106	43	Stiff....	8	" ..	4,340	95	30	36	Very slightly.
22	Pioneer...........	"	20	105	51	"	9	" ..	4,080	94	24	38	Considerably.
23	Storm King.........	"	18	103	49	"	8	Sided....	5,580	91	26	40½	Very slightly.
24	Tartar King.........	"	17	102	47	Fair....	8	"	2,785	91	21	40½	"
25	Golden Giant........	"	30	115	53	"	11	"	4,330	90	10	30	Badly.
26	Milford White......	"	20	105	46	"	8½	"	4,150	89	24	35½	Slightly.

FIELD CROPS OF OATS.

Variety.	No. of acres.	Preparation of Land.	Yield per acre.		Total Yield.	
			Bush.	Lbs.	Bush.	Lbs.
Banner (1)....................	4·41	Summerfallow........	86	29	383·	
" (2)......................	8 42	"	70	10	592·	
" (3)......................	8·16	"	77	15	632·	
Goldfinder................. ...	2·19	"	76	09	167·	
Daubeney................	2·56	Spring ploughing...........	70	24	181·	
Thousand Dollar.....	3 05	"	76	24	234·	

OATS—TEST OF VARIETIES.

AVERAGE YIELD FOR FIVE YEARS.

Following is a list of a number of the leading varieties of oats and their average yield on this farm for the past five years:—

Variety.	Average days Maturing.	Average yield per acre.	
		Bush.	Lbs.
Improved American	109	123	39
Banner	110	122	3
White Giant	109	118	15
Danish Island	110	117	15
Golden Beauty	112	116	18
Goldfinder	113	114	10
Siberian	111	113	31
Abundance	110	113	21
Golden Giant	114	113	18
Lincoln	109	112	29
American Triumph	110	112	3
Wide Awake	110	110	13
Daubeney	96	86	32

Daubeney is a particularly early variety, ripening usually about two weeks earlier than Banner. It is particularly adapted to late districts or sowing late in the season. It is a white oat with a very thin hull, but the average yield is considerably below that of many other sorts.

EXPERIMENTS WITH BARLEY.

The season was a favourable one for barley and good crops of good quality were secured. The yield from the two-rowed varieties was scarcely up to the average, as these were just ripening during our very warm weather, while the six-rowed varieties were ripe earlier, and the yield was not affected to the same extent by the excessive heat.

Fourteen varieties of six-rowed, and eleven varieties of two-rowed barley were sown May 26. The plots were one-twentieth of an acre each, the land being clay loam that had been summerfallowed in 1907.

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.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
					In.		In.		Lbs.	Bush.	Lbs.	Lbs.	
1	Odessa	Aug.	21	87	41	Fair	3	Bearded	3,360	61	12	50½	None.
2	Mensury	"	21	87	45	"	3	"	3,130	59	38	50½	Very slightly.
3	Blue Long Head	"	24	90	38	"	3	"	3,520	57	44	43	None.
4	Albert	"	20	86	38	"	3	"	2,970	56	42	52½	Very slightly.
5	Mansfield	"	22	88	39	"	2¼	"	2,670	56	42	49	None.
6	Yale	"	21	87	42	"	2¾	"	2,990	56	22	49½	Very slightly.
7	No. 21	"	22	88	46	Stiff	3	"	3,410	56	2	48	None.
8	Empire	"	20	86	43	Fair	2½	"	3,480	52	24	49½	Very slightly.
9	Claude	"	20	86	41	"	2½	"	2,290	52	14	47	"
10	Trooper	"	21	87	37	Stiff	2½	"	2,530	49	18	50	"
11	Stella	"	19	85	40	"	3	"	2,560	48	36	50	"
12	Nugent	"	20	86	40	Fair	2½	"	2,440	47	4	48¾	None.
13	Oderbruch	"	19	85	37	Weak	2¼	"	2,220	45	20	52	"
14	Champion	"	18	84	37	Stiff	2¾	Beardless.	1,940	32	24	45	"

Two-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.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.	
1	Swedish Chevalier.....	Aug. 26	92	40	Fair ...	4	Bearded..	3,200	54	8	51	None.
2	Danish Chevalier ...	" 28	94	36	" ...	$3\frac{3}{4}$	" ..	3,460	50	40	51	"
3	Standwell	" 27	93	42	Stiff.. ..	$2\frac{3}{4}$	" ..	3,120	49	28	$49\frac{1}{2}$	"
4	French Chevalier	" 25	91	46	" ...	$3\frac{3}{4}$	" ..	3,360	42	24	50	"
5	Canadian Thorpe......	" 24	90	38	" ...	3	" ..	2,590	41	42	$50\frac{1}{2}$	"
6	Gordon...............	" 26	92	44	" ...	3	" ..	3,500	41	32	$48\frac{1}{4}$	"
7	Beaver..........	" 25	91	40	Fair....	$3\frac{1}{2}$	" ..	2,500	41	22	$50\frac{1}{2}$	"
8	Sidney	" 24	90	43	Stiff....	$3\frac{1}{2}$	" ..	2,720	41	12	50	"
9	Clifford	" 24	90	45	" ...	3	" ..	3,030	36	42	$48\frac{1}{2}$	Very slightly.
10	Invincible........	" 25	91	40	" ...	3	" ..	5,160	36	12	$50\frac{1}{2}$	"
11	Jarvis	" 25	91	45	" ...	4	" ..	2,980	35	40	$48\frac{3}{4}$	None.

BARLEY—AVERAGE YIELD FOR FIVE YEARS.

Following is a list of a number of the leading varieties of barley and their average yield on this farm for the past five years.

Six-Rowed.

Variety.	Average Days Maturing.	Average Yield per Acre.	
		Bush.	Lbs.
Odessa	89	63	40
Yale	89	61	32
Mensury	88	61	22
Mansfield	89	60	22
Claude	89	59	42
Empire	89	58	38

Two-Rowed.

Variety.	Average Days Maturing.	Average Yield per Acre.	
		Bush.	Lbs.
Swedish Chevalier	94	60	24
Standwell	92	59	42
Jarvis	90	58	38
Danish Chevalier	92	57	26
Gordon	90	56	8
Canadian Thorpe	91	55	18

FIELD CROPS OF BARLEY.

Variety.	Number of Acres.	Preparation of Land.	Yield per Acre.		Total Yield.
			Bush.	Lbs.	Bush.
Odessa	9·33	Summerfallow	65	44	615
Mensury (1)	5·71	Sown on corn stubble	46	45	268
" (2)	8·31	Summerfallow	49	39	414

EXPERIMENTS WITH PEAS.

The pea crop at present is not given a place among the important grain crops of Manitoba, but it has merits which warrant its receiving more attention than it has hitherto been accorded. Being a leguminous crop, it is able, like the clovers, to utilize to a great extent, in its growth, the nitrogen of the air, and undoubtedly stores some of it in its roots. The root system, unfortunately, is not nearly so extensive as that of red clover or alfalfa, and the amount of vegetable matter left in the soil in the form of root fibre is, therefore, not so great as with these crops. It is, however, considerable. The pea crop does not draw heavily on the land, which is therefore left in good condition for the succeeding crop. There is now no difficulty in harvesting peas with the harvester attachment to the mower, and threshing is accomplished with the ordinary threshing machine.

The grain is very rich in protein and is unsurpassed as feed for hogs and cattle when fed in conjunction with other grains deficient in this constituent. Mixed with oats and fed to milch cows, it gives particularly good results, and as a producer of high quality of bacon it has few equals. The straw, if cut before fully ripe, is excellent for sheep feed, and does not collect in the wool to the same extent as the straw from other cereals.

Eighteen varieties were sown under uniform conditions on May 2, on one-twentieth of an acre plots. The soil was a clay loam summerfallowed in 1907, and the seed grown at the rate of from two to three bushels per acre, according to size of the pea.

PEAS—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	Paragon	Sept.	4	125	Rank	55	4720	2½	Medium	58		63¼
2	Mackay	"	2	123	Medium	51	4930	2¼	"	57	50	62½
3	Prince	"	5	126	"	48	4640	2¼	"	57	40	63
4	English Grey	"	7	128	"	52	4720	2½	"	56	20	61½
5	Early Britain	"	6	127	"	50	5330	2¼	Large	54	30	60¾
6	Gregory	"	3	124	Rank	60	4740	2½	"	52	40	62
7	Prussian Blue	"	2	123	Medium	54	4460	2½	Medium	52	20	63
8	Picton	"	4	125	"	50	4690	2¼	Small	51	50	63½
9	Victoria	"	9	130	V. Rank	66	5220	2½	Medium	51	20	63
10	Arthur	Aug.	31	121	Medium	48	3710	2½	"	49	50	63
11	Archer	Sept.	5	126	Rank	60	4900	2¼	Small	48	20	63½
12	Wisconsin Blue	"	3	124	Medium	54	4230	2¼	"	44	30	65
13	Chancellor	"	1	122	"	56	2560	2	"	44		65
14	Golden Vine	"	7	128	Rank	58	2820	2	"	41	20	65½
15	Daniel O'Rourke	"	6	127	"	60	3220	2	"	39	40	64½
16	Black-eye Marrowfat	"	13	134	V. Rank	71	6360	2½	Large	37	20	62½
17	Agnes	"	7	128	Medium	50	5310	2½	Medium	34	50	60½
18	White Marrowfat	"	12	133	V. Rank	73	4420	2½	Large	34	40	62

5094—p. 280.

Alsike Clover in Bloom. Second Crop of the Season, Experimental Farm, Brandon, Man., Aug., 1908. *Photo by C. E. Saunders.*

PEAS—TEST OF VARIETIES.

AVERAGE YIELD FOR FIVE YEARS.

Following is a list of a number of the leading varieties of peas and their average yield on this farm for the past five years.

Variety.	Average days maturing.	Average yield per acre.	
		Bush.	Lbs.
Mackay	130	56	58
Gregory	129	53	36
Early Britain	129	53	04
Prince	131	52	44
Picton	129	50	48
Arthur	124	50	46
Victoria	129	50	26
Paragon	126	50	23
Prussian Blue	123	48	02
English Grey	131	47	04

FIELD CROPS OF PEAS, 1908.

Variety.	Number of Acres.	Preparation of Land.	Days Maturing.	Yield per Acre.		Total Yield.	Weight per Bushel.
				Bush.	Lbs.	Bushels.	Lbs.
Arthur	2·47	Fall ploughing	127	25	55	64	63
Golden Vine	2·58	"	126	24	02	52	64
Daniel O'Rourke	1·85	"	130	31	53	59	62½

ROTATION EXPERIMENTS.

In 1899, some experiments were started to test the feasibility of eliminating the bare summerfallow from the system of farming in the province, by substituting the ploughing-down of some leguminous crop every third year. On account of the land where these tests were in progress being repeatedly flooded, the work of the first three years was lost, and these trials were started again in 1905. The following tables give the system of rotation, with the yields, and other particulars of the crop produced in 1908.

ROTATION TEST.

Number.	1906.	1907.	1908.
1	Wheat	Wheat	Peas.
2	"	Oats	Tares.
3	"	Wheat	Red Clover.
4	"	Barley	Alfalfa and Alsike.
5	"	Peas	Wheat.
6	Oats	Tares	"
7	Wheat	Red Clover	"
8	Barley	Alfalfa and Alsike	"
9	Peas	Wheat	"
10	Tares	"	Oats.
11	Red Clover	"	Wheat.
12	Alfalfa and Alsike	"	Barley.
13	Wheat	Summer fallow	Wheat.
14	Oats	" "	"
15	Barley	" "	"
16	Wheat	Oats	"
17	Barley	"	"

ROTATION TEST.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Days Maturing.	Length of Straw.	Yield per Acre.		Weight per Measured Bushel.
					In.	Bush.	Lbs.	Lbs.
1	*Peas							
2	*Tares							
3	*Red Clover							
4	*Alfalfa and Alsike							
5	Wheat, Red Fife H.	May 2	Aug. 24	114	41	33	25	60
6	" "	" 2	" 24	114	42	32	55	60
7	" "	" 2	" 24	114	45	33	5	60
8	" "	" 2	" 23	113	39	34	30	60
9	" "	" 2	" 24	114	41	27	10	60
10	Oats, Banner	" 7	" 22	107	43	57	22	40
11	Wheat Red Fife H.	" 2	" 24	114	42	24	15	60
12	Barley, Mensury	June 1	" 25	85	36	41	42	48
13	Wheat, Red Fife H.	May 2	" 24	114	40	35	35	60
14	" "	" 2	" 24	114	43	35	45	60
15	" "	" 2	" 24	114	43	36	25	60
16	" "	" 2	" 23	113	37	23	55	60
17	" "	" 2	" 24	114	36	24	15	60

*Ploughed under in August.

EXPERIMENTS WITH INDIAN CORN.

Corn is not largely grown as a fodder crop in Manitoba, but the acreage is increasing as the usefulness of the crop becomes better known. It is the heaviest producer of fodder that we have, and although the large-growing varieties do not approach maturity in this climate, the smaller varieties become sufficiently mature to make excellent feed, which is relished by all kinds of cattle. Small quantities may also be fed occasionally to horses and pigs.

Corn thrives best on rich warm soil with a slope to the south, but it will give a good account of itself on any fertile well-drained soil. Liberal manuring before sowing and frequent cultivation from the time the seed is sown until the crop is four feet high, is essential to the best results. Harrows may be used to advantage every few days until the stalks are six inches high, and the one or two horse cultivator afterwards. Cultivation should be deep at first, and shallower as the season advances and the ground fills with roots. In this climate the crop should be left standing as long as possible without its being frozen. This crop is undoubtedly handled to the best advantage by being made into silage. When used in this way, it is ready at all seasons without further preparation than that required when it is cut into the silo. There are at present few silos in Manitoba, but the number of inquiries received regarding them would indicate that there is likely to be more in the near future. The stave silo will probably be more generally built than any other kind, as it is cheaper to build and gives good satisfaction. Bulletin No. 35 of the Experimental Farms deals with the construction of such silos, and could be read to advantage by those contemplating building one.

A new stave silo was built this year on this farm to take the place of the old square silos which had outlived their usefulness. The silo is outside at the north of the barn, the entrance being in the middle of the basement stable. Thirteen feet of concrete extends to the ground level, and a superstructure of twenty-foot staves rests on this foundation, giving a total height of thirty-three feet. The diameter is eighteen feet, so that the capacity is about 175 tons of silage. Our corn was cut into the silo on September 19 and 21, but there was not nearly sufficient to fill it. The variety grown this year for the silo was Northwestern Dent, and although it will be found in the variety test to have produced the lowest yield per acre of all those under test, I consider it a satisfactory variety. The corn was well-cobbed, and at the time of cutting it was in the firm dough stage and an excellent quality of silage was produced.

Sixteen varieties were grown in the test of varieties this year. They were sown on June 4, on clay loam summerfallowed in 1907, the rows being 40 inches apart. The yield per acre in each case is calculated from the product of two rows each 66 feet long.

INDIAN CORN—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Character of Growth.	Height.	Leafiness.	Condition when Cut.	Weight per Acre Grown in Rows.	
				In.			Tons.	Lbs.
1	Longfellow	June 4	Rank	86	Very leafy	Silk	22	550
2	Salzer's All Gold	" 4	Very rank	98	"	Not in tassel	21	966
3	Superior Fodder	" 4	"	97	Fairly	"	19	1,204
4	Early Mastodon	" 4	"	95	Very leafy	Tassel	19	808
5	Compton's Early	" 4	Rank	96	Fairly	Silk	18	1,026
6	Angel of Midnight	" 4	"	78	Very leafy	"	18	630
7	Pride of the North	" 4	Very rank	87	"	Tassel	17	1,838
8	Champion White Pearl	" 4	"	96	Fairly	"	16	1,660
9	Eureka	" 4	"	102	"	Silk	16	274
10	White Cap Yellow Dent	" 4	Rank	84	Very leafy	"	15	1,680
11	Mammoth Cuban	" 4	Very rank	85	"	Not in tassel	15	294
12	Wood's Northern Dent	" 4	"	86	"	Tassel	15	96
13	North Dakota White	" 4	Rank	88	Fairly	Silk	14	1,700
14	Selected Leaming	" 4	"	94	"	"	13	334
15	North Western Dent (Dakota seed)	" 4	Fair	72	"	Late milk	10	1,780
16	North Western Dent (Manitoba seed)	" 4	"	72	"	"	10	1,186

INDIAN CORN SOWN DIFFERENT DISTANCES APART.

Variety.	Distance Apart.	Height.	Growth.	Condition when Cut.	Yield per Acre.	
	Inches.	Inches.			Tons.	Lbs.
Longfellow	24	84	Rank	Silk	20	1,910
"	30	84	"	"	20	128
"	36	84	"	"	19	1,160
"	42	84	"	"	17	1,815
Selected Leaming	24	90	"	"	19	1,600
"	30	90	"	"	18	432
"	36	90	"	"	16	560
"	42	90	"	"	14	652
Champion White Pearl	24	94	Very rank	Tassel	22	550
" "	30	94	"	"	19	1,336
" "	36	96	"	"	17	320
" "	42	96	"	"	18	192
Longfellow	Hills	86	Rank	Silk	17	848
Selected Leaming	"	94	"	"	14	1,700
Champion White Pearl	"	96	Very rank	Tassel	16	76

EXPERIMENTS WITH FIELD ROOTS.

The acreage in field roots in Manitoba is gradually increasing from year to year as the value of the crop as a feed and a condiment for all classes of stock comes to be appreciated. While all classes of roots give abundant yields of good quality, turnips will probably continue to be the most largely grown as they are less easily injured by frost in spring or fall than mangels or sugar beets. When well-saved, mangels and sugar beets will keep better than turnips and are more relished by cattle and hogs.

The past season has been a good one for all kinds of roots and good crops have been harvested. As usual, two sowings were made this year about two weeks apart, and, as has usually been the case here, the earlier sowings gave the better results. The land on which the roots were grown produced a crop of potatoes in 1907, and was given a dressing of farm-yard manure. Sowing on the flat was practised, as the land retains the moisture somewhat better this way than when it is drilled up. The soil was well packed before sowing and the seed sown with a Planet Junior drill in rows 30 inches apart, and when, the young plants were two or three inches high they were thinned out to about nine inches apart.

EXPERIMENTS WITH TURNIPS.

Thirteen varieties of turnips were sown this year on clay loam under uniform conditions. The first sowing was made May 4 and the second May 19, both lots being pulled October 23. The estimate of the yield per acre is made from the product of two rows each 66 feet long.

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. Tons.	Lbs.	Bush.	Lbs.	Yield per Acre. 2nd Plot. Tons.	Lbs.	Bush.	Lbs.
1	Halewood's Bronze Top	May 4	May 19	Oct. 23	Oct. 23	38	1,880	1,298	..	26	536	875	36
2	Hartley's Bronze......	" 4	" 19	" 23	" 23	35	488	1,174	48	29	344	972	24
3	Perfection Swede.....	" 4	" 19	" 23	" 23	33	792	1,113	12	26	800	880	..
4	Derby	" 4	" 19	" 23	" 23	32	1,472	1,091	12	32	152	1,069	12
5	Kangaroo.............	" 4	" 19	" 23	" 23	32	944	1,082	24	27	648	910	48
6	Skirving's	" 4	" 19	" 23	" 23	31	568	1,042	48	26	1,328	888	48
7	Mammoth Clyde......	" 4	" 19	" 23	" 23	29	1,664	994	24	29	1,136	985	36
8	Good Luck	" 4	" 19	" 23	" 23	29	1,136	985	36	22	1,936	765	36
9	Hall's Westbury.....	" 4	" 19	" 23	" 23	29	344	972	24	30	1,512	1,025	12
10	Carter's Elephant.....	" 4	" 19	" 23	" 23	27	912	915	12	22	1,672	761	12
11	Magnum Bonum......	" 4	" 19	" 23	" 23	27	120	902	..	29	1,928	998	48
12	Bangholm Selected ...	" 4	" 19	" 23	" 23	26	1,856	897	36	29	1,400	990	..
13	Jumbo	" 4	" 19	" 23	" 23	26	8	866	48	27	1,968	932	48

EXPERIMENTS WITH MANGELS.

Eleven varieties of mangels were sown this year on clay loam under uniform conditions. The first sowing was made May 14, and the second May 28, both lots being pulled October 7. The estimate of yield per acre is made from the product of two rows each 66 feet long.

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. Tons.	Lbs.	Yield per Acre.—1st Plot. Bush.	Lbs.	Yield per Acre.—2nd Plot. Tons.	Lbs.	Yield per Acre.—2nd Plot. Bush.	Lbs.
1	Ideal.................	May 14.	May 28.	Oct. 7.	Oct. 7.	44	1496	1491	36	24	1368	822	48
2	Giant Yellow Globe ..	" 14.	" 28.	" 7.	" 7.	40	1840	1364	..	31	832	1047	12
3	Gate Post...........	" 14.	" 28.	" 7.	" 7.	35	1280	1188	..	28	760	946	..
4	Yellow Intermediate..	" 14.	" 28.	" 7.	" 7.	34	1168	1152	48	27	1704	928	24
5	Perfection Mammoth Long Red..........	" 14.	" 28.	" 7.	" 7.	32	1736	1095	36	26	8	866	48
6	Prize Mammoth Long Red................	" 14.	" 28.	" 7.	" 7.	31	40	1034	..	30	1248	1020	48
7	Mammoth Red Intermediate..........	" 14.	" 28.	" 7.	" 7.	26	272	871	12	19	808	646	48
8	Half Sugar White	" 14.	" 28.	" 7.	" 7.	23	992	783	12	30	720	1012	..
9	Selected Yellow Globe	" 14.	" 28.	" 7.	" 7.	23	200	770	..	20	392	673	12
10	Giant Yellow Intermediate............	" 14.	" 28.	" 7.	" 7.	21	768	712	48	25	688	844	48
11	Crimson Champion...	" 14.	" 28.	" 7.	" 7.	14	1040	484	..	12	1344	422	24

EXPERIMENTS WITH CARROTS.

Six varieties of carrots were sown this year under uniform conditions on clay loam. The first sowing was made May 4, and the second May 19, both lots being pulled October 27. The estimate of yield per acre is from the product of two rows each 66 feet long. The carrots were sown in rows 18 inches apart, and when the plants were two or three inches high, they were thinned out to about four inches apart.

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	Improved Short White	May 4.	May 19.	Oct. 27.	Oct. 27.	15	360	506	..	12	1960	432	40
2	Mammoth White Intermediate......	" 4.	" 19.	" 27.	" 27.	13	1280	454	40	11	1760	396	..
3	Giant White Vosges..	" 4.	" 19.	" 27.	" 27.	11	440	374	..	11	..	366	40
4	Half Long Chantenay.	" 4.	" 19.	" 27.	" 27.	10	1120	352	..	12	200	403	20
5	Ontario Champion....	" 4.	" 19.	" 27.	" 27.	10	680	344	40	10	240	337	20
6	White Belgian........	" 4.	" 19.	" 27.	" 27.	9	1360	322	40	11	1320	388	40

EXPERIMENTS WITH SUGAR BEETS.

Only three varieties of sugar beets were grown this year, all of which are considered suitable kinds to grow for sugar production. As there are, at present, no beet sugar factories in Manitoba, all the sugar beets grown are used for stock feeding. They are relished by all classes of stock, hogs being particularly partial to them.

Samples of the three varieties from here were sent to Mr. F. T. Shutt, Chemist of the Experimental Farms, for analysis, and the results are given herewith.

—	Wanzleben.	Vilmorin's Improved.	French Very Rich.
Average weight of one root..............	1 lb. 7 oz.	1 lb. 8 oz.	1 lb. 7 oz.
Sugar in juice............	15·35	16·59	15·51
Solids in juice............	19·46	19·33	18·69
Co-efficient of purity............	78·88	85·8	82·98

These results are very similar to those of last year, and we may conclude that the season was fairly suitable for the production of sugar.

The sowings were made on clay loam on May 14 and 28, and the roots pulled October 7. The estimate of yield per acre is from the product of two rows each 66 feet long.

SUGAR BEETS—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	Klein Wanzleben.	May 14.	May 28.	Oct. 7..	Oct. 7..	20	1,184	686	24	24	840	814	..
2	French Very Rich'...	" .	" .	" ..	" ..	18	1,224	620	24	14	1,568	492	48
3	Vilmorin's Improved..	" .	" .	" ..	" ..	18	432	607	12	15	360	506	..

EXPERIMENTS WITH POTATOES.

The season was a favourable one for potatoes, and good yields were secured although many of them were below the average of recent years. Nearly all the varieties ripened and produced tubers of good size and quality. The land on which the potatoes were grown produced roots the year previous, and was given a coat of manure after the roots were harvested. The soil was clay loam. Potato beetles made their appearance as usual, but were controlled by spraying with Paris green.

Twenty-nine varieties were grown, under uniform conditions, this year. They were planted on May 25, in rows three feet apart, with the sets about a foot apart in the row. The estimate of yield per acre was obtained from the product of one row 66 feet long.

POTATOES—Test of Varieties.

Number.	Name of Variety.	Average Size.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Form and Colour.
			Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
1	Ashleaf Kidney....	Large..........	528	..	509	40	18	20	Long; white.
2	American Wonder.	"	465	40	447	20	18	20	Long, round; white.
3	Reeve's Rose.......	Medium to large.	454	40	429	..	25	40	Flat, oval; light pink.
4	Holborn Abundance	" " ..	447	20	418	..	29	20	Round; white.
5	Irish Cobbler.......	" " .	432	40	366	40	66	..	Flat; white.
6	Burnaby Mammoth.	" " ..	421	40	399	40	22	..	Flat, oval; pink.
7	Everett.............	" " .	418	..	377	40	40	20	Long, oval; pink.
8	Late Puritan.......	" " ..	418	..	399	40	18	20	Long, round; white.
9	Canadian Beauty...	Small to medium	414	20	396	..	18	20	Round; white.
10	Early White Prize.	Medium	414	20	388	40	25	40	Round, oval; light pink.
11	Rochester Rose.....	Small to medium	414	20	388	40	25	40	Long, round; light pink.
12	Country Gentleman	Medium to large	410	40	385	..	25	40	Long; pink.
13	Morgan's Seedling..	Large..........	410	40	403	30	7	20	" "
14	State of Maine.....	Small to medium	407	..	385	..	22	..	Flat, oval; white.
15	Carman No. 1......	Medium........	403	20	385	..	18	20	Flat; white.
16	Uncle Sam.........	Medium to large	392	20	366	40	25	40	Flattish, oval; white.
17	Twentieth Century.	Large..........	377	40	341	..	36	40	Flat; red.
18	Dreer's Standard...	Medium to large	374	..	352	..	22	..	Flattish, oval; white.
19	MacQueen..........	Large.........	370	20	352	..	18	20	Long, round; white.
20	Collin's Seedling...	Small to medium	355	40	330	..	25	40	Round; white.
21	Money Maker......	" " ..	352	..	322	40	29	20	Round, oval; white.
22	Dooley............	Large.........	348	20	319	..	29	20	Round; white.
23	Vermont Gold Coin.	"	341	..	319	..	22	..	" "
24	Empire State......	Medium to large	315	20	297	..	18	20	Long; white.
25	Manitoba Wonder..	Large	308	..	286	..	22	..	Long, round; red.
26	Improved Honeoye Rose...........	Medium........	282	20	238	20	44	..	Long; pink.
27	Early Manistee....	"	238	20	212	40	25	40	Round; white.
28	Vick's Extra Early.	Small to medium	207	10	179	40	27	30	Flat; pink.
29	Dalmeney Beauty..	Large.........	190	40	161	20	29	20	Oval; white.

Among the best varieties for early use are: Everett, Early White Prize, and Bovee; for general crop Dreer's Standard, Uncle Sam, State of Maine, Late Puritan, and American Wonder.

EXPERIMENTS WITH GRASSES AND CLOVERS.

The past season has been favourable in this district for securing good crops of hay, and generally through the province, good average crops were obtained. The spring and early summer weather was warm with sufficient rain to give the grass a good start, and on this farm excellent crops were secured. Even the old meadows gave a good return.

A number of one-fifth acre plots of grasses, clovers, and mixtures were seeded in the spring of 1907 and were a good catch the first season. They were sown without a nurse crop, and the mower run over them twice during the summer to cut the weeds, the cuttings being allowed to remain on the ground. All came through the winter with little or no winter-killing, although the snowfall was particularly light, and a splendid stand was the result.

The yield of cured hay per acre is given in the following table:—

GRASSES AND CLOVERS—TEST OF VARIETIES.

Crop.	1st Cutting.		2nd Cutting.		Total Crop.	
	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
Alfalfa I. H.	2	600	1	700	3	1,300
Alfalfa	2	300	1	800	3	1,100
Common Red Clover	1	1,800	1	1,000	3	800
Alsike	1	1,600		1,875	2	475
Timothy	1	1,700			1	1,700
Western Rye Grass	2	1,050			2	1,050
Western Rye Grass and Common Red Clover	2	875			2	875
Timothy & Alsike	1	1,900			1	1,900
Timothy and Common Red Clover	1	1,850			1	1,850

The alfalfa marked 'I. H.' was grown from seed ripened at Indian Head in 1906. Both lots of alfalfa came through last winter without any winter-killing, so that it is impossible to say whether there is any difference in hardiness.

Additional plots were sown in the spring of 1908 as follows: Grimm's alfalfa, Turkestan alfalfa, alfalfa and timothy, alfalfa and rye grass, orchard grass, and perennial rye grass. All of these were sown by the same method as was tried here last year with equally good results. By this method the seed is mixed with two or three times its bulk of coarsely chopped wheat or barley, and sown in the same way as grain, only considerably shallower. This system of sowing is calculated to give particularly good results with alfalfa which, in this climate, should always be sown without a nurse crop. With the other clovers it should give equally good results. The clover seeds remain uniformly mixed with the chopped grain, are evenly distributed over the ground and covered to a satisfactory depth, where germination is surer than where the seed is broadcast. About five acres of alfalfa was sown in the way outlined during the past season and an excellent stand resulted.

NURSE CROPS FOR CLOVERS.

In last year's report reference was made to several trials that were made with different nurse crops for clovers and grasses. Red clover, alsike, timothy, rye grass, and a mixture of timothy, red clover and alsike, were each sown with oats, barley and spring rye as nurse crops. Each of these was also sown without a nurse crop. The crops of grain were all heavy and badly lodged, but all grasses and clovers made a good start, although not nearly so strong a growth as where no nurse crop was used. The three nurse crops gave results in the following order: (1) oats, (2) spring rye, (3) barley. The oat crop was the heaviest of the three, but not only was the stand of grasses and clovers better with it at the close of the season than with the others, but they stood the winter better and came out stronger in the spring and produced a heavier crop of hay. The timothy, rye grass, and red clover came through the winter in good condition, and from each a good crop was cut. The alsike was almost completely killed out, and the mixture of timothy, red clover and alsike was also badly winter-killed. These two were, therefore, ploughed up.

Twelve acres of oats were seeded down in 1908 to a mixture of eight pounds of red clover and four of timothy, and a splendid stand was the result. The grass and clover in this instance were sown with the grass seed attachment to the grain drill.

CLOVER SEED

With some crops it is a considerable advantage, in growing them in climates to which they are not native, to have the seed produced under conditions as nearly alike as possible to those where the crop is to be grown. This is notably true of corn, of various kinds of trees and shrubs, and of some kinds of vegetables. The same is probably true of such legumes as red clover, alsike and alfalfa, which have been grown with varying success in Manitoba for some years. An effort was, therefore, made last year to mature seed of red clover and alsike, and with good success. About half an acre of each of these clovers sown in the spring of 1907 was allowed to ripen, and about fifty pounds of each kind of seed was secured. The clovers were threshed with a small threshing machine, the concaves being set as close as possible. The yield is low, but doubtless much of the seed was lost in threshing. The seed is of good quality and will be sown in the spring.

CATTLE.

There are two breeds of cattle represented in the herd now on this farm, viz.: Shorthorn and Ayrshire. There are besides a number of grade cattle and steers. These cattle are kept mainly for breeding and feeding work of an experimental character, but a few breeding animals are sold from time to time.

The cattle on hand at present are:—

Shorthorns, two bulls and eight females.

Ayrshires, two bulls and three females.

Grades, eight Shorthorn and three Ayrshire.

Steers, for experimental feeding, forty head of three-year olds.

EXPERIMENTS IN FEEDING STEERS.

Reference was made in last year's report to an experiment that was under way in the fattening of cattle outside with little or no shelter as compared with fattening in comfortable stables. The experiment was not at that time sufficiently far advanced to give any definite results. In referring in the 1907 report to the conditions leading up to this experiment, the following paragraphs appear:—

'For a number of years the cattle-feeding business in Manitoba has been on the wane owing largely to the low prices that have ruled for beef. The small profits to be realized have been out of proportion to the amount of capital required for buildings and equipment, and the cost of labour. The value of the manure, which is considered by many cattle feeders as equivalent to the cost of labour, is not generally regarded so in Manitoba. The inducement to feed cattle has to be, therefore, that it offers a better market for the coarse grains than to sell them directly off the farm. The tendency to grow more oats and barley is becoming greater every year as their usefulness as cleaning crops is demonstrated, and, as diversified farming becomes more general, their growth will be stimulated further.

One of the deterring factors to the more extensive feeding of steers has been the amount of capital required to house them in comfortable quarters. Buildings of any kind are expensive, and those that are strictly essential are generally all that the average farmer cares to build. He is quite reasonably averse to putting money into buildings in which to feed stock when the profits from feeding are, at most, meagre. To overcome this serious objection, a system of feeding has been advocated with which the cattle are allowed to run outside without any shelter. The strongest advocates of this system are men who have been practising it successfully for several years. By this method, the stock, steers of about 1,100 to 1,300 pounds, kept in the open throughout the winter, are fed straw and chopped grain and allowed abundance of water. The claim is made that steers handled in this way make good gains economically, do not suffer from the cold, and can be handled with far less care, and with the outlay of much less capital, than when comfortable quarters are provided.

So important did this question appear that it was considered advisable to initiate some work to test the feasibility of the system, and to compare the average returns with those obtained by feeding in a comfortable stable. Accordingly a carload of three-year old steers were purchased and divided as evenly as possible into two lots, eight head being put outside and eight in the stable. Those outside were given no shelter other than that afforded by poplar and oak scrub and several coulées, no sheds or wind-breaks being provided. The only outlay by way of equipment was the plank required to make a trough in which to feed the grain.'

The inside lot were started on December 5, on a ration consisting of silage, 25 pounds; straw, 8 pounds; hay, 4 pounds; roots, 10 pounds; grain, 4 pounds. The grain ration was increased from time to time until by the first of April each animal was receiving 10 pounds of grain.

The outside lot had oat straw before them at all times, and were fed grain in the same proportion as those inside. The steers were all dehorned, and were fed their grain in a trough 16 feet long, 3 feet wide and high enough off the ground to prevent them getting their feet in it. During the last three weeks of the experiment, coarse slough hay was substituted for the straw, the supply of which gave out. The grain was fed twice daily and water was available in a neighbouring coulée.

Three of the steers that were stabled had to be dropped from the test before it was complete, so that five only are included in the results. Both lots were sold April 20, for $4.25 per hundred. In considering the results which follow, it should be borne in mind that the winter of 1907-8 was an unusually mild one, the mean temperature of January and February being 10·5 and 9·2, respectively, above the average. The mean temperature for the five months the cattle were on feed were as follows: December, 13·3; January, 7·3; February, 7·4; March, 10·0; April, 39·0.

Test of Feeding Steers.

——	Outside.	——	Inside.
No. of steers in lot	8		5
First weight gross	8,854 lbs.		5,695 lbs.
" average	1,106 "		1,139 "
Finished weight gross	10,630 "		6,950 "
" average	1,328 "		1,390 "
Total gain in 138 days	1,776 "		1,255 "
Average gain per steer	234 "		251 "
Daily gain per steer	1·6 "		1·81 "
" lot	12·8 "		9·05 "
Gross cost of feed	$100 76		$ 77 95
Cost of 100 lbs. gain	5 67		6 20
Cost of steers,—8,848 lbs. at 3⅛c.	276 50	5,695 lbs. at 3⅛c.	177 97
Total cost to produce beef	377 26		255 92
Sold,—14,135 lbs. at 4¼c. less 4 per cent	433 71	6,950 lbs. at 4½c. less 4%	283 56
Profit on lot	56 45		27 64
Net profit per steer	7 05		5 52
Average buying price per steer	34 56		35 59
" selling price per steer	54 21		56 71
" increase in value	19 65		21 12
" cost of feed per steer	12 59		15 59
Amount of meal eaten by lot	8,892 lbs.		5,390 lbs.
" straw	8 tons.		5,680 "
" hay	6 "		2,840 "
" millet	1 ton.	Amount of ensilage and roots	25,850 "
" corn fodder	1 "		

The comparative net profit as given in this statement takes no account of labour, or interest on investment. When these items are considered, the showing is much more favourable to the outside lot. The labour incident to feeding those outside was very much less than to the stabled lot, as the straw was drawn to them once or twice a week with a sleigh, the grain drawn to the feed-room once a week, and the manure taken away in sleigh-loads direct to the fields twice during the winter. The manure was nearly all saved, as the cattle spent most of their time around the straw pile.

There is a notable advantage in favour of those fed outside, when the investment for shelter is considered. While no sheds were provided this year, and the results do not indicate that they were necessary in such a mild winter where good natural shelter from winds exists, they may be found to be an advantage under different conditions where less natural shelter obtains, or when temperatures are more extreme. Undoubtedly shelter of some kind from cold winds must be provided. Extreme cold was not nearly so discomforting as a more moderate temperature with a high wind.

Definite conclusions can not be drawn from the results of a single experiment, and the one above outlined is being repeated this year. Twenty steers are being fed outside and twenty inside. Of those inside, sixteen are getting the same treatment as was accorded under the same conditions last year, and four are in a loose pen in the stable, being fed exactly the same as those outside. A scale has been installed in the outside feed lot and the cattle are weighed at intervals to ascertain at what season the greatest gains are made, and what effect extreme temperatures have on the rate of gain. This information should be a guide as to the methods of feeding.

The mean temperature this winter has been much lower than a year ago, but weather conditions generally have not been unfavourable for work of this kind.

SWINE.

The herd at present consists of 55 head as follows:—

Yorkshires.—1 stock boar, 2 breeding sows, 23 young pigs.

Berkshires.—1 stock boar, 1 breeding sow, 14 young pigs.

Tamworths.—1 breeding sow.

Crossbreds.—12 feeders.

During the year a considerable number of pure-bred pigs have been sold for breeding purposes in this district and throughout the province.

FROZEN WHEAT FOR PIGS.

There is occasionally a considerable quantity of wheat in some parts of Manitoba and other parts of the west that is frozen and of little value for any other purpose than as feed. Last year some frozen wheat was obtained and fed to several lots of young pigs to get some further information as to its value as feed for pigs, and how it could be fed to best advantage.

Twenty pigs, averaging about sixty pounds in weight, were divided into four lots of five each. Lot 1 was fed frozen wheat chopped and soaked for twelve hours; lot 2, frozen wheat chopped and fed dry; lot 3, frozen wheat and barley, equal parts, chopped; lot 4, oats and barley, equal parts, chopped.

The experiment cannot be regarded as entirely satisfactory as all the pigs made poor gains and became unthrifty early in the experiment. The feeds above mentioned were continued for three months. At the end of that time it was found that the following amounts of grain were required to make one pound of gain:

12⅓	lbs. of	frozen wheat	soaked for twelve hours.
7⅝	"	"	dry.
9½	"	"	and barley.
5½	"	"	oats and barley.

From these results no definite conclusions can be drawn, as none of the pigs throve properly, owing probably to some cause other than the feed they were receiving. It may be mentioned, however, that the wheat as a single feed was not relished, either when fed dry or soaked; that the pigs fed on it as an exclusive grain ration were less thrifty than those receiving some other grain in conjunction or a mixture of grains with no wheat included.

PASTURES FOR PIGS.

Last year several different kinds of pasture were used for young pigs and breeding stock, viz.: brome grass, rape, peas, and a mixture of oats, barley and peas. The brood sows were maintained in good breeding condition on brome pasture, no grain being fed until late in the season, when the pasture became short. The young pigs made good growth on the other pastures, with a very light grain ration, and, when put in pens to be finished in October, were in particularly good heart, gaining at the rate of one pound for every two and one-half pounds of grain fed.

WINTERING BROOD SOWS.

As most of the pigs raised in Manitoba are from spring litters, it is of the greatest importance that the breeding sows be brought through the winter in condition to produce strong healthy pigs. In such a severe climate as we have in Manitoba there is a temptation to house them comfortably and not pay sufficient attention to their requirements for exercise. The consequence frequently is that the young come weak and with very little vitality. For a number of years on this farm, the brood sows were confined during the winter in comfortable pens nine feet square, with the result that litters were usually small and weak. The plan was then adopted of allowing them to run all winter in a large yard, shelter being provided by building a framework of poles and threshing a stack of straw over it. The sows were brought inside a week or two before due to farrow. The change in management resulted in the litters being larger and the young pigs strong and vigorous from birth.

In the winter of 1906-7 the sows, four in number, were confined during the winter, as before. During April three sows farrowed, giving twenty-two pigs, all of which died within an hour of birth. The other sow was then turned out and, not farrowing until several weeks later, produced nine pigs, six of which lived and did well.

During the winter of 1907-8 the same sows were again given the run of a large yard with shelter under a straw-stack and fed a limited grain ration, largely composed of bran, and a liberal supply of mangels. Each sow farrowed a healthy litter of pigs and raised an average of eight. During the past winter they have been accorded the same treatment and have again given birth to strong vigorous pigs, the four raising thirty-five pigs.

BEES.

There was an unusually heavy percentage of loss with the bees in the winter, only five of the fifteen hives put into winter quarters coming out alive. They were put on their summer stands April 16, when the temperature was about 60°. All of these made strong colonies, throwing six new swarms, all of which did well through the summer. The season was a good one for honey, and the colonies averaged 76 pounds, spring count. As we had considerable clover this year, much of the honey was from that source and was of excellent quality, being of a lighter colour and a milder flavour than that usually gathered in this province from wild flowers. The clover bloom is available earlier than most of the wild flowers, and the season of profitable gathering was, therefore, extended considerably. The first honey was extracted July 16, which is about two weeks earlier than usual here. Eleven hives were put into winter quarters on November 17.

APPLE ORCHARDS.

It is much to be regretted that a continuation of blight has played havoc with our apple orchards, and, although the usual method of cutting out affected wood has been constantly followed, it has proved of no avail, as trees only slightly attacked last year succumbed this year. A better method would seem to be, the rooting up of all trees showing signs of infection. This is a most unfortunate set-back to apple culture on this farm, as so many of our most promising trees are either killed outright or badly infected. It would seem that trees in both sheltered and exposed positions are equally liable to infection. As an immediate result of blight the crop of fruit was small. Carleton is the only cross-bred variety which has so far showed no indication of being infected.

Amongst the heaviest croppers were: Martha crab, Tonka and a Beautiful Arkad seedling. No. 179 fruited heavily but the fruit, which promised to be of good size and quality, was unfortunately stolen before it was ripe. Hibernal and Repka Kislaga both fruited lightly, producing ripe fruit, possessing size and quality. Transcendent and Hyslop also fruited lightly, while the following varieties ripened fruit of medium size and fair quality: Eastman, Alberta, Derby, Tony, Dean, Pioneer, Ruby, No. 171, No. 132, Elsa. Carleton seedling fruited heavily with fruit of fair quality and medium size. Seedlings of Progress, Aurora, and Prairie Gem fruited lightly, but the fruit was of poor quality.

PLUMS.

A fairly good crop of plums was secured, and owing to the absence of severe frosts during September, practically the whole of the crop was ripened. The Major plum, a selected native variety, was the first to ripen, and was picked on August 16. Pits of the earliest varieties were saved and planted this fall with the hope of obtaining early ripening seedlings.

CURRANTS.

The old plantation of currant bushes was done away with last spring, and a new plantation set out consisting of 15 black, 14 red, and 11 white varieties. The bushes were planted in rows 6 feet apart each way, thus allowing for cross cultivation. The majority of the bushes grew well during the summer and a small quantity of fruit was picked.

GOOSEBERRIES.

Seven varieties of gooseberries were planted in the spring, but out of these only three varieties grew, viz.: Companion, Rideau and Carman.

RASPBERRIES.

A new plantation of raspberries containing thirteen varieties was planted this year, but did not take at all well. However, a small proportion of the plants made satisfactory growth.

The three varieties of blackberries planted all did well.

ARBORETUM.

A large amount of thinning was done during the spring and fall in the arboretum, the more ordinary varieties of trees and shrubs being taken out, giving the better specimens more ground and air space. Each one remaining was re-labelled this year.

The following is a list of trees and shrubs received and planted in the nursery in the spring of 1907, with notes on their growth in 1907, and their conditions in the spring of 1908:—

1 Black Elderberry (Stevenson). Fair growth, killed to ground.
1 Siberian Almond (Stevenson). Dead.
1 Silver Maple (Stevenson). Fair growth, wintered well.
1 Mountain Ash (Stevenson). Good growth, wintered well.
3 Acer pictum (Japan). Fair growth, killed at tips.
6 Acer saccharinum (Dempsey). Fair growth, wintered well.
4 Acer saccharinum (Dempsey). Fair growth, slightly killed at tips.
1 Acer platanoides purpurea. Fair growth, killed to near ground.
3 Acer platanoides Schwedleri. Dead.
1 Acer tartaricum var. Aidzuense. Dead.
2 Acer tartaricum var. Aidzuense. Weak growth, wintered well.
4 Acer spicatum. Dead.
10 Abies balsamea, 3 alive, 7 dead.
1 Amelanchier vulgaris. Dead.
2 Amelanchier vulgaris. Fair growth, wintered well.
1 Ampelopsis self-fastening. Dead.
3 Betula alba laciniata. Dead.

10 Berberis Thunbergii. Fair growth, killed at tips.
6 " aquifolia. Five good growth, wintered well. One dead.
4 " Seedlings of cross-breds. Fair growth, slightly killed.
2 " Canadensis. Fair growth, killed at tips.
1 Cornus purpusa (Japan). Wintered well.
1 " " Killed at tips.
1 " " Half killed.
1 " " Dead.
6 " Spathii aurea. Two dead. Four killed to ground.
2 Clematis vitalba. Dead.
2 " flammula. Dead.
2 " viticella. One dead. One good growth, wintered well.
2 Crataegus carrieri. Killed to ground.
2 " arkansana. Fair growth, half killed.
2 " arnoldiana. Good growth, wintered well.
2 " apiosa. Fair growth 1907. Dead 1908.
2 " coccinoides. Killed at tips.
1 " submollis. Fair growth, killed to near ground.
1 Clethra alnifolia. Dead.
2 Lonicera mundeniensis. Good growth, wintered well.
2 " virginalis alba. Good growth, wintered well.
2 " alpina. Good growth, wintered well.
2 Celastrus scandens. Killed to near ground.
2 Euonymous linearis. Killed to near ground.
2 " Bungeana. One slightly killed at tips. One killed to near ground
2 " alatus. Dead.
2 " Sieboldiana. Half killed.
2 " Europaeus ovatus. Half killed.
2 Fraxinus Mandschuricus sapporo. One dead, 1 killed to near ground.
2 " Bungeana. Dead.
2 Hydrangea paniculata grandiflora. Killed back one-half.
2 Ligustrum amurense. Fair growth, killed to near ground.
2 Philadelphus coronarius aurea. Fair growth, killed to near ground.
2 " Manteau d'Hermine. Dead.
2 " Mont Blanc. Fair growth, killed to near ground.
2 Picea concolor. Dead.
2 Douglas fir. Dead.
2 Pyrus mougeote. Fair growth, killed at tips.
2 Picea Alcockiana. Dead.
2 Prunus Alleghenensis. Fair growth, killed to near ground.
2 Ptelea trifoliata. Killed to ground.
4 Quercus rubra. Three dead, 1 killed to near ground.
2 " Palustre. Fair growth, killed to near ground.
2 Rhamnus davuricum. Fair growth, killed at tips.
2 Rhus cotinus. Dead.
2 Rhodotypus Kerrioides. Killed to near ground.
2 Rubus fasiculatum chinense. Killed to near ground.
2 Syringa Pekinensis. Good growth, wintered well.
2 Spirea callosa superba. Fair growth, killed to near ground.
2 Picea pungens Kosteriana. Good growth, wintered well.
2 Aristolochia sipho. Dead.
2 Syringa Madame Cassimir Perier. Good growth, wintered well.
2 " Chas. Joly. Good growth, wintered well.
2 " Chas. Xth. Good growth, wintered well.

2 Syringa Michael Buchner. Good growth, wintered well.
2 " Emile Lemoine. Good growth, wintered well.
2 " Jacques Calot. Good growth, wintered well.
2 " La Tour d'Auvergne. Good growth, wintered well.
1 " alba grandiflora. Good growth, wintered well.
2 " Congo. Good growth, wintered well.
2 " Souvenir de Ludwig Spath. Good growth, wintered well.
2 " Mdlle Fernande Viger. Good growth, wintered well.
1 Spirea Anthony Waterer. Fair growth, killed to near ground.
2 Eulalia Japonica. Dead.
2 " " variegata. Dead.
2 " " Gracillima. Dead.
2 " " Zebrina. Dead.
10 Black Hill Spruce. Nine dead, 1 alive.
2 Pyrus floribunda. One dead, 1 good growth, wintered well.
2 Catalpa speciosa. Fair growth, dead.
2 Golden-leaved Poplar. One killed to near ground, 1 killed back one-half.

The following were received from Ottawa and placed in the nursery this spring:—

3 Caragana Tragacanthoides.
2 Euonymus Europaeus ovata.
2 Phellodendron amurense.
2 Pyrus maulei Sargenti.
4 Philadelphus multiflorus plenus.
2 Caragana pygmaea.
4 Japanese Walnut.
3 Cadet Seedling Plums.
2 Spirea Menziesi.
50 Syringa Emodi.
3 Lonicera Regeliana.
4 Abies Remonti.

FLOWER GARDEN.

In dealing with the flower garden, the value of the hardy perennial flowers and herbaceous plants with reference to their adaptability to this climate, forces itself forward more and more as we look upon the results of their growth which repeat themselves each year. Their culture requiring, as it does, a minimum of expense, both for seed and labour, should commend them to larger use in the flower gardens of Manitoba. It was a source of great pleasure to see the beautiful and lavish display of bloom and foliage made by the Paeony, in whose favour as a plant pre-eminently adapted to this country, too much cannot be reiterated. Then, again, the Iris is much to be desired for its divergence of colouring and earliness of bloom. Amongst other perennials equally desirable, may be mentioned, Delphinium (Larkspur), Lychnis, Baby's Breath, Columbine, Monk's Hood, Canterbury Bells, and Phlox. A consignment of the latter was received from Ottawa last spring and made a splendid showing of bloom this summer.

In the annual garden, the usual method of propagating the seed in boxes in the propagating house and transplanting to the open was adopted. Nevertheless, there are many varieties raised in heat in the early part of the spring which can be grown and flowered in the most satisfactory manner without any artificial aid. From sowings made in the open ground during the latter part of May and early in June, the flowering will be somewhat later than with plants brought forward under glass, but, as they receive no check from the very commencement, they will not be greatly behind their nursed relations.

5094—p. 296.

Experimental Farm, Brandon, Manitoba, 1908—Beds of Annual Flowers. *Photo by C. E. Saunders.*

The following is a list of flowers grown this year: Verbena hybrida, Antirrhinum *majus manum,* tall varieties, *Dianthus chinesis heddiwigii* and *laciniatus,* Petunia *hybrida, Salpiglossis,* Ten weeks stocks, Chrysanthemum *coronarium, Gaillardia, Tagetes patula,* Zinnia, Pansy in variety, Celosia, Thomson's and *plumosa,* Lobelia, Ageratum, Scabious, tall and dwarf; Balsam, Sweet Sultan, and Phlox *drummondi,* and the following varieties of Asters: Earliest Parisian, Giant Comet, Semple's, Truffaut's Paeony, Queen of the market, Japanese mixed, Victoria and Dwarf Queen. The above were sown in boxes in the greenhouse from April 7 to 10, and planted out on June 17, while the following were sown in the open on June 5: Poppies, Iceland Japanese Pompon, White feathered, Danebrog and the Shirley, Antirrhinum, Clarkia, Dianthus in variety, Bartonia, Phacelia, Portulacca, Stocks, Gaillardia, Nasturtium, Pansy in variety, Eschscholtzia, Nicotiana, Godetia, Celosia, Mignonette, Marigold, Candytuft, Asters in variety, Coreopsis, Abronia, Everlasting Flower, Sweet Sultan, and Phlox drummondi.

Notwithstanding a dry summer, a fairly good display of bloom was obtained, though, unfortunately, the Asters were quite a failure, owing in part to some disease attacking the bud, and in part to the dryness of the season. In addition to the above annuals, twenty-seven different named varieties of Sweet Pea were grown and were much admired.

DAHLIAS AND CANNAS.

A consignment of each of these was received in the spring from Ottawa, and were at once put into frames and planted out as soon as danger from frost was practically over. The Dahlias made a good show and included such varieties as Austin Cannell, Prince Imperial, Kynerith, Ernest Glasse, Prince of Orange, Mrs. Peart, Mrs. Clark, Empress of India, Miss Anne Jones, Cannell's Gem, Crimson Beauty, Perfect Vallon, Grand Duke Alexis, Mrs. Chas. Turner, Harry Stredwick, Lady H. Grosvenor, Matchless, Mrs. Moore, Capstan, Wm. Agnew, Louis Hariot, Kingfisher, Wm. Pearce, Double Claret, Hedon, Iridescent and Constance. A yellow and a pink variety were both received from Mr. Wolverton, of Nelson, B.C.

The Cannas made a striking show of foliage, and the following varieties bloomed: America, Captain Druyon, Leonard Vaughan, Allemania, Explorateur Crampbel, Deputy Ravarin, Miss Berthine Brunner, and Pennsylvania. The variety Wm. Saunders was also received from Ottawa and grown in the superintendent's house, where it produced a most beautiful bloom.

The following additions to the perennial garden received from Ottawa were planted this spring: Nineteen named varieties of Perennial Phlox, twenty-one of Paeonies, Spiræa filipendula, Oenothera fruticosa, Hermerocallis, Spirea aruncus, Campanula macrantha, Aconitum napellus bicolor, Cimicifuga racemosa, and Iberis coreæfolia.

BULBS.

Tulips and Narcissus were planted in the fall of 1907, and protected with a covering of strawy manure which was removed as soon as possible in the spring. Tulips made a splendid show. The Narcissus came through the winter without injury, but failed to bloom. The Tulip bulbs were taken up as soon as their blooming period was over and heeled in. In August they were again taken out of the ground and dried off, and stored until the latter end of September, when they were again planted, the largest bulbs only being used.

A fine succession of bloom for the house was easily obtained from Hyacinths, Narcissus and Tulips. Any good garden soil will do and pots or tins with holes knocked in the bottom is all that is necessary to plant the bulbs in. After planting, place them away in a cool, dark cellar, taking an occasional look at them to see that the earth in the pots is not getting too dry, and if necessary, giving water, and after they are well rooted, they may be brought into heat in succession and watered freely.

ROSES.

Although most of our roses were killed back to the ground last winter, they made very good growth last summer and some bloom was obtained. The Rosa Rugosa, sometimes known as the June rose, and the hardiest variety we have, gave a profusion of sweet-scented roses in June, and the following produced bloom on wood of this season's growth: New Century, Philemon Cochet and Rugosa alba (both white), bloomed during August, while the Dwarf Crimson Rambler came into bloom on July 12, and continued to bloom till late in the fall. Early in September, Lady Helen Gould produced a bloom of great excellence.

VEGETABLE GARDEN.

The land used as a vegetable garden was ploughed and harrowed as early as possible in the spring and levelled with the rake before each plot was sown, the rows being set two and a half feet apart to admit of horse cultivation.

A favourable spring permitted of a fairly early seeding, and with a few exceptions, germination of the various seeds was uniformly good, though owing to the depredations of the pocket gopher, especially amongst the early peas, carrots and beets, the best results were not obtained. Various methods of getting rid of this pest were resorted to, trapping eventually proving the most successful.

The small seeds were all sown with a Planet Junior drill and with good results, though great care must be taken to ascertain that the drill is in perfect working order. As soon as the seed had germinated sufficiently to indicate the rows, frequent use of the wheel hoe was made until such time as the horse cultivation was possible. Weeds were thus kept down, moisture conserved, and a minimum amount of hand work required.

ONIONS.

Two varieties of seed onions, Large Red Wethersfield, and Danver's Yellow Globe, were sown on April 8. The former germinated well; the latter very unevenly. The yield was further reduced by a severe attack of the onion grub, Danver's Yellow Globe, through weak germination, being the greater sufferer. Spraying with kerosene emulsion soon after the appearance of the grub checked its ravages to a great extent. Although Shalots and Yellow Dutch Sets were grown in adjacent rows, they were scarcely injured by the grub, and produced a good yield of well-ripened bulbs. It would seem from this that the onion grub has a decided preference for plants grown from seed. As a preventive of the onion grub, as soon as the seed has germinated, dusting the rows two or three times with powdered hellebore, or sowing soot or salt between the rows, is recommended.

With the object of growing a uniform sample of medium-sized bulbs for pickling purposes, the Silver Skin was not sown until June 17, with a satisfactory result.

PARSNIPS.

Elcombe's Giant and Student were the two varieties of this most useful vegetable for winter purposes grown. They were sown on May 1, and pulled on October 7, the former variety yielding at the rate of 256 bushels and 40 pounds per acre of excellent quality, and the latter 210 bushels and 50 pounds of fair quality.

SALADS.

Lettuce and radish were grown for this purpose, and with the object of maintaining a succession of these, sowings were made at intervals of ten or fourteen days, with fairly good results. The following varieties of lettuce were grown: Wheeler's Tom Thumb, Cos Trianon and Neapolitan, all of which were crisp and very firm. All the Year Round and May King were inclined to be soft in texture, while Stubbornhead was slightly bitter.

Early Scarlet White-Tipped radish sown on May 1 was fit for use on June 1, and yielded an excellent crop of well-flavoured roots. Olive Scarlet made rapid growth, producing a large crop, poor in flavour and lacking in firmness. Black Spanish Winter sown on June 17 produced an enormous crop of coarse roots.

A very late sowing of Early Scarlet Turnip radish was made on August 10, following a rain, and although growth was slow, good palatable roots were available up to September 30, notwithstanding several sharp frosts.

CARROTS.

Early Scarlet Horn sown on May 4, and French Horn, on the 13th, germinated well, but, owing to the depredations of the pocket gopher, the yield was greatly reduced. The quality of both the varieties was below the average.

PEAS.

This crop was also damaged by the pocket gopher, especially the variety Wm. Hurst, sown on May 4, which, being the first sown, suffered most. A fair crop of a good quality of peas was available for use on July 7. Following this variety, Nott's Excelsior was sown on May 15, producing a fair crop of good quality by June 10. On May 23 a sowing of Gradus and American Wonder from home-grown seed of 1907 was made, a full crop resulting, the former being fit for use July 23, and the latter five days earlier. Another sowing of these two varieties was made as late as July 18. The seed was soaked in water for 12 hours previous to sowing, and, although the weather and the ground were dry, a fair germination was obtained and an acceptable crop of peas to hand by August 20.

BEET-ROOT AND BEANS.

It was deemed desirable to make two sowings of these vegetables, and fortunately so in the case of the beet root, as the pocket gopher showed his partiality for it. What were left of the first sowing made on May 15, were used during the summer. Egyptian and Early Blood turnip were fit for use on July 13, and Nutting's Dwarf Improved a week later. Of the second sowing of the above varieties made on May 27, the following results were obtained: Egyptian at the rate of 536 bushels per acre, Early Blood turnip 591 bushels, Nutting's Dwarf Improved, 517 bushels. In each variety, the roots were too large to insure good quality.

Beans were sown on the same dates as the beet-roots, a satisfactory succession being obtained from the following varieties in the order following: French Dwarf Extra Early, Emperor of Russia, Dwarf Wax Everyday, Fame of Vitry and French Dwarf Matchless.

CORN.

Four varieties of this much appreciated vegetable were sown on May 27. Earliest Devitt's Sugar being fit to use on August 16, and proved of excellent quality. Burpee's Golden Bantam, coming in a week later, was also of excellent quality. Pocahontas was fit for use on the same date as the latter, and produced a heavy yield, but lacked the quality of any of the preceding varieties. Hiawatha, which was not fit for use until September 1, was also of poor quality. Matured cobs of each of these varieties were secured. The two varieties of Kaffir corn (Red and White), sown on the same date, failed to mature.

CABBAGE.

Of the two early varieties of cabbage sown on April 6, and planted out on June 1, Very Early Paris Market produced heads compact in shape, solid and of good flavour, by July 1, a week earlier than Early Jersey Wakefield, which is also of good habit and quality. Two very desirable later varieties are Large Flat Drumhead and Fottler's Improved Brunswick, each of which produced large shapely heads.

Red cabbage for pickling purposes was sown and planted out on the same dates as the above and yielded small but well-shaped heads of good quality and flavour, fit for cutting on September 11.

Another sowing of seeds was made on May 19, and planted out on July 12. The following were the varieties: Summer Danish and Long Island 2nd, fit for use on August 10, and Volga or Russian and Nonesuch, fit for use September 17. Each of these varieties produced shapely solid heads of average weight. Red Wonderful did not head out well.

A fair crop of Brussel's Sprouts was fit for use on September 16.

TOMATOES.

Seeds selected at Ottawa of Spark's Earliana as well as Graham's Earliana were sown on April 6, and planted out June 19. In point of earliness there was no difference between the two varieties, ripe fruit having been picked off both on September 1. Spark's Earliana was decidedly the better-shaped tomato. Both varieties produced heavy crops from which a quantity of ripe fruit was gathered.

CELERY.

Although celery has seldom been grown here successfully, owing, supposedly, to want of means for irrigation, it was decided to give it another trial this year, which resulted in well-bleached, crisp heads of fair size and excellent quality being obtained. The method adopted was as follows: A trench 12 inches deep by 12 inches wide was made, six inches of well-rotted manure was placed in the bottom and well trodden, and was covered with six inches of soil. The celery, which had been grown in boxes, was planted in this trench on June 29, and well watered until the plants were established. It was afterwards watered once a week, earth being drawn around it at once to prevent excessive drying out, and at the same time bleaching the celery. Paris Golden Yellow, Giant Pascal and Rose Ribbed Paris were the varieties grown.

SPINACH.

Spinach, so desirable for its earliness, was sown on May 4, and was fit for use on June 19, producing a heavy crop of very acceptable early greens.

TURNIPS.

White Milan turnip was sown on May 15, and fit for use July 1. The crop was poor in both quality and flavour.

RHUBARB.

It being desirable to give the test plots a year's rest, no rhubarb was taken from them. The bed of Tottle's Improved, which had been hitherto kept for seed purposes, was used, and produced a large quantity of nicely flavoured rhubarb. The first cutting was made on May 20.

Two large roots of rhubarb were put into barrels and covered lightly with earth and placed in a warm cellar with the idea of providing a winter supply, on October 20. A fortnight later another large root was dug up and exposed to the weather until it was frozen solid. It was then placed in the cellar and watered occasionally. This root produced stalks 15 inches long by December 20, being far ahead of the roots placed in the barrels.

AGRICULTURAL MEETINGS.

During the year a number of farmers' meetings have been attended and addressed on some agricultural subject. At the following seed fairs, I judged the grain or assisted in that work and addressed the meeting afterwards:—

Swan Lake, December 14; Virden, January 11; Elkhorn, January 20; Oak Lake, January 21; Strathclair, February 2; Hamiota, February 3, Oak River, February 4.

The subjects discussed at these meetings related mainly to the successful growing of grain, grasses, clovers and corn, but some other branches of work on the farm were also given attention. At the Convention of Agricultural Societies and Grain Show held in Winnipeg, February 15 to 18, I acted as one of the judges of the grain, and gave before the convention a resumé of some of the most important experiments conducted here during the past year. At the Manitoba Winter Fair and Fat Stock Show held in Brandon March 9 to 12, I discussed 'The Production of Beef with minimum labour and expense,' paying particular attention to experiments under way at this farm.

A Farmers Institute meeting was also attended at Melita on February 9, which was very successful.

VISITORS.

During the year many thousand visitors have inspected the work under way at the Experimental Farm, many of whom were farmers from Manitoba and other provinces. Several press excursions from the United States paid close attention to the Farm during their stay in Brandon. The most interested and critical group of visitors was the Scottish Agricultural Commission, sent to Canada to study agricultural development and education. They spent several days in Manitoba visiting various places, spending one forenoon at the Farm. At your direction, I met them in Winnipeg and accompanied them during the time they spent in this province. They took a particular interest in everything pertaining to the agricultural welfare of this part of Canada, and, while impressed with its possibilities, did not regard our present system of farming with much favour, as they considered it too prodigal of our soil fertility.

DISTRIBUTION OF SAMPLES.

The distribution of samples of grain, potatoes, trees, and shrubs, &c., has been continued, and during the past year the following material has been sent out:—

Seedling trees and shrubs, packages	274
Potatoes in 3-lb. bags	134
Wheat in 3-lb. bags	55
Oats in 3-lb. bags	53
Barley in 3-lb. bags	24
Peas in 3-lb. bags	17
Maple seed in 1-lb. bags	10
Rhubarb seed in 1-lb. bags	4
Ash seed in 1-lb. bags	5
Caragana seed in 1-lb. bags	5

CORRESPONDENCE.

Since the last report 3,067 letters were received and 3,044 despatched, irrespective of circulars.

METEOROLOGICAL RECORD FOR BRANDON.

Months.	Highest Temperature.		Lowest Temperature.		Total Rainfall.	Total Snowfall.	Hours bright Sunshine.
1908.	Day.	Deg.	Day.	Deg.	Inches.	Inches.	Hours.
April	13	8[illegible]·5	2	— 1·1	0·64	3½	199·6
May	9	82·5	3	14·	2·14	....	231·5
June	26	88·5	9	29·	2·97	....	202·9
July	9	93·5	13	40·	2·22	....	316·3
August	20	91·5	22	29·	2·09	....	270·1
September	15	93·5	28	22·	1·73	....	223·
October	9	74·	30	8·	0·67	1	123·7
November	5	60·9	30	— 6·1	0·08	6	74·7
December	26	38·9	6	—34·3	....	12	82·2
1909.							
January	20	39·9	11	—50·4	....	11	120·8
February	19	29·9	7	—35·3	....	9	98·1
March	23	38·9	17	—24·2	....	13	134·6
					12·54	55½	2,077·5

I have the honour to be, sir,

Your obedient servant,

JAMES MURRAY,

Superintendent.

EXPERIMENTAL FARM FOR SASKATCHEWAN

EXPERIMENTAL FARM, INDIAN HEAD, SASK., March 31, 1909.

DR. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit to you the twenty-first annual report of the operations on the Experimental Farm for the province of Saskatchewan, at Indian Head, Sask., during the year 1908.

The past year was one of great disappointment for crops over the greater part of the province, and, following the crop of 1907, which was a very serious failure, the outlook in many districts has been rather disheartening.

In the eastern portion of the province, rain was abundant in nearly all districts during the greater part of the growing season and grain of all sorts gave small yields. The sample, however, was good and commanded the best price going.

In the eastern portion of the province rain was abundant in nearly all districts early in the season, and crops made a rapid growth up to July 8 when hot, dry weather set in, and continued all through the month and up to August 12, when heavy rain was followed by a slight frost, which injured wheat on fallow land. The hot days of July 24 and 25, no doubt, also injured a good deal of grain.

Spring opened from April 10 to 15, and seeding became general during this period. Land was never in better condition, and a great deal was sown up to the 24th when rain and snow delayed work for a few days. Seeding was completed early in May.

Wheat harvest commenced about August 20, with oats and barley a week earlier. The weather continued fine and the crop was easily secured early in September.

Threshing started from September 15 to 20, and continued with little or no delay until completed in October.

Grain crops on the Experimental Farm were very promising for heavy yields, especially in straw, all through the season, but the hot, dry month of July and the cold snap of August 12 told against the wheat crop the same as all over the province. Oats, barley and peas gave good yields and fine samples. The hay crop was extra good. While roots, potatoes and corn suffered greatly in yield from the dry, hot July, the quality was extra fine.

WHEAT EXPERIMENTS.

Wheat tests were not satisfactory either in plot or field lots. The plot tests were on fallowed land not uniform in quality of soil, and, when the hot winds of July 24 struck the lighter soil, they ripened up the straw quickly, which resulted in a good deal of small, shrunken grain with yields greatly reduced.

The field lots were sown on fallowed land, and on Brome-sod, broken and backset the previous year. The grain on the fallows was heavy and very promising up to July 25, when it was injured by the hot winds, and, the slight frost following on August 12, the injury to the yield and quality was considerable.

The grain on the Brome backsetting, strange to say, did not suffer from either of these causes, but from wire-worms working in the soil and thinning out the grain as it came above the surface.

TEST OF VARIETIES.

Seventeen varieties of spring wheat were sown on April 16 on clay loam, mixed near the edge of coulée with considerable sand and gravel, which in ordinary years would make lit le difference to the crop, but which with the dry, hot winds of July, ripened the crop prematurely. This was specially noticeable in the Durum wheat, which usually ripens along with Red Fife and other late sorts. The size of the plots was one-twentieth acre each.

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.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Measured Bushel after Cleaning.
					In.		In.		Lbs.	Bush.	Lbs.	Lbs.
1	Huron Selected	Aug.	21	127	50	Strong	3¾	Bearded	5,260	50	40	60½
2	White Fife	"	20	126	49	Medium	3½	Bald	3,080	50	20	57½
3	Chelsea	"	21	127	43	Strong	3½	"	4,420	48	40	61½
4	Marquis B.	"	15	121	45	"	3½	"	5,210	46	20	63½
5	Huron	"	21	127	44	"	3¼	Bearded	5,580	45	20	60¼
6	Bobs	"	13	119	43	"	3	Bald	3,280	43	20	59½
7	Bishop	"	21	127	44	"	3	"	5,080	41	20	62
8	Stanley	"	15	121	46	"	3½	"	3,340	38	20	58¾
9	Percy A.	"	15	121	45	"	3¼	"	5,180	37	..	57
10	Preston	"	15	121	45	"	3	Bearded	4,820	36	40	62¼
11	White Russian	"	16	122	48	"	3½	Bald	4,900	36	..	58½
12	Stanley A.	"	15	121	52	"	3½	"	3,480	35	20	56
13	Red Fife H	"	21	127	48	"	3	"	5,100	35	..	59½
14	Riga	"	15	121	43	"	3	"	5,340	33	40	56
15	Pringle's Champlain	"	16	122	44	"	3	Bearded	5,360	32	40	58
16	Hungarian White	"	15	121	48	"	3	"	3,100	32	40	59
17	Red Fern	"	21	127	48	"	4	"	3,940	31	40	58½

TEST OF WHEAT IN FIELD LOTS.

Eight varieties were sown in field lots on April 13 to 16 on clay loam. The fallowed land was ploughed 7 inches deep before the end of June, 1907, and cultivated 2 to 3 inches deep as required, to kill weeds during the growing season.

The backsetting land was broken shallow in May and early June, and backset in August, and disked several times before and after, to kill any roots of grass that might have escaped in the ploughing.

WHEAT—Test of Varieties in Field Lots.

Name of Variety.	Size.	Date of Sowing.		Date of Ripening.		No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Measured Bushel after cleaning.
	Acres.						In.		In.		Bush.	Lbs.	Lbs.
Marquis	2⅓	April	13	Aug.	17	126	43	Strong	3	Bald	37	52	63
Preston	7½	"	13	"	23	131	50	"	4	Bearded	33	37	62¼
"	4⅓	"	14	"	21	129	50	"	3¾	"	32	40	60
Bobs	¾	"	14	"	11	119	43	"	2¾	Bald	32	22	63¼
Stanley A.	⅜	"	13	"	17	126	45	"	3½	"	30	5	58½
Chelsea	2	"	14	"	17	125	46	"	3¼	"	29	38	60¾
Huron Selected	1⅓	"	13	"	17	126	47	"	3½	Bearded	29	36	63½
Red Fife	23¼	"	17	"	31	136	54	"	3	Bald	29	16	61¾
Percy A.	2⅔	"	14	"	17	125	47	"	3	"	25	40	60¾
Red Fife H.	4	"	13	"	29	138	47	"	3½	"	22	4	61¼

WHEAT—Average and Total Yields.

Variety.	Cultivation.	Acres.	Yield per Acre.		Total Yield	
			Bush.	Lbs.	Bush.	Lbs.
Marquis	Backsetting.	2⅓	37	52	88	21
Preston	Fallow	7½	33	37	252	8
Preston	Backsetting.	4⅓	32	40	141	20
Bobs	"	¾	32	22	24	17
Stanley A	"	⅔	30	5	20	4
Chelsea	"	2	29	38	59	16
Huron Selected	"	1½	29	36	44	24
Red Fife	Fallow	23¼	29	16	680	27
Percy A	Backsetting.	2⅔	25	40	68	27
Red Fife H	Fallow	4	22	4	88	16
		49			1,467	00

An average of 29 bushels, 56 lbs. per acre.

WHEAT—Five Years Comparison of Field Lots.

The average yield per acre, and time taken to mature, of five varieties of wheat grown in field lots under similar conditions for the past five years are given below:—

Variety.	Average Days to Mature.	Days earlier than Red Fife.	Average Yield per Acre.	
			Bush.	Lbs.
Preston	130·	8·	37	19
Huron	127·6	10·4	37	14
Red Fife	138·	....	31	5
Stanley	130·	8·	30	45
Percy	130·	8·	29	42

DURUM WHEAT—Test of Varieties.

Four sorts were tested. Sown April 16, on clay loam.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Measured Bushel after Cleaning.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs.
Yellow Gharnovka	Aug. 15	121	53	Weak	3	Bearded	4,080	40	..	62
Goose	" 15	121	55	"	3	"	4,340	37	..	60½
Kubanka	" 15	121	52	"	3	"	3,940	33	20	62
Roumanian	" 15	123	55	Medium	3	"	3,160	30	..	60½

FALL WHEAT.

For the first time in all the tests made with winter wheat since the farm started the crop came through safely from spring-killing. The grain was considerably shrunken and the yield not heavy. Date of seeding, September 18, 1907; ripe and cut, August 4; name of variety, Turkey Red; straw strong, 47 inches long; heads bearded, 3¼ inches in length; yield 27 bushels per acre.

Last fall (1908) Turkey Red fall wheat was sown on August 13, 21 and 31, and Kharkov fall wheat on September 19. Kharkov is a purer strain of Turkey Red.

EXPERIMENTS WITH OATS.

TEST OF VARIETIES.

Twenty-six varieties were sown May 5 on fallowed land. A few varieties were on lighter soil than others and suffered from the hot, dry July. These were Kendal White, Lincoln, Milford White, Swedish Select, Swedish Select (regenerated), Virginia White and Joanette. Plots were each one-twentieth acre.

OATS—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.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Measured Bushel after Cleaning.
					In.		In.		Lbs.	Bush.	Lbs.	Lbs.
1	Banner	Aug.	22	109	50	Medium	10	Branching	4,000	115	10	39
2	Danish Island	"	18	105	50	"	9	"	3,000	110	20	38½
3	American Triumph	"	20	107	52	"	9	"	3,600	104	04	39¾
4	Golden Giant	"	19	106	52	Strong	11	Sided	3,360	98	28	34
5	Twentieth Century	"	18	105	48	Weak	9	Branching	3,100	98	28	35¼
6	Storm King (Agassiz seed)	"	22	109	56	Strong	12	Sided	2,960	94	04	38¼
7	Siberian	"	20	107	47	Weak	8	Branching	2,420	91	26	40½
8	Goldfinder	"	18	105	40	Strong	8	"	3,620	89	14	35
9	Irish Victor	"	17	104	42	"	9	"	3,020	87	22	37
10	Abundance	"	22	109	50	Medium	10	"	3,000	87	2	32½
11	Storm King (I. Head seed)	"	22	109	50	Strong	10	Sided	3,840	87	2	39
12	Improved American	"	17	104	45	"	8	Branching	2,860	85	10	36½
13	Improved Ligowo	"	17	104	40	"	7	"	3,640	82	32	36
14	White Giant	"	17	104	47	"	8	"	3,600	75	30	33¾
15	Golden Beauty	"	19	106	54	Medium	10	"	3,800	73	18	35½
16	Regenerated Swedish Select	"	17	104	51	Strong	9	"	2,640	71	26	34¼
17	Milford White	"	17	104	51	"	11	Sided	2,040	71	6	37
18	Swedish Select	"	17	104	51	"	9	Branching	2,760	70	20	37
19	Wide Awake	"	15	102	44	"	8	Sided	3,080	68	8	34½
20	Kendal White	"	17	104	41	"	9	Branching	3,460	67	22	32¼
21	Tartar King	"	17	104	47	"	10	Sided	4,440	67	2	37¾
22	Thousand Dollar	"	13	100	40	"	8	"	3,300	67	2	36½
23	Lincoln	"	17	104	48	"	9	Branching	3,160	62	32	31½
24	Virginia White	"	13	100	40	"	7	Sided	2,920	62	12	40
25	Pioneer	"	15	102	42	"	8	Branching	3,700	57	22	31
26	Joanette	"	15	102	37	"	7	Sided	1,720	46	16	37½

TEST OF OATS IN FIELD LOTS.

Six varieties were sown in fields on fallowed land from May 1 to 7; 2½ bushels were sown to the acre on account of rather low germination. Banner oats, which usually head all varieties in yield, did not sustain their good reputation. This may have been caused by weak vitality in the seed, and larger acreage sown.

Oats—Test of Varieties in Field Lots.

Name of Variety.	Size of Lot.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per measured bushel after cleaning.
	Acres.				In.		In.		Bush.	Lbs.	Lbs.
Wide Awake	3¾	May 4.	Aug. 19.	107	40	Strong....	8	Branching	95	30	33
Danish Island	4⅔	" 2.	" 18.	108	48	" ...	9	" ..	90	12	38½
White Giant	4⅔	" 4	" 18.	106	40	" ...	8	" .	90	6	34¾
Improved Ligowo	4½	" 1.	" 13.	104	48	Medium. .	8	" ..	78	20	38
Banner	27¾	" 6.	" 24.	110	50	Strong....	9	" ..	78	..	37½
Tartar King	5⅔	" 5.	" 18.	105	49	" ...	9	Sided	78	..	37

Oats—Average and Total Yields.

Variety.	Cultivation.	Acres.	Yield per Acre.		Total Yield.	
			Bush.	Lbs.	Bush.	Lbs.
Wide Awake	Fallow.. ...	3¾	95	30	359	20
Danish Island	"	4⅔	90	12	421	22
White Giant	"	4⅔	90	6	420	28
Improved Ligowo	"	4½	78	20	353	22
Banner	"	27¾	78	..	2,165	16
Tartar King	"	5⅔	78	..	442	..
		51			4,163	6

An average of 81½ bushels per acre.

Oats—Five Years Comparison of Field Lots.

The average yield per acre and time taken to mature, of four varieties of oats grown in field lots under similar conditions for the past five years are shown below:—

Variety.	Average days to Mature.	Average Yield per Acre.	
		Bush.	Lbs.
Wide Awake	116·6	88	6
Banner	116·8	86	11
Tartar King	113·8	75	7
Improved Ligowo	114·8	74	27

EXPERIMENTS WITH BARLEY.

The barley tests in plots and field lots were, as a rule, satisfactory. All were too far advanced in July to be injured to any great extent by the hot weather, but it is quite possible that without the heat the yield might have been larger.

Having little rain or dew after harvest, the sample in most cases is bright in colour and plump.

Uniform Plot Tests.

In this test, 14 varieties of six-rowed and 11 varieties of two-rowed barley were sown on May 5, at the rate of 2 bushels of seed per acre. Soil, clay loam fallowed the previous year. All the plots were one-twentieth acre in size.

Six-Rowed 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.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after cleaning.
					Inches.		Inches.	Lbs.	Bush.	lbs.	
1	Black Barley	Aug.	7	94	38	Medium	2½	2,000	72	4	50
2	Trooper	"	7	94	43	Weak	3½	2,120	59	8	51
3	Stella	"	7	94	32	Medium	2	2,260	55	40	50½
4	Yale	"	7	94	44	"	3½	1,900	45	40	46½
5	Mensury	"	4	91	43	Strong	2½	3,420	45	20	45½
6	Albert	"	7	94	46	Medium	3¼	2,540	45	20	49½
7	Blue Longhead	"	4	91	38	"	3½	1,700	45	20	45½
8	Empire	"	4	91	45	"	3	2,820	44	8	45½
9	Odessa	"	4	91	38	"	3	1,860	42	44	45
10	Claude	"	4	91	42	"	2¾	2,060	41	32	46
11	Oderbruch	"	4	91	39	"	2½	1,940	40	40	51
12	Mansfield	"	4	91	36	"	3	2,320	38	36	45
13	Nugent	"	4	91	40	Strong	3½	2,780	37	4	45
14	Champion	"	4	91	45	Medium	3¼	2,600	35	40	43¼

Two-Rowed 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.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after cleaning.
					Inches.		Inches.	Lbs.	Bush.	lbs.	Lbs.
1	Danish Chevalier	Aug.	15	102	40	Medium	4	2,200	60	..	49
2	Swedish Chevalier	"	17	104	42	Weak	3¼	2,320	59	8	51
3	Gordon	"	7	94	44	Medium	3	3,000	56	12	52¾
4	Standwell	"	17	104	42	Weak	3	3,560	54	8	51½
5	Clifford	"	8	95	57	Medium	3½	1,680	52	24	52½
6	French Chevalier	"	15	102	38	"	3½	2,360	48	16	50
7	Jarvis	"	7	94	43	"	3½	2,700	47	4	50½
8	Sidney	"	6	93	40	"	3¼	1,520	46	12	52
9	Invincible	"	14	101	40	"	3¼	3,400	41	32	47
10	Canadian Thorpe	"	7	94	41	"	3	2,760	40	..	46½
11	Beaver	"	7	94	42	"	3¼	2,240	37	44	48¾

BARLEY—Test of Varieties in Field Lots.

Seven varieties were sown in field lots. Mensury in this test gave much the best return.

Name of Variety.	Size of lot.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including head.	Character of Straw	Length of Head.	Kind of Head.	Yield per Acre.		Weight per measured Bushel after cleaning.
	Acres				Inches		In.		Bush.	Lbs.	Lbs.
Mensury	14½	May 4	Aug. 8	96	44	Strong	2½	6-rowed.	59	..	49½
Claude	3	" 7	" 8	93	40	"	3	6-rowed.	49	..	50
Standwell	2	" 6	" 20	104	46	Medium	3	2-rowed.	47	41	52
Invincible	5	" 6	" 20	104	47	"	3	2-rowed.	47	22	53½
Sidney	4½	4 6	" 8	92	48	Strong	3	2-rowed.	44	8	52½
Canadian Thorpe	4¾	" 7	" 17	100	43	...	3	2-rowed.	42	4	51½
Mansfield	1¾	" 7	" 8	93	38	...	2¾	6-rowed.	39	42	49½

BARLEY—Average and Total Yields.

Variety.	Cultivation.	Acres.	Yield per Acre.		Total Yield.	
			Bush.	Lbs.	Bush.	Lbs.
Mensury	Fallow	14½	59	..	855	28
Claude	"	3	49	..	147	....
Standwell	"	2	47	41	95	34
Invincible	"	5	47	22	237	14
Sidney	"	4½	44	8	198	36
Canadian Thorpe	"	4¾	42	4	199	43
Mansfield	"	1¾	39	42	69	37
		35½			1,804 bush.	

An average of 50¾ bushels per acre.

BARLEY—Five Years Comparison of Field Lots.

The average yield per acre, and time taken to mature, of seven varieties of barley grown in field lots under similar conditions for the past five years will be found below.

Variety.	Average days to Mature.	Average Yield per Acre.	
		Bush.	Lbs.
Claude	101·6	56	16
Mensury	100·6	56	10
Mansfield	101·	54	30
Invincible	109·4	45	44
Sidney	103·2	42	35
Standwell	108·2	41	5
Canadian Thorpe	105·2	39	..

EXPERIMENTS WITH FIELD PEAS.

Peas were sown on root land of the previous year, and were successful in every way. The land had been fallowed for the roots and 10 to 12 loads of manure applied per acre. After the roots and corn were taken from the field, the ground was ploughed 6 to 7 inches deep and well harrowed, and the small plots and larger lots of peas sown in the spring without further cultivation. After sowing, the land was rolled with an ordinary roller. This was done to allow the crop to be cut with a Pea Harvester, which consists of four or five teeth attached to an ordinary mower, which lift the vines in front of the mower knife.

After being harvested and lying in bunches on the land, a pea crop is liable to be carried by winds to any part of the farm, and to overcome this danger it is necessary to allow the crop to get dead ripe, then cut with harvester or pull by hand, and stack the same day. Peas, unlike other grain, do not suffer if left for a week or ten days after they are ripe, unless heavy and continuous rains take place, which is hardly possible in this province.

UNIFORM PLOT TESTS.

Eighteen varieties of peas were sown on one-twentieth acre plots, 2 to 3½ bushels of seed being sown according to size of peas. They were sown on clay loam.

FIELD LOTS.

Three varieties, Arthur, White Wonder and Golden Vine, were sown on April 23, alongside the plot lots, the land being clay loam and prepared in the same way. Yields per acre: Arthur, 38 bushels; White Wonder, 39 bushels, and Golden Vine, 42 bushels.

PEAS—Test of Varieties.

No. of Plot.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number 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	Gregory	April 22	Aug. 20	1[illegible]0	Strong	55	2	Medium	48	40	61¼
2	Mackay	" 22	" 22	122	"	60	2½	Large	48	40	61½
3	Golden Vine	" 22	" 18	118	"	50	2¼	Small	46		64½
4	Chancellor	" 22	" 15	11[illegible]	"	50	3	"	45	20	63
5	Prussian Blue	" 22	" 22	1[illegible]2	"	50	2¾	Medium	45	20	64
6	Dan O'Rourke	" 22	" 18	118	"	45	2¼	Small	45		64
7	Paragon	" 22	" 22	122	"	60	2¾	Medium	44		63½
8	Arthur	" 22	" 15	115	"	50	2½	Large	43	40	63½
9	Picton	" 22	" 18	118	"	45	2½	Medium	42	20	64½
10	English Grey	" 22	" 21	121	"	50	2¾	Large	42		62½
11	Wisconsin Blue	" 22	" 24	124	"	55	2	Small	41	20	65
12	Prince	" 22	" 22	122	"	55	2½	"	40	40	63½
13	Early Britain	" 22	" 18	118	"	50	2½	"	39	20	63
14	Archer	" 22	" 18	118	"	40	2½	Medium	37		64
15	Black-eye Marrowfat	May 4	" 24	112	"	50	3	Large	36	40	64
16	White Marrowfat	April 22	" 24	124	"	55	3	"	35	20	64
17	Agnes	" 22	" 16	116	"	45	2¾	Large	33	20	64¼
18	Victoria	May 4	" 22	110	"	45	2¾	Medium	32	40	65

SMUT TESTS.

In 1907, two bushels of smut dust was obtained from King's elevator, Fort William, and sown on five plots of fallowed land, each 8 feet square. After sowing, the dust was well raked in, and then Red Fife wheat treated as follows, was sown. In 1908, Red Fife was again sown on these plots, without any further application of smut dust.

RESULTS IN 1907 AND 1908.

Number.	Quality of Seed.	Treatment.	Smut Heads in Plot.	
			1907.	1908.
1	No. 1 Northern.....	Bluestone, 1 lb. in 10 gals. water.....	44	2
2	"	Formalin, 1 " 40 "	52	12
3	"	Not treated	81	23
4	Shrunken and poor..	Bluestone, 1 lb. in 10 gals. water.....	80	42
5	" ..	Formalin, 1 " 40 "	36	57

Alongside the plots sown with smut dust were five plots of equal size, not treated with the dust, resulting as follows:—

Number	Quality of Seed.	Treatment.	1907.	1908.
1	No. 1 Northern.....	Bluestone, 1 lb. in 10 gals. water.....	8	3
2	"	Formalin, 1 " 40 "	11	0
3	"	Not treated.....	30	5
4	Srunken and poor..	Bluestone, 1 lb. in 10 gals. water.....	5	8
5	" ..	Formalin, 1 " 40 "	3	25

In the spring of 1908, the stubble of the preceding crop was gang-ploughed 3 inches deep and the seed sown.

The above tests were undertaken to prove whether dust blown from threshing machines, or smut-balls falling from grain and remaining in the soil, would cause more smut in the crop than would otherwise be the case.

Although the amount of smut dust used may appear excessive, yet it is not more than may settle about threshing machines when grain is badly affected.

On comparing the two years result, it looks very like a verdict for smut remaining in the soil and injuring following crops.

The only smut test conducted outside the above was treatment with Bluestone versus Formalin of No. 1 Feed wheat of 1907 crop, and a plot sown with good Red Fife bluestoned in spring of 1907 and sown in 1908. A plot of No. 1 Northern, untreated, was sown for comparison.

Quality of Seed and Treatment.	Smut Heads in 8 ft. square.	Yield per Acre.	
		Bush.	Lbs.
No. 1 Feed, Bluestone, 1 lb. to 10 gals. water.....	10	31	—
" Formalin, 1 " 40 "	2	29	—
Treated in 1907.....	0	33	20
Untreated, No. 1 Northern.....	4	29	—

It will be noticed that while the bluestoned grain in this test was not as free from smut as that treated with formalin, the results of using bluestone versus formalin in the Smut Dust Test favoured the bluestone considerably.

It will also be observed that wheat treated one year in advance of sowing is not ruined for seed, as many suppose. This is the second test of this nature, both resulting the same way.

Treatment for smut is of such vast importance to this province that I may be permitted to dwell longer on this matter than I otherwise should. In the spring of 1908, on account of the large bulk of the seed wheat in the country being of low grade and weak vitality, it was thought advisable to recommend formalin instead of bluestone, which in former years was generally successful when properly applied.

On the Experimental Farm, all the wheat sown, except the test plots, was treated with formalin, with the result that we never before had the quantity of smut in all the varieties that was present last harvest. The seed for the field lots was treated with formalin, 1 lb. in 30 gallons water, well soaked in going through the pickler and covered after treatment as recommended. The seed for the plot lots was dipped five minutes in the solution and allowed to dry in the bags.

In former years, bluestone was invariably used, and generally little or no smut was found in the crops. One pound bluestone in 10 gallons water for clean seed, and 1 lb. in 5 to 7 gallons of water if at all affected with smut, was applied.

For oats and barley, formalin has been found the most effective, and for years has been the only remedy used.

I draw attention to the yields in the smut tests, sown with No. 1 Feed Wheat, which go to prove that bluestone is not more injurious to seed wheat than formalin.

ROTATION OF CROPS.

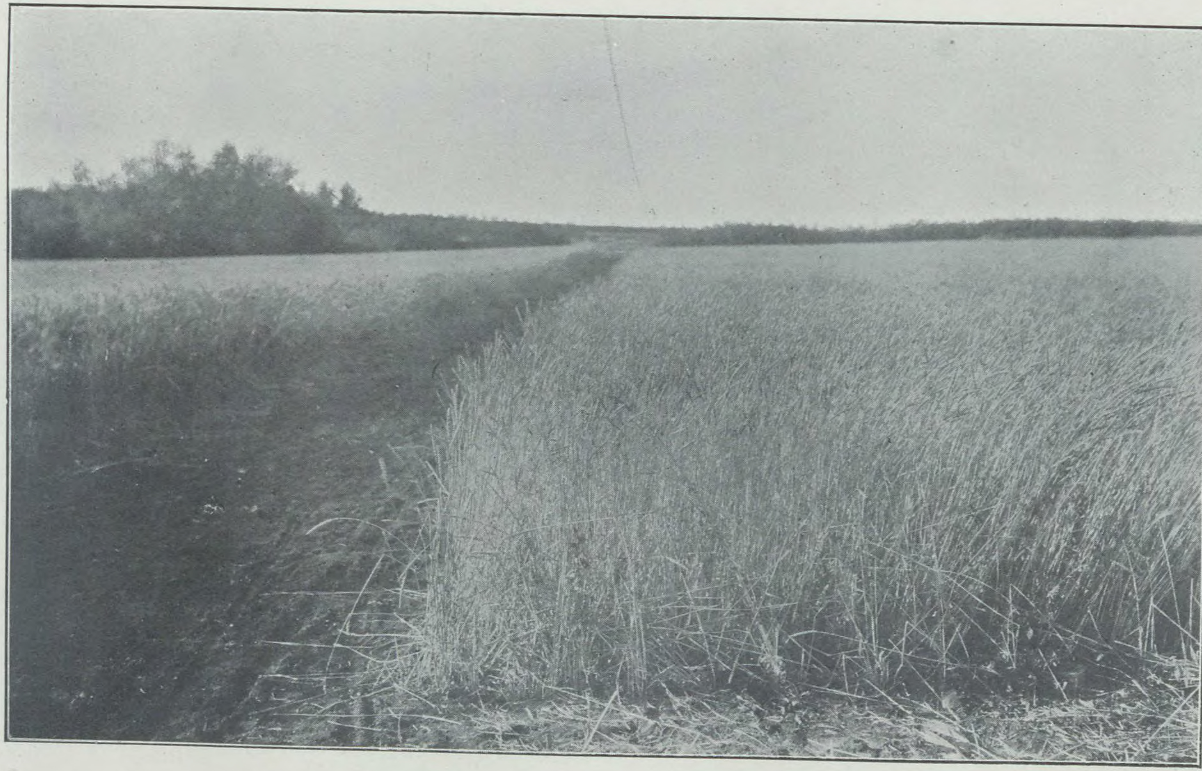
These tests were commenced in 1899. Below is given the order of rotation for the past three years, with yields, &c., of each plot. The plots are each one-half acre in size, the soil being clay loam.

The preparation of the soil for the 1908 crop was ploughing 5 to 6 inches deep in fall when grain was removed, and cultivating shallow in the spring.

ORDER OF ROTATION.

No.	—	1906.	1907.	1908.
1	....	Oats.	Peas.	Wheat.
2	....	Wheat.	Tares.	"
3	....	Oats.	Alsike.	"
4	....	Wheat.	Red Clover.	"
5	....	Barley.	Alfalfa.	"
6	....	Wheat.	Wheat.	Peas.
7	....	"	Oats.	Tares.
8	....	"	"	Alsike.
9	....	"	Wheat.	Red Clover.
10	....	"	Barley.	Alfalfa.
11	....	"	Fallow.	Wheat.
12	....	"	"	"
13	....	Oats.	"	"
14	....	Barley.	"	"
15	....	Wheat.	Oats.	"
16	....	Barley.	"	"
17	....	Alsike.	Wheat.	Oats.
18	....	Peas.	"	Emmer.
19	....	Tares.	"	Oats.
20	....	Red Clover.	"	Wheat.
21	....	Alfalfa.	"	Barley.
22	....	Summer-fallow.	"	"

5094—p. 312.



Field of Stanley Wheat. Experimental Farm, Indian Head, Sask., 1908, Stanley A. *Photo by C. E. Saunders.*

ROTATION TESTS.

Number.	Name of Variety.	Character of Soil.	Date of Sowing.	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.
						Ins.		Ins.	Bush.	Lbs.	Lbs.
1	Wheat	After peas	Aug. 17.	Aug. 24.	129	48	Medium	3	31	16	56½
2	"	After tares	" 17.	" 24.	129	47	Strong	3	32	..	60½
3	"	After alsike	" 17.	" 24.	128	44	"	3	30	26	63
4	"	After red clover	" 17.	" 29.	134	48	"	3	29	50	62½
5	"	After alfalfa	" 17.	" 29.	134	46	"	3	31	40	63
6	Peas		May 11.	Cut July 15; ground too hard to plough them under.							
7	Tares		" 11.	" " " " "							
8	Alsike		" 26.	Ploughed under September 15.							
9	Red Clover		" 26.	" " "							
10	Alfalfa		" 26.	" " "							
11	Wheat	After fallow	Apl. 17.	Aug. 29.	134	46	Strong	3	35	42	64
12	"	"	" 14.	" 24.	132	51	Medium	3	36	32	62
13	"	"	" 15.	" 24.	131	49	"	3	31	40	62½
14	"	"	" 15.	" 29.	136	50	"	3	31	10	58
15	"	After oats	" 17.	" 29.	134	33	Strong	2¼	14	36	58
16	"		" 17.	" 29.	134	36	"	2¼	14	6	..
17	Oats		May 8.	" 29.	114	33	"	7	46	4	..
18	Emmer		" 10.	" 29.	112	34	"	1¾	..	..	1,284
19	Oats		" 10.	" 29.	112	40	"	8	52	2	..
20	Wheat		Apl. 17.	Cut green on account of wild oats appearing in crop.							
21	Barley		May 10.	Aug. 15.	97	30	Strong	2	27	36	..
22	"		" 10.	" 15.	97	30	"	2	22	20	..

FALL RYE.

For several years a few acres of fall rye have been sown with good success. In 1907 the plot of 1½ acres was extremely heavy and lodged greatly, and in 1908 a good seeding was found on the ground, and, without cultivation or harrowing, this was left for a second crop, the result both in straw and grain being satisfactory, considering the work put on the plot. Cultivation two or three inches deep would no doubt have increased the crop greatly.

For early pasture in the spring, or for fodder or hay before other crops are available, fall rye is very satisfactory.

FALL RYE.

Size of Plot.	Date Sown.	Date Ripe.	Length of Straw.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per Bushel after Cleaning.
Acres.			In.		In.	Bush.	Lbs.	Lbs.
1½	Volunteer	Aug. 4	65	Medium	3¾	27	10	57
2/5	Sept. 8	" 4	65	"	3¾	55	20	57

FLAX.

This test was made on fallowed land, the seed being sown on May 13. One variety, from seed not germinating properly, gave a very small yield.

FLAX—Test of Varieties.

Name of Variety.	Size of Plot.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Weight of Straw.	Yield per Acre.		Weight per Measured Bushel after Cleaning.
	Acres.				In.	Lbs.	Bush.	Lbs.	Lbs.
Common	1/40	May 13	Aug. 17	96	26	3,720	22	28	54
Riga	"	" 13	" 17	96	28	3,660	21	24	55
Improved Russian	"	" 13	" 17	96	28	2,080	14	36	56
White Flowering	"	" 13	" 17	96	29	2,360	13	32	53½
Yellow Seeded	"	" 13	" 20	99	26	1,520	6	4	54½
Common	2¾	" 13	" 26	105	27	....	18	12	54½

GRASSES AND CLOVERS.

All the various plots or fields of grass and clover that gave a crop the preceding year came through the winter and spring better than ever before. Red Clover sown with Western Rye Grass in 1906, came through the two winters and springs safely, as did also the Red Clover sown in 1907, and gave a good crop. These are the first crops of Red Clover ever obtained on the Farm.

The alfalfa tests gave good yields, with the exception of the common sort sown in 1905.

An extra good plot of Turkestan alfalfa was left for seed and threshed with ordinary threshing machine, giving a very small yield of seed. A part of a second plot alongside, after taking off first crop for hay, was left for seed, but did not even fill before frost came and destroyed it.

The variety of alfalfa called 'Grimm' has proven the hardiest of all the strains of alfalfa tested on this Farm. This variety, named after a German farmer who brought it to Minnesota about 1860, is supposed to have come originally from Norway. If reports are true, it has succeeded in Minnesota beter than all other kinds.

YIELDS OF HAY AND CLOVER, 1908.

Variety.	Year Sown.	Acres.	Date Cut.	Yield per Acre.	
				Tons.	Lbs.
Western Rye Grass	1906	4½	July 16	2	1,536
W. Rye Grass and Red Clover	1906	7	" 13	2	360
W. Rye, Red Clover and Timothy	1907	2½	" 18	2	1,875
Meadow Fescue	1904	½	" 21	0	1,122
Timothy	1905	½	" 21	1	1,100
Brome Grass	1899*	½	" 21	1	800

* Renewed by ploughing shallow in 1904.

ALFALFA.

Source of Seed.	Year Sown.	First Crop.		Second Crop.	
		Date Cut.	Yield per Acre.	Date Cut.	Yield per Acre.
			Tons. Lbs.		Tons. Lbs.
Turkestan	1904	July 4	2 346	Aug. 6	1 153
Common	1904	" 4	2 1,120	" 6	0 1,540
Common	1905	" 4	1 1,000	" 6	0 1,540
Minnesota (Grimm)	1905	" 2	3 90	" 6	1 955
New York	1905	" 2	3 705	" 6	1 1,227
Samarkand (Turkestan)	1905	" 2	2 1,636	" 6	1 1,023
Nebraska	1905	" 2	2 368	" 6	1 358
Common	1905	" 4	2 1,640	" 7	1 45

INDIAN CORN.

The Indian corn tests were far from satisfactory. Wire worms worked in the plots after the seed was sown, making a second seeding necessary; then, just as a good start was made, the dry July occurred, followed by frost on August 13, which stopped further progress.

The varieties giving the very low yields are those most injured by wire worms.

The corn was planted in the hills 3 feet apart each way, and the rows were also 3 feet apart. The yields were computed from the weight of two rows each 66 feet long.

Following the test of varieties of corn in hills and in rows, are given the results of a test of three varieties sown in rows at four different distances apart, and also the average results of this test for the past ten years.

CORN—Test of Varieties.

	Name of Variety.	Character of Soil.	Date of Sowing.	Height.	Conditions when cut.	Weight per acre grown in rows.	Weight per acre grown in hills.
				Inches.		Tons. Lbs.	Tons. Lbs.
1	Compton's Early	Clay Loam	May 18	55	Tasselled	12 750	8 1,380
2	Longfellow	"	"	58	"	11 1,540	7 1,510
3	Champion White Pearl	"	"	62	"	11 1,210	10 350
4	Selected Leaming	"	"	57	"	9 1,170	8 1,380
5	Wood's Northern White Dent	"	"	50	"	9 920	7 300
6	Angel of Midnight	"	"	54	"	9 810	9 700
7	White Cap Yellow Dent	"	"	52	"	8 1,490	8 170
8	Superior Fodder	"	"	50	Not tasselled	8 280	9 1,8[illegible]0
9	Salzer's All Gold	"	"	50	"	8 280	7 1,400
10	Early Mastodon	"	"	60	Tasselled	8 60	7 1,180
11	Mammoth Cuban	"	"	65	Not tasselled	5 1,550	9 810
12	North Dakota White	"	"	58	Tasselled	3 1,920	7 960
13	Eureka	"	"	55	Not tasselled	3 1,700	8 170
14	Pride of the North	"	"	66	"	2 1,830	7 630

CORN—Test of Seeding at Different Distances.

Name of Variety.	Character of Soil.	Date of Sowing.	Rows. Distance apart.	Height.	Weight per acre grown in rows.	
			Inches.	Inches.	Tons.	Lbs.
Selected Leaming	Clay loam	May 18	21	50	14	1,600
"	"	"	28	50	10	263
"	"	"	35	50	6	556
"	"	"	42	50	6	1,296
Longfellow	"	"	21	55	13	1,347
"	"	"	28	55	10	1,964
"	"	"	35	55	10	489
"	"	"	42	55	9	1,803
Champion White Pearl	"	"	21	58	11	632
"	"	"	28	58	13	1,632
"	"	"	35	58	11	1,338
"	"	"	42	58	8	230

CORN—Test of Seeding at Different Distances—Average for Ten Years ending 1908.

Name of Variety.	Distance between rows.	Weight per acre grown in rows.	
	Inches.	Tons.	Lbs.
Selected Leaming	21	15	818
"	28	14	604
"	35	12	652
"	42	10	748
Longfellow	21	16	1,612
"	28	14	209
"	35	13	1,383
"	42	12	1,539
Champion White Pearl	21	14	164
"	28	12	1,428
"	35	12	1,547
"	42	10	1,995

FIELD ROOTS.

On account of the hot, dry July, all varieties of roots were small, and the yields below the average of ordinary years.

The roots were of extra good quality, and dry weather in the fall when lifting, permitted their being stored in the cellars in good condition.

The yields were computed from the weight of two rows each 66 feet long and 30 inches apart.

Turnips—Test of Varieties.

No. of Plot.	Name of Variety.	Character of Soil.	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	Clay loam	May 13	May 23	Oct. 12	Oct. 12	19	1072	651	12	16	1000	550	00
2	Perfection	.....	.....	.....	.....	.....	18	432	607	12	15	1680	528	00
3	Derby Bronze Top	.....	.....	.....	.....	.....	17	584	576	24	20	524	675	24
4	Hall's Westbury	.....	.....	.....	.....	.....	17	584	576	24	19	412	640	12
5	Kangaroo	.....	.....	.....	.....	.....	16	1528	558	48	17	980	583	00
6	Jumbo	.....	.....	.....	.....	.....	15	1944	532	24	18	960	616	00
7	Mammoth Clyde	.....	.....	.....	.....	.....	15	1944	532	24	17	1904	598	24
8	Bangholm Selected	.....	.....	.....	.....	.....	15	1812	530	12	25	556	842	36
9	Halewood's Bronze Top	.....	.....	.....	.....	.....	15	888	514	48	17	584	576	24
10	Skirving's	.....	.....	.....	.....	.....	15	360	506	00	16	604	543	24
11	Hartley's Bronze	.....	.....	.....	.....	.....	14	1832	497	12	15	1020	517	00
12	Good Luck	.....	.....	.....	.....	.....	14	1436	490	36	19	280	638	00
13	Magnum Bonum	.....	.....	.....	.....	.....	13	532	442	12	20	788	679	48

Mangels—Test of Varieties.

No. of Plot.	Name of Variety.	Character of Soil.	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	Clay loam	May 13	May 22	Oct. 6	Oct. 6	19	544	642	24	*		*	
2	Yellow Intermediate	.....	.....	.....	.....	.....	17	1904	598	24	18	36	600	36
3	Perfection Mammoth Long Red	.....	.....	.....	.....	.....	17	1376	589	36	*			
4	Prize Mammoth Long Red	.....	.....	.....	.....	.....	17	56	567	36	12	1212	420	12
5	Mammoth Red Intermediate	.....	.....	.....	.....	.....	16	736	545	36	14	644	477	24
6	Giant Yellow Intermediate	.....	.....	.....	.....	.....	16	604	543	24	12	948	417	48
7	Gate Post	.....	.....	.....	.....	.....	16	340	539		18	960	616	00
8	Selected Yellow Globe	.....	.....	.....	.....	.....	16	76	534	36	*		*	
9	Half Sugar White	.....	.....	.....	.....	.....	14	1832	497	12	11	704	378	24
10	Crimson Champion	.....	.....	.....	.....	.....	14	1832	497	12	11	440	374	00

*Destroyed by wire-worms.

CARROTS—Test of Varieties.

No. of Plot.	Name of Variety.	Character of Soil.	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	Clay loam	April 22	May 6	Oct. 12	Oct. 12	10	64	334	24	8	500	275	
2	Half-long Chantenay	......	......	......	......	......	9	744	312	24	5	824	180	24
3	Ontario Champion.	......	......	......	......	......	9	348	305	48	7	1576	259	36
4	Improved Short White	......	......	......	......	......	8	368	272	48	9	348	305	48
5	White Belgian	......	......	......	......	......	7	1048	250	48	5	956	182	36
6	Mammoth White Intermediate	......	......	......	......	......	7	388	239	48	8	1820	297	00

SUGAR BEETS—Test of Varieties.

Name of Variety.	Character of Soil.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre 1st Plot.		Yield per Acre 1st Plot.	
						Tons.	Lbs.	Bush.	Lbs.
Vilmorin's Improved	Clay loam	May 13	May 23	Oct. 10	Oct. 10	10	1780	363	
Wanzleben	......	......	......	......	......	10	196	336	36
French Very Rich	......	......	......	......	......	7	1708	261	48

(Second seeding destroyed by wire-worms).

POTATOES.

The yields of potatoes were smaller than those of any preceding year, but the quality was excellent The hot, dry July no doubt caused the poor returns, as frost did no injury during the growing season.

Yields were computed from weight of two rows each 66 feet long and 30 inches apart.

POTATOES.—TEST OF VARIETIES.

Number.	Name of Variety.	Character of Soil.	Planted.	Dug.	Character of Growth.	Average Size.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Form and Colour.
							Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
1	Reeve's Rose	Clay loam	May 15	Oct. 5	Strong	Medium	283	48	277	12	6	36	Oval, red.
2	Country Gentleman	"	" 15	" 5	"	Large	281	36	257	24	24	12	Long, pink.
3	Philanthropist	"	" 15	" 5	"	Medium	277	12	257	24	19	48	Oval, pink.
4	Everett	"	" 15	" 5	"	Large	266	12	248	36	17	36	Long, pink.
5	Ashleaf Kidney	"	" 15	" 5	"	"	264	—	259	36	4	24	Round, white.
6	Morgan's Seedling	"	" 15	" 5	"	Medium	239	48	228	48	11	—	Long, pink.
7	Rochester Rose	"	" 15	" 5	"	"	239	48	224	24	15	24	Oval, red.
8	Empire State	"	" 15	" 5	"	Large	237	36	226	36	11	—	Round, white.
9	Late Puritan	"	" 15	" 5	"	Small	235	24	213	24	22	—	Oval, white.
10	Early Manistee	"	" 15	" 5	"	Medium	233	12	228	48	4	24	Oval, pink.
11	Burnaby Mammoth	"	" 15	" 5	"	"	233	12	217	48	15	24	"
12	State of Maine	"	" 15	" 5	"	"	226	36	222	12	4	24	Oval, white.
13	Holborn Abundance	"	" 15	" 5	"	Small	226	36	222	12	4	24	Round, white.
14	Vermont Gold Coin	"	" 15	" 5	"	Medium	224	24	215	36	8	48	Oval, white.
15	Canadian Beauty	"	" 15	" 5	"	Large	220	—	204	36	15	24	Long, pink.
16	Dreer's Standard	"	" 15	" 5	"	Medium	213	24	206	48	6	36	Oval, white.
17	Early White Prize	"	" 15	" 5	"	"	211	12	195	48	15	24	Round, white.
18	Vick's Extra Early	"	" 15	" 5	"	"	209	—	202	24	6	36	Oval, pink.
19	American Wonder	"	" 15	" 5	"	"	200	12	193	36	6	36	Long, white.
20	Money Maker	"	" 15	" 5	"	Small	189	12	180	24	8	48	"
21	Irish Cobbler	"	" 15	" 5	"	Large	187	—	180	24	6	36	Round, white.
22	Uncle Sam	"	" 15	" 5	"	Small	184	48	173	48	11	—	Oval, white.
23	Dooley	"	" 15	" 5	"	Medium	178	12	160	36	17	36	"
24	Carman No. 1	"	" 15	" 5	"	"	162	48	156	12	6	36	Round, white.
25	Dalmeny Beauty	"	" 15	" 5	"	"	145	12	136	24	8	48	Oval, white.
26	Twentieth Century	"	" 15	" 5	"	Small	88	—	77	—	11	—	Flat, white.

SUMMARY OF CROPS, 1908.

	Bushels.
Wheat:	
10 varieties, 49 acres	1.467
11 half-acres, rotation test	160
21 uniform test plots	40
	1,667
Oats:	
6 varieties, 51 acres	4,163
2 half-acres, rotation test	49
27 uniform test plots	104
	4,316
Barley:	
7 varieties, 35½ acres	1,804
2 half-acres, rotation test	25
25 uniform test plots	60
	1,889
Peas:	
3 varieties, 5¼ acres	214
18 uniform test plots	37
	251
Fall Rye	60
Flax	52
Potatoes	92
Roots	2,500
	Tons
Corn ensilage	30
Hay:	
Western Rye Grass	25
Western Rye Grass and Red Clover	22
Alfalfa	12
Cut in coulées	15

5094—p. 320.

Winter Rye, Experimental Farm, Indian Head, Saskatchewan, Aug., 1908. *Photo by C. E. Saunders.*

THE VEGETABLE GARDEN.

Nearly all varieties of vegetables suffered from the dry weather in July, beans and tomatoes excepted. No frost injured the garden stuff, and all varieties sown matured with the exception of melons and the ordinary varieties of table corn. The native variety (Squaw Corn), as usual, ripened. More tomatoes ripened in the open than in any previous year.

ASPARAGUS.

A good crop was obtained from the old beds of Barr's Mammoth, Barr's Elmira and Conover's Colossal. In use from May 13 to July 9.

BEANS—Sown May 15.

Variety.	Seed from.	In use.	Pulled.	Remarks.
Golden Wax		July 26	Aug. 31	Good crop.
Dwarf White Wax		" 26	" 31	Did not germinate.
Bush Green Pod		" 27	Sept. 4	Long wax.
Bush Butter		" 25	" 4	"
Davis Wax	Indian Head	" 25	" 4	Good crop.
Black Speckled	"	Aug. 4	Aug. 21	Long green.
Challenge Black Wax	"	July 28	" 21	Large pod.
Currie's Rust-proof	"	" 24	" 21	Long wax.
Dwarf Wax	"	" 26	" 21	"
Dwarf Kidney	"	" 25	Sept. 4	Long, fine quality.
Emperor of Russia	"	Aug. 1	" 4	Short green.
Extra Early	"	July 25	Aug. 31	Green.
Early Six Weeks	"	" 28	" 31	Long green.
Haricot Extra Early	"	" 27	" 31	Long wax.
Haricot Matchless	"	Aug. 1	Sept. 4	Long green.
French Extra Early	"	July 26	" 4	Medium wax.
White Field	"	Aug. 15	" 4	Small green.
Black	"	" 1	" 12	Good crop.
Broad	"	" 1	" 4	Medium crop.

BEETS—Sown May 6; Pulled October 10.

Variety.	In use.	Yield per Acre.
Globe XXX	July 17	1,462 bushels.
New Cardinal	" 14	1,396 "
Early Blood Turnip	" 16	836 "
Danvers Half-long	" 18	785 "
Black Prince	" 17	655 "

CABBAGE—Sown in Hot-house April 3; Set out May 18; Taken up October 10.

Variety.	In use.	Average weight.	Remarks.
Early—Ey. Jersey Wakefield	July 4	10 lbs.	Large, solid.
Early Winningstadt	" 13	9 "	Medium, solid.
Paris Market	" 8	9 "	Large, solid.
All Seasons	" 18	7 "	Solid heads.
Late—Marble Head Mammoth	Aug. 10	10½ "	"
Large Drumhead	" 9	10 "	Large, solid.
World Beater	" 10	9 "	" "
Autumn King	" 8	11 "	" "
Winter Drumhead	" 4	10 "	Solid heads.
Mammoth Red Rock	" 13	7 "	"

CRESS—Sown May 7.

Variety.	In use.	Remarks.
Extra Curled	June 10	Good crop
Fine Triple-curled	" 10	"
Champion Curled	" 10	"

CAULIFLOWER—Sown in Hot-house April 3; Set out May 18.

Variety.	In use.	Average Weight.	Remarks.
Early—			
Early Snowball	July 17	2½ lbs	Very fair.
Dwarf Erfurt	" 15	2½ "	"
Dwarf Paris	" 19	2 "	Fair.
Early Snowball	" 14	2 "	Very fair.
Earliest Erfurt	" 12	2½ "	Good crop.
Late—			
Veitch's Autumn Giant			Did not germinate.
Walcheren			" "
Lenormand	July 9	3½ "	Very fine heads.

CARROTS—Sown April 21; Pulled October 10.

Variety.	In use.	Yield Per Acre.
Half-long Danvers	July 10	475 bushels.
Chantenay	" 10	322 "
Chantenay Half-long	" 10	290 "
Early Scarlet Horn	" 10	264 "
Nantes	" 10	212 "

CUCUMBERS—Sown in Hot-house April 19; Set out May 30.

Variety.	In use.	Ripe.	Length.	Remarks.
Early White Spine	July 12	August 15	7 inches	Fair crop.
Long Green	" 10	" 15	6 "	"
Chicago Pickling	" 8	" 12	8 "	Good crop.
Giant Pera	" 16	" 18	12 "	Fair crop.
Improved Long Green	" 24	" 22	5 "	Good crop.
Prolific	" 18	" 18	5 "	"
Everbearing	" 16	" 16	11 "	"

CORN—Sown May 15.

Variety.	In use.	Date Ripe.
Early Sweet	Sept. 22	Did not mature.
Peep O'Day	" 6	" "
Golden Bantam	" 6	" "
Eureka	" 1	" "
White Squaw	Aug. 18	September 20.
Earliest Dent	" 28	Did not mature.
Red Squaw	" 13	September 10.

CELERY.

Variety.	Sown in Hothouse.	Set Out.	Weight of Six Heads.
White Plume	April 9	June 2	12 lbs.
Paris Golden Yellow	" 3	" 2	10 "
Giant Pascal	" 9	" 2	10 "
Paris Golden Extra Select	" 9	" 2	12 "
Golden Self-blanching	" 9	" 2	10 "
Brandon Prize	" 3	" 2	11 "

Crop of good quality and yield. White Plume fit for use in August; other kinds, September 8.

CITRONS.

Colorado Mammoth and Small Green were sown in hot-house April 19; set out May 30. A good crop; average circumference, 14 inches.

CHEVRIL.

An annual plant grown for its leaves, which are used in salads and garnishing. Sown in open May 7; in use July 1. Gave a good crop of fine quality.

LETTUCE—First seeding May 7; second seeding June 7. First seeding in use June 11; second seeding in use July 10.

Variety.	Remarks.
Solid Head	Heavy crop.
Denver Market	Very fine.
Big Boston	Fair.
Toronto Gem	Heavy crop.
All the Year Round	Did not germinate.
Cream Butter	Fair crop
Half Century	Very good crop.
May King	Good heads.
Head	"

MELONS—Sown April 9; Set out May 30.

Variety.	Circumference.	Remarks.
Musk Melons		
Earliest of All	16 in.	Poor crop.
Early Hackensack	19 "	Fair crop.
Water Melons		
Early Canada	22 "	Fair crop.
Earliest Sweet	18 "	"
Fordhook	15 "	Good crop.

No melons of any variety matured.

ONIONS—Sown in Hot-house April 9; Transplanted to Garden May 15. Also sown in open April 21. All ripe and pulled October 2.

Variety.	Yield per acre.	
	Sown in hot house.	Sown in open.
Large Red Wethersfield	195 bushels.	195 bushels.
Connecticut Large Red	171 "	134 "
Early Red	162 "	92 "
Northland	140 "	127 "
Yellow Globe Danvers	125 "	80 "
Prize Taker	115 "	173 "

PARSNIPS—Sown May 6.

Variety.	In use.	Yield per acre.
Guernsey	September 8	472 bushels.
Elcomb's Giant	10	387 "
The Student	14	310 "

PARSLEY—Champion Curled, sown April 14; in use June 6. Good quality.

PEPPER—Long Red Pepper, sown in hot-house April 3; set out May 30; matured September 20.

PEAS—First Sowing May 6; Second Sowing May 14.

Variety.	Seed from	First sowing. In use.	Remarks.
Anticipation	Indian Head	July 27	Very good crop.
American Wonder	"	" 28	Heavy crop.
Admiral	"	" 26	Fair crop.
Burpee's Profusion	"	" 28	"
Gradus		" 18	Wrinkled, large pods.
Horsford's Market Garden	Indian Head	" 26	Very good.
Laxton's Charmer	"	" 26	"
Leviathan		" 18	Large, wrinkled.
Nott's Excelsior	Indian Head	" 18	Large, well-filled.
Queen	"	" 21	Fair crop.
Perfection	"	" 25	Large, fine pods.
Yorkshire Hero	"	" 26	Large, wrinkled.
Surprise	"	" 27	Good crop.
Stratagem	"	" 26	Large, wrinkled.
Shropshire Hero	"	" 26	" "
Dwarf Telephone	"	" 28	Very good.

The peas in the second sowing were in use about three days later than the first seeding.

RADISH—Sown May 7.

Variety.	In use.	Remarks.
French Breakfast	June 16	Good quality, large.
Early Scarlet	" 16	Good crop and quality.
Rosy Gem	" 11	" "
Olive-shaped	" 11	Large, fine.
White-tipped	" 11	Very good.
Icicle	" 20	Large, white.

RHUBARB.

Old beds in use from May 16. The crop from two roots was kept track of during the season, resulting in a total weight of 48 pounds for the two plants.

SQUASH—Sown in Hot-house April 9; Set out May 19.

Variety.	Ripe.	Size.	Average weight.	Remarks.
Crookneck	Aug. 15	Length, 10 in.		Fair crop.
Boston Marrow	" 14	Circum. 34 in.	13 lbs.	Good crop.
Warty Hubbard	" 15	" 23 in.	6 lbs.	"
Orange Pie	" 15	" 21 in.		"

SPINACH—Sown May 7.

Variety.	In use.	Remarks.
Bloomsdale	June 20	Good crop.
Victoria	" 18	"

SAGE—Sown May 7; in use July 30.

SORREL—Sown May 7; in use July 6.

TABLE TURNIPS.

Variety.	In use.	Pulled.	Yield per acre.
Golden Ball	July 1	Oct. 1	933 bushels.
Purple Top	" 10	" 1	606 "

TOMATOES—Sown in Hot-house April 9; Set out May 18; Pulled September 18.

Variety.	Green.	First Ripe.	Yield from 9 plants.
First of All	July 4	Aug. 20	65 Lbs.
First of All	" 25	Sept. 4	56 "
Early Ruby	" 24	" 4	84 "
Earliana	" 10	" 1	85 "
Earliest of All	" 8	Aug. 24	60 "
Golden Jubilee	" 24	Sept. 4	50 "
Early Baseball	" 19	" 1	80 "
Diadem	" 20	" 6	40 "
Spark's Earliana*	" 4	Aug. 20	80 "
Spark's Earliana	" 14	Sept. 1	75 "

* The seed of this variety is the result of six years selection by Mr. W. T. Macoun, Horticulturist, Experimental Farm, Ottawa, who saved seed from only the earliest and smoothest samples of fruit. The fruit raised from this seed was smoother and, as will be seen above, ripened 12 days earlier than that grown from seed of the same variety obtained commercially, thus showing the advantages of careful and rightly directed selection.

THE FLOWER GARDEN.

The flower garden was very satisfactory. Both annual and perennial sorts giving lots of bloom, some well through September.

ANNUALS—Sown in Hot-house April 2 and 3; Set out May 27.

Variety.	In Bloom. From	In Bloom. To
Asters, 10 varieties	July 12	Sept. 24
Balsam	June 30	Aug. 16
Daisy	July 8	Sept. 28
Nasturtium, 4 varieties	" 1	" 24
Portulaca	" 14	" 3
Stocks	June 25	" 28
Verbena	July 11	" 28
Zinnia	June 25	Aug. 16
Petunias	July 1	Sept. 30

The following annuals were sown in open:—

Variety.	Date Sown.	In Bloom. From	In Bloom. To
Alyssum	May 10	July 12	Aug. 30
Antirrhinum	" 18	" 30	Sept. 28
Brachycome	" 18	" 20	" 24
Bartonia Aurea	" 18	" 16	" 20
Clarkia	" 18	" 16	" 24
Celosia, 3 varieties	" 18	Aug. 12	" 24
Chrysanthemum	" 18	July 18	" 24
Campanula	" 18	" 12	Aug. 20
Coreopsis	" 18	" 24	Sept. 26
Candytuft	" 10	" 10	" 26
Calendula	" 18	" 24	Aug. 30
Eschscholtzia	May 19	July 11	Sept. 28.
Godetia	" 19	" 30	Aug. 30.
Gaillardia picta	" 19	Aug. 1	Sept. 29.
Mignonette	" 10	July 8	" 3.
Nicotiana affinis	" 19	Aug. 2	" 29.
Phlox, two varieties	" 10	July 28	" 10.
Poppy, four varieties	" 19	" 18	Aug. 22.
Scabiosa, three varieties	" 19	" 30	Sept. 29.
Salpiglossis	" 19	" 30	" 10.
Sweet Sultan (Centaurea)	" 19	" 10	" 26.
Sweet Peas, 27 varieties	" 8	" 18	" 29.

PERENNIALS PLANTED 1908.

Variety.	Planted in Hothouse.	In Bloom. From	In Bloom. To
Cannas	May 2	August 2	September 10.
Dahlias	" 4	" 3	" 15.
Gladioli	April 3	July 1	" 10.
Pansies	" 3	" 1	October 20.

OLD PERENNIALS.

Variety.	In Bloom.	
	From	To
Clematis Recta	June 30	August 7.
Columbine	" 8	July 20.
Delphinium	July 8	August 30.
Helianthus	" 26	September 29.
Iris	June 1	July 16.
Lychnis	" 30	August 5.
Oriental Poppy	" 30	July 16.
Tulips	May 23	June 20.
Pæonies	June 24	July 18.

PERENNIALS PLANTED IN SPRING, 1908.

The following plants were received from the Central Experimental Farm, Ottawa, and set out early in May:—

Oriental Poppy 'Mahoney.'
" 'Salmon Queen.'
Spiraea filipendula fl. pl
Oenothera fruticosa.
Hemerocallis, species.
Spiraea aruncus.
Campanula macrantha.
Aconitum napellus bicolor.
Cimicifuga racemosa.
Iberis correaefolia.

BULBS PLANTED IN FALL, 1908.

The bulbs comprised in the following list were received from the Central Experimental Farm, Ottawa, and planted on October 22.

TULIPS.

100 Chrysolora (pure yellow).
100 Duc van Tholl (crimson).
100 " (gold-laced).
50 Keizer's Kroon (scarlet and yellow).
50 Cottage Maid (rose pink and white).
50 Artus (brilliant scarlet).
50 Joost von Vondel (cherry-red white feathered).
50 Pottebakker (yellow).
50 " (white).
50 " (scarlet).
50 Proserpine (carmine rose).
50 Double superfine (mixed colours).
50 Gloria solis (red with gold).
50 Gesneriana spathulata (scarlet and blue).
50 L'Immaculae (white).
100 Parrot (mixed).

CROCUSES.

150 Blue and purple.
150 Large yellow.
100 Striped and variegated.
50 White of all shades.

OTHER BULBS.

50 Chionodoxa gigantea. (Glory of the Snow.)
10 Colchicum autumnale. (Meadow Saffron.)
50 Galanthus Elwesii. (Giant Snowdrops.)
50 Galanthus nivalis. (Snowdrops.)
5 Frittillaria Imperialis.
10 Leucojum vernum. (Snowflake.)
10 Leucojum aestivum.
50 Spanish Iris.
50 Scilla Sibirica. (Squills.)
10 Bulbocodium vernum.

FRUIT CROP.

Currants and gooseberries were infested with the Currant Maggot (*Epochra Canadensis*), and a good deal of the fruit fell before maturing.

Raspberries and strawberries gave fairly good fruit, the dry July being rather against them.

In larger fruits, the Siberian varieties of crab-apple were all well loaded with fruit, some of the better sorts having apples of good size.

The native plum trees were well loaded, and, with one or two exceptions, ripened their fruit. The cross-bred plum 'Aitkin' gave a heavy crop.

The winter of 1907-8 and the spring of 1908 proved disastrous to a large number of the cross-bred apple trees, most of the losses being replaced in May by trees sent from Ottawa for the purpose.

A small orchard of cross-bred plum trees was set out in May last, also some fresh plots of currants, gooseberries and raspberries. Details of these are as follows:—

CROSS-BRED APPLE TREES.

Sent by the Experimental Farm, Ottawa.

20 Jewel.	12 Osman.	10 Columbia.
20 Josie.	10 Tony.	3 Carleton.
20 Magnus.	12 Prince.	5 Charles.
20 Robin.	3 Mecca.	12 Alberta.
25 Silvia.	10 Pioneer.	10 Norman.
5 Jewel.	15 Golden.	10 Kent.

CROSS-BRED PLUM TREES.

From Prof. N. E. Hansen, Experiment Station, Brookings, S.D.

1 Sapa.	2 Wakapa.	3 Hanska.
2 Enopa.	4 Yuteka.	4 Wastesa.
2 Eyami.	6 Winnipeg.	2 Wabanka.
4 Huya.	2 Opata.	1 Skuya.
2 Assiniboia.	2 Owauka.	4 S. D. No. 32.
4 Topa.	6 Tokeya.	

RASPBERRIES AND BLACKBERRIES.

From Central Experimental Farm, Ottawa, except Sunbeam, which was sent by Prof. Hansen:—

Columbia raspberry.
Cuthbert raspberry.
Marlboro raspberry.
Schaffer raspberry.
Conrath raspberry
Palmer raspberry.
King raspberry.
Cardinal raspberry.
Munger raspberry (black).
Older raspberry (black).
Golden Queen raspberry.
Ruby Red raspberry.
Hilborn Black Cap raspberry.
Sunbeam raspberry.
Eldorado blackberry.
Mesereau blackberry.
Ancient Briton blackberry.

CURRANTS.

From Central Experimental Farm, Ottawa.

Black Currants.

Saunders.
Topsy.
Bang Up.
Ontario.
Kerry.
Magnus.
Beauty.
Eagle.
Ethel.
Winona.
Ogden.
Eclipse.
Lee's Prolific.
Climax.
Merveille de la Gironde.

Red Currants.

Moore's Early
Large Red.
La Conde.
Raby Castle.
Greenfield.
New Red Dutch.
Benwell.
Victoria Red.
Rankin's Red.
Cumberland Red.
Red Grape.
Red English.
Cherry.
Long Bunch Holland.
Red Jacket.

White Currants.

White Dutch.
White Kaiser.
White Cherry.
White Pearl.
Verrier's White.
Large White.
White Grape.
Large Wh. Brandenburgh.
Wentworth Leviathan.

Gooseberries.

From Central Experimental Farm, Ottawa.

Industry.
Downing.
Houghton's Seedling.
Companion.

TREES AND SHRUBS.

Although the winter of 1907-8 was disastrous throughout the province to many trees (especially Cottonwoods) from unripe growth of previous year, on the Experimental Farm no loss or injury took place. Trees and shrubs among the hardy varieties came through in good condition.

It may be said, in connection with the distribution of trees and shrubs, that, notwithstanding the immense number of the former sent out by the Forestry Farm, situated near Indian Head, the applications received by the Experimental Farm far exceed what can be supplied. In 1908, 932 applications from this province and Alberta were filled. This year (1909), 900 applications from Saskatchewan alone will be filled, with as many more received that cannot be supplied.

SHRUBS PLANTED.

The following shrubs were received from the Central Experimental Farm, Ottawa, last spring, and planted out during May:—

4 Caragana tragacanthoides.
2 Euonymus Europeus ovatus.
2 Phellodendron amurense.
2 Pyrus Maulei Sargenti.
2 Philadelphus multiflorus plena.
4 Juglans Sieboldiana (Japanese Walnut).
50 Syringa Emodi (for hedge).
50 Thunberg's Barberry (for hedge).
25 Ginnalian Maple (for hedge).
3 Lonicera regeliana,
4 Abies remonti.

EXCURSIONS TO THE EXPERIMENTAL FARM.

On July 28 and 29, excursions were run by the Department of Agriculture at Regina, from all points on the Canadian Pacific Railway from Fleming, on the east, to Caron, on the west; from all points along the Regina and Arcola and the Soo and Estevan lines in the province; and from Regina north along the Canadian Northern Railway.

A lunch was provided by the Minister of Agriculture, Hon. W. R. Motherwell, and prepared and served by the Indian Head Hospital Directors, with the generous assistance of the ladies of the town and district.

Mr. J. Bracken, Superintendent of Fairs and Institutes, who had charge of the excursions, and a number of the staff from the department were in attendance during the two days and gave valuable assistance in looking after the comfort of the visitors. Superintendent Murray, of the Brandon Experimental Farm, and G. H. Greig, Commissioner of Live Stock, were also in attendance. All regretted that the Hon. Mr. Motherwell could only be present a short time.

Over thirty suitable conveyances were engaged by the department, and these, with numerous private conveyances were kept busy during the two days showing the large crowd over the farm.

No injury was done to anything, although the flower and other plots were continuously surrounded.

PREPARING LAND FOR GRAIN CROPS IN SASKATCHEWAN.

During the growing season of 1908, almost the entire western portion of the province suffered from dry weather, and the majority of the new settlers, either from unfamiliarity with the methods of cultivation for the conservation of moisture, or through a desire to bring the greatest possible area under cultivation, naturally suffered a severe disappointment.

In some districts, where in former years moisture had been abundant and proper cultivation had in consequence been neglected in the effort to 'get rich quick,' the partial failure of the crop proved an expensive lesson.

For many years, commencing in 1888, the methods of conserving moisture by 'breaking and backsetting' and by 'summer-fallowing'—now called 'dry-farming' for a change—have been recommended and universally adopted by the older settlers but to very many of the new settlers they are unknown. The latter, I trust, may be benefited by the following explanation of the methods which, for a great many years, have proved uniformly successful for every district in the province of Saskatchewan.

BREAKING PRAIRIE SOD.

The success or failure of a new settler often depends on the method employed in the preparation of the land for his first crop, and it is, therefore, of the utmost importance that the question of 'breaking' or 'breaking and backsetting' be given the consideration it deserves.

For some years past, the general practice throughout the country has been to continue breaking three or more inches deep so long as the teams can turn over the sod; then, in the fall, to disk the topsoil, and sow grain on the spring following. From the breaking so done before the end of June, a good crop of wheat, oats or barley is usually obtained, but no amount of cultivation will ensure even a fair crop on this land in the next succeeding year. After the first crop has been cut the soil is usually in a perfectly dry state, and remains so, in spite of any known method of cultivation, until the rains come in the following spring. If they are insufficient or late, as is frequently the case, failure of the crop must be the result.

BREAKING AND BACKSETTING.

Breaking and backsetting is the true way of laying the foundation of future success in the greater number of districts throughout the province, and while this method does not permit of as large an acreage being brought under cultivation in a year, it does permit of more thorough work and ensures better results in the long run. The anxiety of nearly all settlers to sow every acre possible, regardless of how or when the work on the land has been accomplished, may be given as the reason for breaking and disking to a large extent superseding the older, better and safer plan.

Breaking and backsetting means the ploughing of the prairie sod as shallow as possible before the June or early July rains are over, and, in August or September, when the sod will have become thoroughly rotted by the rains and hot sun, ploughing two or three inches deeper in the same direction, and then harrowing to make a fine and firm seed-bed. From land prepared in this way, two good crops of wheat may be expected. The first crop will be heavy, and the stubble, if cut high at harvest time, will retain sufficient snow to produce the moisture required, even in the driest spring, to germinate the seed for the next crop. The stubble land can readily be burned on a day in the spring with a hot, steady wind, and the seed may be sown with or without further cultivation. In a case where the grass roots have not been entirely killed by the backsetting, a shallow cultivation before seeding will be found advantageous, but as a rule the harrowing of the land with a drag-harrow after seeding will be sufficient.

The principal objection to breaking and backsetting is urged with regard to the backsetting, which is, no doubt, heavy work for the teams, but, if the disking required to reduce deep breaking, and afterwards the ploughing or other cultivation that must be done in an effort to obtain a second crop be taken into consideration, it must be conceded that in the end 'breaking and backsetting' is the better method.

When two crops have been taken from new land it should be summer-fallowed.

SUMMER-FALLOWS AND SUMMER-FALLOWING.

Among the many advantages to the credit of the practice of summer-fallowing may be mentioned: the conservation of moisture, the eradication of weeds, the preparation of land for grain crops when no other work is pressing, the availability of summer-fallowed land for seeding at the earliest possible date in the spring, and the minor advantages of having suitable land for the growing of pure seed, potatoes, roots and vegetables at the least cost and with the greatest chance for success, and that of being able to secure two crops of grain with little or no further cultivation.

Summer-fallowing has undoubtedly some disadvantages, but so long as the growing of grain, and more particularly wheat, remains the principal industry of the province, it will be necessary to store up moisture against a possible dry season, to restrain the weeds from over-running the land, and, on account of the short seasons, to prepare at least a portion of the land to be cropped, in the year previous to seeding. A well-made summer-fallow is the best means to this end. Among the disadvantages are: the liability of the soil to drift, the over-production of straw in a wet season (causing late maturity and consequent danger of damage by frost), and, it is claimed, the exhaustion of the soil. The two former may, to a great extent, be overcome by different methods of cultivation, and, if the soil can be prevented from drifting, I am satisfied that one of the reasons for the latter contention will disappear.

Various methods are practised in the preparation of fallow, and where the aim has been to take advantage of the June and July rains and to prevent the growth of weeds, success is almost assured. Where the object has been to spend as little time as possible on the work, failure is equally certain.

In my annual report for 1889, the following was submitted for the consideration of the settlers. Since then many experiments have been conducted on the Experimental Farm with different systems, and again I submit what, on the whole, have been found to be the most successful methods for the cultivation of the soil in Saskatchewan.

FROM REPORT OF 1889 (DECEMBER 29).

'The year just past has been one of extremes, last winter was one of the mildest on record, and March was so very fine that thousands of acres of grain were seeded from 15th to 31st, and at no time in the history of the country has the ground been in better condition for the reception of the seed. Immediately after seeding, however, exceptionally high winds set in, followed by extreme drought during the entire growing season. In many places the crops were injured by the winds, and finally almost ruined by the succeeding dry weather. In some localities, however, where the farming had been done in accordance with the requirements of the country, the crops did fairly, and considering the excessively dry weather, remarkably well.

'The Experimental Farm suffered in company with every other farm in the country. Perhaps very few suffered as much from winds, but the dry weather, though reducing the yields, did not prove as disastrous as to many others. In this portion of the Territories at least, every settler knows the importance of properly preparing his land. For several years after the country became open for settlement, every one imagined that grain would grow, no matter how put in, but now the man is devoid of reason who thinks he is sure of a crop without any exertion on his part. It is true that since 1882 we have had one year in which the land required little or no preparation for the production of an abundant crop, but only too many realize the loss in the remaining years from poor cultivation.

'Our seasons point to only one method of cultivation by which we may in all years expect to reap something. It is quite within the bounds of possibility that some other and perhaps more successful method may be found, but at present I submit that 'fallowing' the land is the best preparation to ensure a crop. Fallowing land in this country is not required for the purpose of renovating it, as is the case with the worn-out lands in the east; and it is a question as yet unsettled how much or how little the fallows should be worked, but, as we have only one wet season during the year, it has been proved beyond doubt that the land must be ploughed the first time before this wet season is over if we expect to reap a crop in the following year. The wet season comes in June and July, at a time when every farmer has little or nothing else to do, and it is then that this work should be done. Usually seeding is over by first of May, and to secure the best results the land for fallow should be ploughed from 5 to 7 inches deep as soon after this date as possible. Land ploughed after July is of no use whatever unleses the rains in August are much in excess of the average. A good harrowing should succeed the ploughing, and all weeds and volunteer grain be kept down by successive cultivations. A good deal of uncertainty is felt with regard to a second ploughing; some holding that it is useless; others maintaining that it is an injury; while others again have found it to give from five to ten bushels per acre more than one ploughing. So far the experiments on the Experimental Farm have shown that by far the best returns have been received from two ploughings, and more noticeably was this the case when the first ploughing had been completed in May or June. Without doubt, two ploughings cause a greater growth of straw, and consequently in a wet year the grain is several days later in maturing, causing greater danger from frost; but taking the seasons so far passed (1884 excepted), two ploughings with as much surface cultivation as possible in between, may be safely recommended.

'Above all, it is of the greatest importance that the first ploughing be as deep as possible, and that it be done in time to receive the June and July rains.'

From Report of 1906.

'In view of the fact that every year brings to the Northwest 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 the southern parts of Saskatchewan and the latter to Alberta and the northern parts of Saskatchewan, where the land is more or less covered with bluffs.

SHALLOW-BREAKING AND BACK-SETTING.

'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 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.

SUMMER FALLOWS.

'The true worth of properly prepared fallows has been clearly demonstrated in past years in every grain-growing district of Saskatchewan.

'The work of preparing land for crop by fallowing is carried on in so many ways in different parts of the Northwest, 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 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.'

DRY FARMING.

During the past two years the term 'dry farming' has been applied in Alberta to what was formerly known in the west as 'summer-fallowing.'

With the exception of the addition of the use of a soil-packer, there is no change in the methods formerly employed, when the spring rains and frequent cultivation were depended upon for the packing of the soil.

A packer is, without doubt, a most useful implement on the farm, and where from any cause the soil is loose, it should be used. It is, however, an expensive implement, and within the means of comparatively few of the new settlers. Fortunately, early ploughing and frequent shallow cultivation may be depended upon to produce equally satisfactory results.

CULTIVATION OF STUBBLE.

When farmers summer-fallow one-third of their cultivated land each year, as they should, one-half of each year's crop will be on stubble. For wheat, the best preparation of this land is to burn the stubble on the first hot, windy day in the spring, and either cultivate shallow before seeding or give one or two strokes of the harrow after seeding; the object being to form a mulch to conserve whatever moisture may be in the soil until the commencement of the June rains.

The portion intended for oats or barley should be ploughed four or five inches deep, and harrowed immediately; then seeded and harrowed as fine as possible. In case time will not permit ploughing, good returns may be expected from sowing the seed oats or barley on the burnt ground and disking it in; then harrowing well.

FALL PLOUGHING.

With regard to fall-ploughing, it may be said that, as a rule, on account of short seasons and dry soil, very little work can possibly be done in the fall, but if the stubble land is in a condition to plough, and the stubble is not too long, that portion intended for oats and barley may then be ploughed, if time permits.

It is, however, a mistake to turn over soil in a lumpy or dry condition, as nine times out of ten it will remain in the same state until May or June, with insufficient moisture to properly germinate the seed, and the crop will be overtaken by frost.

CATTLE.

The herd of cattle at present on the Farm consists of 27 pure-bred Shorthorns and 21 grade animals, 8 of the latter being three-year-old steers bought for feeding tests.

On December 3-4, 1908, the entire herd was tested for tuberculosis and was found to be free from the disease with the exception of one steer bought shortly before for feeding test. This animal was killed, and on examination by the health inspector, its thoracic glands were found to be affected.

FEEDING TEST.

A test was made for the sixteen weeks from December 7, 1908, to March 29, 1909, of the comparative feeding values of Western Rye Grass and Alfalfa in fattening cattle.

Two lots of 4 three-year-old steers were made up, but, owing to one animal in lot 2 becoming sick during the test, it was withdrawn from the lot, and lot 1 was also reduced to three steers to keep the numbers equal.

Each steer was fed a daily ration of 1 pound of ground linseed throughout the test, and 4 pounds of meal for the first four weeks, increased to 6 pounds for the second four weeks, and 8 pounds during the last eight weeks of the feeding period.

In addition, lot 1 received all the Western Rye Grass they would eat, and lot 2 all the Alfalfa they wanted. The weight of both Western Rye Grass and Alfalfa consumed daily per head was about 22 pounds, and the cost of feed has been figured on this basis.

The meal used consisted of two parts of barley to one of wheat.

Following will be found particulars of the weights and gains of each lot; the quantity and value of feed consumed; and the financial results of the transaction.

WEIGHTS AND GAINS DURING TEST.

—	Lot 1.		Lot 2.	
	Weight.	Gain.	Weight.	Gain.
	Lbs.	Lbs.	Lbs.	Lbs.
Start of test	3,115	....	3,315	....
End of first month	3,310	195	3,400	85
End of second month	3,500	190	3,540	140
End of third month	3,670	170	3,710	170
End of fourth month	3,800	130	3,845	135
Total gain during test	....	685	....	530
Average gain per head	....	228	....	177

Total weight and estimated value of feed consumed.

—	Lot 1.		—	Lot 2.	
		$ cts.			$ cts.
Western rye grass	7,392 lbs. at $5 per ton	18 48	Alfalfa	7,392 lbs. at $5 per ton	18 48
Ground linseed	336 lbs. at 4c. per lb.	13 44	Ground linseed	336 lbs. at 4c. per lb.	13 44
Meal	2,184 lbs. at 1c. per lb.	21 84	Meal	2,184 lbs. at 1c. per lb.	21 84
Total cost	....	53 76	Total cost	....	53 76
Cost per head	....	17 92	Cost per head	....	17 92

SUMMARY of the Financial Results of the Transaction.

	Lot 1.	Lot 2.
Weight at start	3,115 lbs.	3,315 lbs.
Value at 3c. per lb	$ 93.45	$ 99.45
Cost of feed	$ 53.76	$ 53.76
Total cost	$147.21	$153.21
Total cost per head	$ 49.07	$ 51.07
Weight at finish	3,800 lbs.	3,845 lbs.
Less 5 p.c. shrinkage	190 lbs.	192 lbs.
Net weight	3,610 lbs.	3,653 lbs.
Value at 5c. per lb.	$180.50	$182 65
Value per head	$ 60.17	$ 60.88
Net profit	$ 33.29	$ 29.44
Net profit per head	$ 11.10	$ 9.81

HORSES.

Ten draft horses, with three light animals for driving and scuffling, constitute the working force on the farm. Two of the draft animals are very old, and only able to do light work. One draft brood mare was purchased late in March of the present year.

SWINE.

Two breeds are kept on the farm—Yorkshire Whites and Berkshires. Following is the number of each at present: 1 Berkshire boar and 2 sows; 1 Yorkshire boar and 3 sows; a young litter of 8 Yorkshires; and 20 grade pigs, which include a litter of 11.

During the year ending March 31, 1909, 14 pigs were sold to farmers for breeding purposes, and 18 were sold for pork.

POULTRY.

Very poor success was obtained last year with poultry. At present the breeding pens consist of 2 Barred Plymouth Rock cockerels and 21 pullets; a Black Minorca cockerel and 13 pullets, and a Buff Orpington cockerel and 5 pullets.

BEES.

Eight hives of bees came safely through the winter of 1907-8 and increased to 14 during the season. Two young swarms were sold in the fall and 12 put in the cellar for the winter, with from 30 to 40 lbs. honey each. The only cellar available is in my house, and neither the temperature nor ventilation is suitable for bees

Although the season was favourable for honey, only a few pounds were obtained in 1-lb. sections during the season.

DISTRIBUTION OF SAMPLES.

A distribution of samples of the products of the farm was made in the spring to residents of Saskatchewan and Alberta.

Following is a list of samples sent out:—

Wheat, 3-lb. bags	204
Oats, 3-lb. bags	226
Barley, 3-lb. bags	132
Peas, 3-lb. bags	60
Sundries (flax, rye, spelt), 3-lb. bags	23
Potatoes, 3-lb. bags	630
Garden peas, 1-lb. bags	190
Garden corn, ½-lb. bags	9
Root seeds, bags	35

Small seeds, 350 bags containing 5,025 packets of flower, garden and shrub seeds.

Tree seeds, Maple..	780
" Ash..	36
Shrub seeds..	140
	Parcels.
Tree and shrub seedlings..	900
Express parcels of trees and shrubs..	32
Crab apple and plum seedlings..	208
Rhubarb roots..	154

CORRESPONDENCE.

During the 12 months ending March 31, 1909, 8,114 letters were received and 7,951 mailed from this office.

In letters received, reports on samples are not included, and in letters mailed, circulars of instructions sent out with samples are not counted.

METEOROLOGICAL RECORDS.

Month.	Temperatures.					Rainfall.		Snowfall.	Bright Sunshine.
	Maximum.		Minimum.		Mean.				
1908.	Date.	°	Date.	°	°	Days.	In.	In.	Hours.
April	20	76	1	—10	37·40	4	1·45	5·00	181·4
May	9	86	2	21	49·90	6	1·46	0·75	241·2
June	25	85	8	34	57·82	17	5·44	....	217·8
July	25	94½	22	41	64·70	5	0·71	....	301·3
August	20	88	12	33	59·00	6	1·87	....	279·7
September	7	94	27	20	54·10	6	0·64	0·50	212·2
October	8	74	29	11	37·80	6	1·60	0·50	122·8
November	2	58	30	—14	27·95	.....	.....	4·00	69·3
December	13	40	31	—32	23·42	.....	.....	8·00	51·0
1909.									
January	20	40	6	—47	—3·90	.....	.....	7·00	78·5
February	3	35	12	—36	2·34	.....	.....	6·00	79·4
March	20	43	16	—11	19·50	.....	.....	2·00	137·7
						50	13·17	33·75	1,972·3

I have the honour to be, sir,

Your obedient servant,

ANGUS MACKAY,

Superintendent.

EXPERIMENTAL FARM FOR CENTRAL ALBERTA.

EXPERIMENTAL FARM, LACOMBE, ALTA., March 31, 1909.

Dr. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit to you my second annual report covering the operations of the Experimental Farm for Central Alberta, at Lacombe, for the year 1908.

The winter of 1907-8 was mild and was followed by an early spring. The early part of the season was particularly favourable, seeding operations commencing three weeks earlier than in 1907. Spring work continued without interruption from bad weather until finished on April 29. Growth was rapid and uniform, very large heads of all grains being produced, but cool weather in August delayed the maturing of the grain, and late crops of wheat were injured by frost. The quality of the grain is this year much superior to 1907, excellent samples of wheat, oats and barley being produced.

Fruit trees matured their season's growth better than in 1907, and the majority of the trees and shrubs made good growth during the year.

Though sufficient frost came early in November to close the land to the plough, fall work generally was further advanced than in 1907, owing to the fact that harvest operations were conducted with greater facility, leaving farmers free to direct their energies toward fall work.

EXPERIMENTS WITH WINTER WHEAT.

All plots in the variety tests of winter wheat were on black clay loam on brome sod from which a hay crop was taken in 1907. After the hay was harvested, the land was ploughed and well cultivated at intervals for about three weeks, and seeded to winter wheat on August 10 and 11. The season of 1907 was unusually wet during July and August, hence it was impossible to bring the brome grass as thoroughly under subjection as in a normal season. The consequence was that the brome persisted in growing, which retarded the growth of the wheat and reduced the yields.

All plots were one-sixtieth of an acre.

FALL WHEAT—Test of Varieties.

Number	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of straw, including head.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.
					In.		In.		Lbs.	Bush.	Lbs.	Lbs.
1	Karkov	Sept. 4.	Aug. 14.	345	36	Stiff.	2⅓	Bearded	4,080	16	..	61
2	Turkey Red	" 4.	" 13.	344	37	"	2½	"	4,200	16	..	63
3	Reliable	Aug. 21.	" 11.	356	41	"	3¾	"	4,080	16	..	61
4	Red Velvet Chaff	" 21.	" 11.	356	32	"	3	Beardl's	4,920	15	..	60
5	Early Windsor	" 20.	" 10.	356	32	"	2½	"	6,120	14	..	59¼
6	Red Chief	" 21.	" 10.	355	38	"	2⅓	"	4,020	14	..	58
7	Abundance	" 20.	" 11.	357	35	"	2¼	"	5,040	13	..	61
8	Dawson's Golden Chaff	" 20.	" 10.	356	37	"	2¼	"	4,440	11	..	59
9	Prosperity	" 20.	" 11.	357	35	"	3¼	"	5,040	11	..	58½

SUMMER-FALLOW COMPARED WITH SOD PLOUGHED UNDER FOR WINTER WHEAT.

A series of experiments have been begun to gain information as to the relative crop from winter wheat sown on summer-fallow as compared with seeding on sod ploughed under, from which a hay crop has been taken that same season. Notwithstanding the low yields secured on brome sod this year, it is proposed to continue the work with brome, and also to include timothy sod, and special attention will be given to a comparison of the latter with summer-fallow. While brome is conceded a high place in making a permanent pasture and supplying hay of value for dairy cattle, it is not thought desirable to include it in a rotation of crops. Following are the results of three varieties of wheat on brome sod as compared with summer-fallow, and one of the same varieties on timothy sod. It is well to remember in considering these yields that, in the case of timothy, a yield of hay of about 2½ tons per acre was secured in 1907. (2) That the season of 1907 did not permit (on account of heavy rains) the sod being subdued with the usual effectiveness, and (3) that in addition to the sale crop of wheat, a crop of grass seed was also secured, the seed on timothy sod amounting to four bushels per acre.

Name.	Cultivation.	No. Days Maturing.	Yield.	
			Bush.	Lbs.
Dawson's Golden Chaff	Summer-fallow	359	56	..
Reliable	"	366	49	..
Abundance	"	360	46	..
Reliable	Brome Sod	358	16	..
Abundance	"	357	13	..
Dawson's Golden Chaff	"	356	11	..
" "	Timothy Sod	353	20	30

WINTER WHEAT—DATE OF SOWING.

Experiments to determine the best time to sow were begun in 1907 and the results are herewith reported. It is proposed that this work be carried further in 1908-9. Seeding was begun August 1, 1908, and continued till September 12, seedings being made one week apart. Two varieties were used, namely, Turkey Red and Dawson's Golden Chaff, and these were sown on both timothy sod and summer-fallow. Following are the yields of wheat sown at different dates on sod in 1907:—

WINTER WHEAT—Dates of Sowing.

Name.	Date of Sowing.	Date Cut.	Yield.	
			Bush.	Lbs.
Turkey Red	Aug. 7	Aug. 8	19	30
"	" 14	" 8	14	..
"	" 21	" 8	18	..
"	" 28	" 10	14	..
"	Sept. 4	" 12	8	..
Dawson's Golden Chaff	Aug. 7	" 7	30	..
" "	" 14	" 8	19	..
" "	" 21	" 8	14	15
" "	" 28	" 10	15	30
" "	Sept. 4	" 12	8	30

WINTER WHEAT—QUANTITIES OF SEED PER ACRE.

Not having sufficient land in condition for winter wheat no tests were conducted with quantities of seed on summer-fallow. Owing to the fact that the timothy sod was not well subdued, more seed was used than would be necessary under average conditions. In 1908, when weather conditions permitted, a thorough working of the sod, seed was sown from 15 lbs. per acre up to 120 lbs., each plot being seeded one peck heavier than the preceding one. This experiment was also repeated on summer-fallow, but results of yields are not, of course, available for this report.

WINTER WHEAT—Quantities of Seed per Acre.

Variety.	Quantity of Seed.	Date Sown.	Date Cut.	Yield.	
				Bush.	Lbs.
Turkey Red	1 bushel	Aug. 21	Aug. 12	23	30
"	1½ "	"	" 11	21	..
"	2 "	"	" 10	25	..
"	2½ "	"	" 8	26	..

EXPERIMENTS WITH SPRING WHEAT.

All plots of spring wheat looked very promising until late in July, when blight appeared on those plots marked with an asterisk. The wheat Chelsea gives evidence of being a good yielder and is also a wheat of good quality. Downy Riga ripened earliest and was a good sample.

The land was all timothy sod ploughed after the hay was cut, and well worked during the fall. Seed was sown on April 10 at the rate of 1½ bushels per acre. The soil was a clay loam of medium quality.

All plots were one-sixtieth of an acre.

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.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after cleaning.	Rusted.
					In.		In.		Lbs.	Bush.	Lbs.	Lbs.	
1	Chelsea	Aug.	21.	133	45	Medium	3¼	Beardless	3,900	46	..	61¾	None.
2	Bishop	"	21.	133	47	"	3	"	6,120	43	..	61	"
3	Preston	"	21.	133	40	Stiff	3	Bearded	4,800	39	..	61½	Slightly.
4	Huron	"	21.	133	44	"	2¾	"	3,810	37	30	62	None.
5	Pringle's Champlain.	"	22.	134	45	"	3	"	4,680	36	..	61⅓	"
6	Stanley	"	21.	133	50	"	3½	Beardless	5,610	35	30	61	"
7	White Russian	"	25.	137	50	"	2½	"	5,340	35	..	58½	"
8	Hungarian White	"	22.	134	46	"	3¾	Bearded	5,040	32	..	61½	"
9	Downy Riga D.	"	10.	122	38	Medium	3½	Beardless	4,440	31	..	63½	Slightly.
10	White Fife	"	25.	137	48	Stiff	3	"	6,720	31	..	57½	None.
11	Marquis	"	21.	133	35	"	2¾	"	3,660	30	..	63	"
12	Percy A	"	21.	133	42	"	3¼	"	3,420	28	..	60½	Slightly.
13	*Red Fern	"	22	134	41	"	3½	Bearded	2,760	28	..	60½	None.
14	*Red Fife H	"	25.	137	38½	"	3¼	Beardless	3,420	18	..	58½	"

SPRING WHEAT IN FIELD LOTS.

Five varieties of spring wheat were sown in field lots on stubble land, which had been fall ploughed. Growth was rapid, heavy crops of straw were produced, but the grain did not mature before frost, and the yields of all the varieties, particularly Red Fife, were consequently reduced.

SPRING WHEAT IN FIELD LOTS.

Variety.	Character of Soil.	Size of Plot.	Date Sown.	Date Maturing.	Days Maturing.	Yield.		Rust. Smut.
						Bush.	Lbs.	
Percy	Clay loam	1½	Apr. 11	Aug. 27	138	31	37	None.
Stanley	"	1½	" 11	" 28	139	30	15	"
Preston	"	1½	" 11	" 28	139	27	19	"
Huron	"	1½	" 11	" 27	138	26	21	"
Red Fife	"	1½	" 11	Sept. 7	149	12	45	"

TIMOTHY SOD VERSUS SUMMER-FALLOW FOR SPRING WHEAT.

After the hay was harvested in 1907, the land was ploughed and worked throughout the fall. Two varieties of spring wheat were sown on April 10, at the rate of 1½ bushels per acre. On the day following, the same two varieties were sown on land that had been under corn and roots in 1907. The corn of that year did not succeed, and the land was ploughed in August, so that this section was practically summer-fallow.

It will be noticed that the wheat sown on the sod matured a week earlier than that on the corn and root land.

SPRING WHEAT ON TIMOTHY SOD.

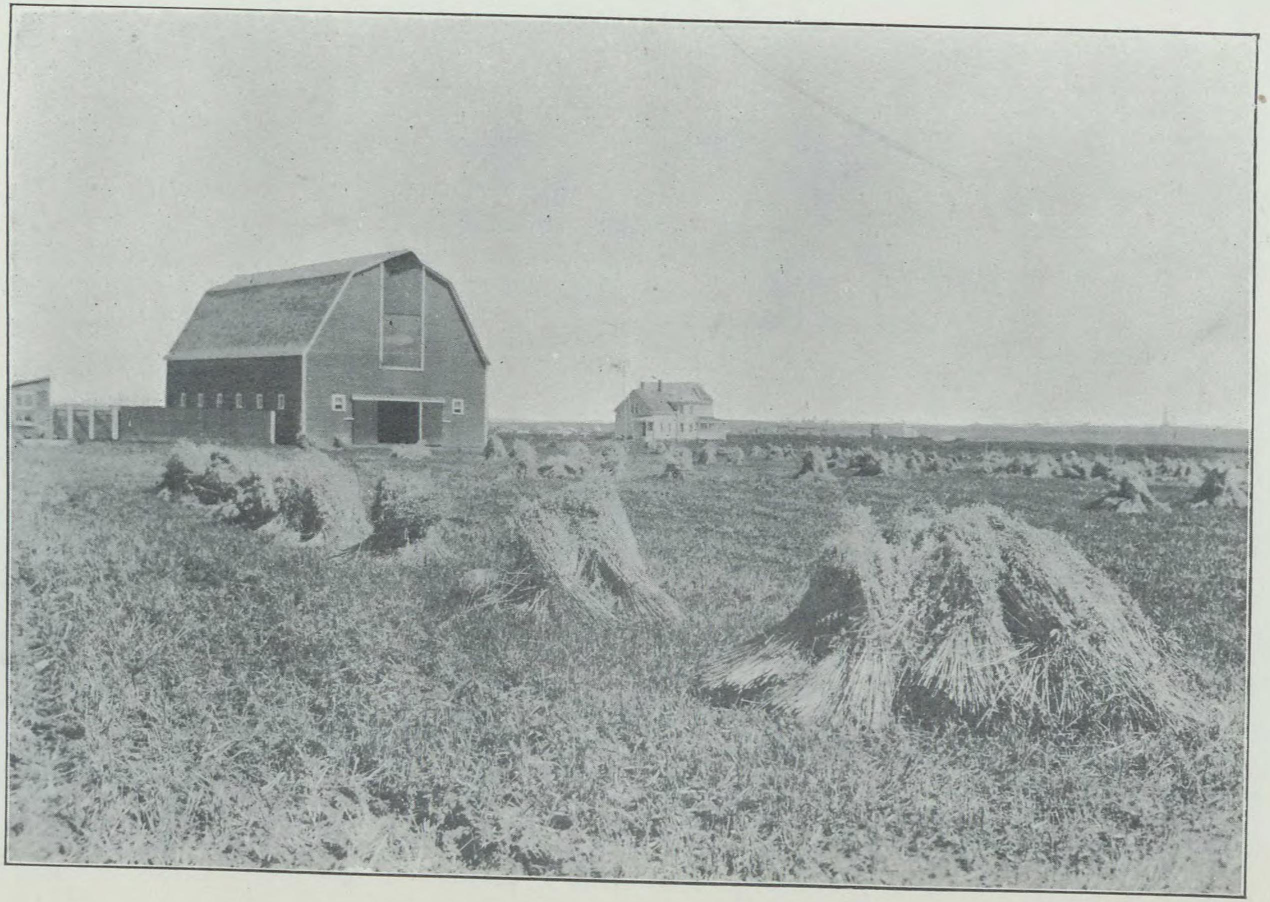
Name.	Date Sown.	Date Cut.	Days Maturing.	Yield per Acre.	
				Bush.	Lbs.
Preston	April 10	Aug. 21	133	39	..
Stanley	April 10	Aug. 21	133	33	30

SPRING WHEAT ON CORN AND ROOT LAND OF 1907.

Name.	Date Sown.	Date Cut.	Days Maturing.	Yield per Acre.	
				Bush.	Lbs.
Stanley	April 11	Aug. 28	139	30	17
Preston	April 11	Aug. 28	139	27	19

In the case of the grain on what was practically a summer-fallow, the difference given in length of time maturing does not represent as great a difference as really existed, since frost cut off the development of the latter grain, which never matured as did the grain on sod, which escaped untouched.

5094—p. 344.



Field of Oats. Experimental Farm, Lacombe, Alberta, Aug., 1908. *Photo by C. E. Saunders.*

EXPERIMENTS WITH EMMER AND SPELT.

Red Spelt and Common Emmer were sown on April 15, on clay loam, ploughed timothy sod in the fall of 1907.

EXPERIMENTS WITH EMMER AND SPELT.

Name.	Date of Ripening.	Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield.	Weight of Straw.
			In.		In.		Lbs	Lbs.
Common Emmer	Aug. 29	136	39	Weak	1¾	Bearded	2400	6900
Red Spelt	Aug. 29	136	40	Stiff	3¼	Beardless	3180	5220

EXPERIMENTS WITH RYE.

One variety of fall rye was sown on August 21, 1907, and was harvested on July 30, 1908. A plot of spring rye was sown April 10, and harvested on August 14.

The seed of both was sown on timothy sod at the rate of 1½ bushels per acre. Following are the yields:—

EXPERIMENTS WITH RYE.

Name.	No. of days Maturing.	Yield per Acre.		Weight per Bushel.
		Bush.	Lbs.	Lbs.
Spring Rye	126	41	14	56½
Fall Rye, Mammoth White	344	27	48	55½

FALL SOWING OF OATS.

On November 9, in 1907, just previous to the land freezing up, a plot of Tartar King oats was sown on well drained, summer-ploughed and well-worked timothy sod. Many argue since oats volunteer so readily, that time could be saved by fall seeding. A plot was sown in the spring of 1908 beside fall-sown oats which grew well and ripened early, but none of the seed sown in the fall germinated. Winter conditions of climate were unfavourable, and the vitality of the seed was destroyed.

EXPERIMENTS WITH OATS.

In average yield the results of the experiments with oats were not as satisfactory as in 1907. The straw, however, stood better, and the grain was of better quality.

The seed was sown on April 15, at the rate of about 2 bushels per acre, on timothy sod ploughed in 1907, after the hay crop was taken off, and well worked during the fall. The soil was black clay loam.

Twenty-four varieties were sown on plots of one-sixtieth of an acre each. All made good growth and produced a fair yield. None of the varieties rusted. Pioneer again takes first place in point of yield, but, since it is a black oat, it cannot be recommended for general cultivation, but for feed only.

OATS—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.	Kind of Head.	Weight of Straw.	Yield per Acre. Bush. Lbs.	Weight per measured bushel after cleaning.
				In.		In.		Lbs.	Bush. Lbs.	Lbs.
1	Pioneer..........	Aug. 22..	129	42	Large Stem.	11	Branching..	7,140	111-6	37
2	Banner.........	" 22..	129	56	Strong......	10	" ..	7,980	90 ..	33½
3	Milford White.....	" 22..	129	52	"	9½	Sided......	5,460	88-8	37
4	Siberian..........	" 22..	129	38	"	9	Branching..	4,920	77-22	38
5	Abundance.......	" 21..	128	48	"	8¾	" ..	4,650	75 ..	33½
6	Lincoln...........	" 21..	128	42	"	9¼	" ..	5,640	74-4	35
7	White Giant.......	" 21..	128	42	"	10¼	" ..	3,600	74-4	40
8	American Triumph.	" 21..	128	46	"	9	" ..	5,100	68-28	37½
9	Thousand Dollar...	" 20..	127	40	"	8¼	" ..	3,720	68-28	37¾
10	Improved American	" 21..	128	42	Med. Strong	10¾	" ..	3,750	67-32	39½
11	Wide Awake......	" 21..	128	38	Medium....	8¼	" ..	3,900	67-2	40
12	Improved Ligowo..	" 16..	123	40	"	8½	" ..	3,540	65-10	39
13	Irish Victor........	" 19..	126	31	"	8¾	" ..	3,660	65-10	40
14	Golden Beauty.....	" 23..	127	37	"	7¼	" ..	4,080	63-18	38¾
15	Gold Finder........	" 28..	130	47	Strong......	11	" ..	4,380	60 ..	37
16	Golden Giant......	" 28..	135	36	"	11	Sided.......	3,960	60 ..	34½
17	Twentieth Century.	" 21..	128	40	"	9	Branching..	4,620	60 ..	38
18	Kendal White......	" 18..	125	37	Med. Strong	8	" ..	2,880	60 ..	39½
19	Danish Island......	" 20..	127	48	Strong......	10¾	" ..	5,040	60 ..	35½
20	Joanette..........	" 19..	126	30	Medium....	9	" ..	2,880	51-6	36½
21	Storm King........	" 18..	125	40	Strong......	10	Sided.......	2,640	50-10	37¼
22	Tartar King.. ...	" 20..	127	41	Medium....	9	Branching..	4,380	49-14	35½
23	Swedish Select.....	" 21..	128	42	Strong......	8¾	" ..	4,770	48-18	39½
24	Virginia White ..	" 19..	126	38	"	8	" ..	3,660	44-4	36½

OATS—TEST OF VARIETIES IN FIELD LOTS.

Four varieties of oats were sown in field lots on April 24, on rather lower and heavier clay loam than that on which the variety tests were conducted. The straw grew an extremely heavy crop and the heads were of good size, but did not develop a good quality of grain; owing to the heavy straw growth and lower land ,they did not ripen before frost. There was no rust on these plots.

OATS IN FIELD LOTS.

Variety.	Soil.	Size of Plot.	Date Cut.	Days Maturing.	Length of Straw.	Length of Head.	Yield per Acre.	
					In.		Bush.	Lbs.
Banner................	Black clay..	3¾	Sept. 11..	129	58	10	62	20
Thousand Dollar..............	" ..	1¾	Aug. 31..	128	53	8	59	21
Danish Island................	" ..	1½	" 30..	128	50	8	58	26
Ligowo	" ..	1⅔	" 29..	127	47	7½	55	16

OATS—QUANTITIES OF SEED PER ACRE.

Two varieties of oats were sown, both branching, with varying quantities of seed per acre. Both were sown on April 18, on black clay loam that had been in timothy the year previous, and was fall-ploughed and well worked.

OATS—Quantities of Seed per Acre.

Name of Variety.	Bush. per Acre.	Date of Ripening.	Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield.	
				In.			Lbs.	Bush.	Lbs.
Thousand Dollar......	1	Aug. 18..	122	41	Medium....	7·6	2,820	42	12
" "	1½	" 17..	121	42	"	7	3,240	44	4
" "	2	" 16..	120	40	"	7-4	3,000	49	14
" "	2½	" 15..	119	38	"	7-4	3,000	52	32
" "	3	" 14..	118	37	"	7	3,060	51	6
" "	3½	" 14..	118	39	"	6	3,720	60	—
" "	4	" 13..	117	36	"	6	3,000	58	8
Banner..............	1	" 25..	129	46	"	9¾	3,480	56	16
"	1½	" 21..	125	45	"	10	4,080	67	2
"	2	" 23..	127	42	"	9½	3,720	68	28
"	2½	" 22..	126	41	"	9	3,840	75	30
"	3	" 16..	120	40	"	8	3,900	79	14
"	3½	" 14..	118	39	"	7	3,780	72	12
"	4	" 13..	117	35½	"	8	3,000	56	16

OATS—DATES OF SOWING.

Two varieties of oats were sown, commencing April 14, and continuing at weekly intervals until May 5. These first sown oats were seeded while frost was not more than 5 inches below the surface, though the land was in good condition. All plots were on timothy sod and were seeded at the rate of two bushels per acre.

OATS—Dates of Sowing.

Name.	Date Sown.	Date Ripened	Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield.	
				Ins.		Inches.		Lbs.	Bush.	Lbs.
Thousand Dollar......	April 15	Aug. 20	127	40	Stiff......	8¼	Branching..	3,720	68	28
" "	" 21	" 22	123	38	"	9½	" ..	6,900	52	32
" "	" 28	" 21	115	37	Medium..	9	" ..	4,800	90	..
" "	May 5	" 25	112	36	" ..	8	" ..	4,140	67	2
Banner...............	April 14	" 18	126	38½	Stiff......	9	" ..	3,000	61	26
"	" 21	" 21	122	38	"	8¾	" ..	3,240	72	12
"	" 28	" 24	118	36	Medium..	8¼	" ..	1,560	75	30
"	May 5	" 28	117	35·8	" ..	8½	" ..	4,140	75	30

EXPERIMENT WITH SOIL-PACKING FOR OATS.

Much discussion has been carried on of late in regard to the merits of the soil packer. We have used the form known as the pulverizer and results would seem to indicate the value of this machine. The soil on this farm is a heavy vegetable mold in most places inclining to clay, but in certain limited areas inclining to sand. On account of the large percentage of humus it contains, the soil is rather loose in texture. The packer fills up the larger air spaces and leaves a surface mulch, preventing the evaporation of moisture from the surface. The soil is pressed into contact with the seed and the rise of moisture by capillarity to the seed is facilitated, hence germination takes place more promptly and with greater uniformity than when the soil is not so packed. This test was made on fall-ploughed stubble land that was left as ploughed till spring, then worked down, and, after seeding, the packer loaded with stone passed once over the plots to be tested. Two varieties of oats were used and two different quantities of seed sown. All were sown on May 7, and all ripened August 29.

SOIL PACKING.

Name.	Soil.	Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield.	
			Inches.		Inches.		Lbs.	Bush.	Lbs.
Banner, 2 bushels..	Packed.....	114	48	Stiff......	8½	Branching..	3,480	90	..
" 2½ " ..	"	114	46	"	8	" ..	4,200	95	10
" 2 " ..	Unpacked..	114	44	"	6½	" ..	2,940	61	26
" 2½ " ..	" ..	114	43	"	6	" ..	2,760	86	16
Thousand Dollar, 2bus	Packed.....	114	46	"	7¾	" ..	4,620	67	2
" " 2½ "	"	114	45	"	7	" ..	3,240	84	24
" " 2½ "	Unpacked..	114	44	"	6	" ..	2,940	54	24
" " 2½ "	" ..	114	42	"	6	" ..	3,000	70	20

FARM-YARD MANURE APPLIED TO THE LAND.

Banner and Thousand Dollar oats were sown on April 22 on stubble land to which well-rotted barn-yard manure was applied at the rate of 10 and 20 tons per acre. No safe conclusions can be drawn on such questions from a single experiment. The presence of manure may dry out the soil the first season after application, while its effect may be beneficial to succeeding crops.

OATS—Manure.

Variety.	Manure.	Bushels.	Date Cut.	Days Maturing.	Yield		Weight Straw.
					Bush.	Lbs.	
Banner....	20 tons....	2	Aug. 21..	121	84	24	4080
"	10 " ...	2	" 21..	121	83	28	3750
"	None.....	2	" 21..	121	97	2	3900
Thousand Dollar............	20 tons....	2	" 21..	121	87	12	4770
" "	10 " ...	2	" 21..	121	88	8	6000
" "	None.....	2	" 21..	121	79	14	3840

EXPERIMENTS WITH BARLEY.

All comparative test-plots of barley were grown on fall-ploughed timothy sod. The yields and quality were both satisfactory, though the former did not reach as high an average as in 1907. Birds reduced the yields of most varieties to quite an extent, these being the first plots to mature. No allowance has been made, however, for loss sustained in this way. Seed was sown at the rate of about two bushels per acre.

Thirteen varieties of six-rowed barley were sown on April 17, in plots of one-sixtieth of an acre each on fall-ploughed timothy sod. The soil, as with other plots, was a black clay loam.

Eleven varieties of two-rowed barley were sown on April 17, under similar conditions. No rust occurred on any of these plots.

SIX-ROWED BARLEY—Test of Varieties.

Number	Variety.	Date Ripened.	Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield.	
									Bush.	Lbs.
1	Mansfield.....	Aug. 5...	110	47	Stiff.......	2¼	Bearded..	5820	62	24
2	Blue Long Head	" 7...	112	36	Fairly....	2¾	" ..	4980	60	00
3	Mensury........	" 7...	110	40	Stiff.......	3¼	" ..	6120	47	24
4	Odessa..........	" 4...	109	37	"	2½	" ..	4440	45	
5	Stella........	" 5...	110	36	"	3¼	" ..	3780	43	36
6	Albert..........	" 5...	110	44	Fairly....	3	" ..	4920	43	36
7	Claude..........	" 5...	110	40	Stiff.......	2½	" ..	4200	41	12
8	Nugent........	" 4...	109	39	"	3½	" ..	4920	40	
9	Champion	" 4...	109	38	"	2½	Beardless.	4200	33	36
10	Yale............	" 6...	111	36	"	2½	Bearded..	3600	33	36
11	Empire.........	" 4...	109	39	"	3¼	" ..	6060	31	12
12	Oderbruch......	" 5...	110	38	"	2¾	" ..	4110	29	8
13	Trooper........	" 5...	110	35	"	2¾	" ..	3600	23	36

TWO-ROWED 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.	Kind of Head.	Yield per Acre.	
				Inches.		In.		Bush.	Lbs.
1	Invincible....................	Aug. 12..	117	43	Medium to weak	3	Bearded..	56	42
2	Sidney....................	" 10..	115	43	" " .	3¼	" ..	55	..
3	Standwell.................	" 11..	116	42	" " .	2¾	" ..	53	36
4	Swedish Chevalier	" 12..	117	38	Medium........	4½	" ..	52	24
5	Gordon	" 8..	113	46	Stiff...........	2½	" ..	43	36
6	French Chevalier...........	" 8..	113	42	Medium........	2¾	" ..	37	24
7	Canadian Thorpe.........	" 7..	112	42	"	2½	" ..	33	36
8	Danish Chevalier..........	" 12..	104	41	Stiff...	3¾	" ..	32	24
9	Clifford..................	" 5..	110	38	"	3	" ..	27	24
10	Jarvis.....................	" 6..	111	36	Medium. Stiff..	4½	" ..	21	12
11	Beaver	" 4..	109	46	Stiff...........	3½	" ..	18	36

BARLEY—TEST OF VARIETIES IN FIELD LOTS.

Two varieties of six-rowed and two varieties of two-rowed barley were sown on fall ploughed stubble land. The crop grew well and ripened early, producing a fair yield of grain of good quality.

BARLEY—Test of Varieties in Field Lots.

Variety.	Soil.	Size of Plot.	Date Sown.	Date Cut.	Days Maturing.	Yield.	
		Acres.				Bush.	Lbs.
Six Rowed.							
Mansfield	Black clay loam.	1½	April 24	Aug. 7	105	66	2
Mensury	"	2	" 24	" 7	105	49	42
Two Rowed.							
Sidney	"	2	" 24	" 15	113	45	36
Invincible	"	2⅓	" 24	" 17	115	40	17

BARLEY—QUANTITIES OF SEED PER ACRE.

Two varieties of barley, Invincible representing two-rowed varieties, and Mensury the six-rowed, were sown on April 21, on timothy sod, using from 1 to 3 bushels of seed per acre in each case. As the quantity of seed per acre increased, the length of head and length of time required to mature decreased.

BARLEY—Quantities of Seed per Acre.

Variety.	Quantities of Seed.	Date Ripened.	Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield.	
								Bush.	Lbs.
Invincible	1	Aug. 18	119	48	Medium	5	4,350	38	6
"	1½	" 15	116	46	"	4½	3,690	44	18
"	2	" 13	114	45	Medium to weak	4½	3,180	35	..
"	2½	" 12	113	42	"	3½	4,410	49	18
"	3	" 11	112	40	"	3	3,360	42	24
Mensury	1	" 10	111	44	Medium	3	4,740	26	12
"	1½	" 8	109	42	"	3	4,920	33	36
"	2	" 5	106	41	Medium to weak	2½	3,600	26	12
"	2½	" 5	106	40	"	2	3,780	31	12
"	3	" 5	106	38	"	2	4,320	32	24

BARLEY—SOWN AT DIFFERENT DATES.

The same two varieties of barley were sown under the same soil conditions as for the test as to quantities of seed. The results are fairly uniform and point to the advantages of the early seeding of barley. Too much advantage is often taken of the comparatively short time necessary for barley to mature, the seeding is delayed and then it does not have an opportunity of doing itself justice either in yield or quality of grain produced.

BARLEY—Sown at Different Dates.

Variety.	Quantity Sown.	Date Sown.	Date Ripened.	Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield.	
	Bush.							Lbs.	Bush.	Lbs.
Mensury	2	Apr. 17..	Aug. 5..	100	40	Medium..	3¼	6,120	47	24
"	2	" 24..	" 8..	104	45	" ..	2½	4,560	30	..
"	2	May 1..	" 8..	99	41	" ..	2¼	3,780	27	24
"	2	" 8..	" 10..	94	34½	" ..	2	2,040	20	..
Invincible...........	2	Apr. 17..	" 12..	117	43	Medium to weak...	3	4,950	56	42
"	2	" 24..	" 12..	110	35½	" ..	3	2,670	34	18
"	2	May 1..	" 14..	105	35	" ..	2-8	2,100	31	12
"	2	" 8..	" 20..	104	34	" ..	2	4,860	26	12

EFFECTS OF A DIRECT APPLICATION OF MANURE UPON BARLEY.

As a result of the tests with manure as applied before ploughing the stubble for spring grain, it would appear that the best place to apply manure is not on stubble for grain, but preferably upon hay stubble, taking a crop of hay before breaking.

MANURE AS APPLIED TO MENSURY BARLEY.

Variety.	Manure.	Quantity.	Date Sown.	Date Ripened.	Days Maturing.	Yield.	
	Tons.	Bush.				Bush.	Lbs.
Mensury	20	2	Apr. 22.....	Aug. 7.....	107	23	36
"	10	2	" 22.....	" 9.....	109	23	36
"	None.	2	" 22.....	" 11.....	111	40	..

EXPERIMENTS WITH FIELD PEAS.

Eighteen varieties of field peas were sown on April 14, on one-sixtieth acre plots on black clay loam.

The soil was similar to that on which other grains were tested, and had been ploughed out of timothy sod the summer of 1907. Growth was somewhat irregular and unhealthy in appearance.

PEAS—Test of Varieties.

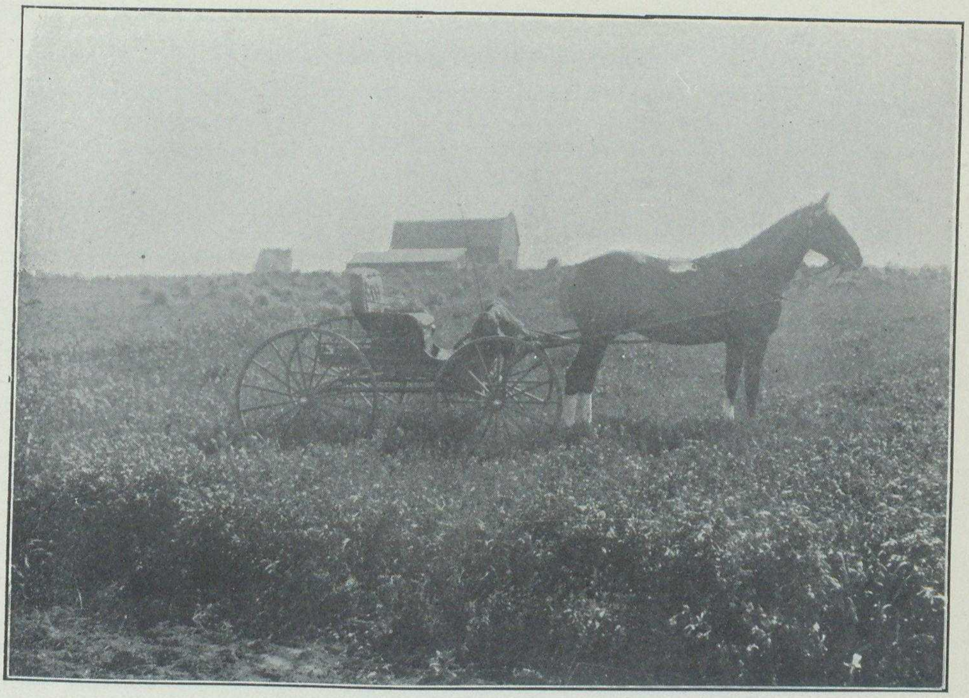
Number.	Variety.	Date Ripened.	Days Maturing.	Character of Growth.	Length of Straw.	Length of Pod.	Yield per Acre.	
					Inches.	Inches.	Bush.	Lbs.
1	Wisconsin Blue	Aug. 21	129	Medium Strong.	39	2	16	..
2	English Grey	" 21	129	Medium	43	2¼	16	..
3	Victoria	" 21	132	Strong	47	2¼	15	..
4	Early Britain	" 21	129	Medium	36	2	14	30
5	Paragon	" 21	129	Strong	36	2	14	..
6	Agnes	" 21	129	Medium	48	2	13	30
7	Golden Vine	" 21	129	"	40	1¾	13	..
8	Picton	" 21	129	"	38	1¾	13	..
9	Chancellor	" 19	127	"	32	1⅛	13	..
10	White Marrowfat	" 21	129	Strong	42	2½	12	..
11	Prince	" 21	129	Medium	41	2	12	..
12	Mackay	" 21	129	Strong	43	1¾	12	..
13	Daniel O'Rourke	" 21	129	Medium	36	1¾	12	..
14	Gregory	" 21	129	Strong	46	2	10	..
15	Black eye Marrowfat	" 21	129	"	36	2¼	10	..
16	Prussian Blue	" 21	129	Medium	40	2¼	11	..
17	Archer	" 21	129	"	43	1¾	9	..
18	Arthur	" 18	126	"	31	1½	8	..

EXPERIMENTS WITH ALFALFA.

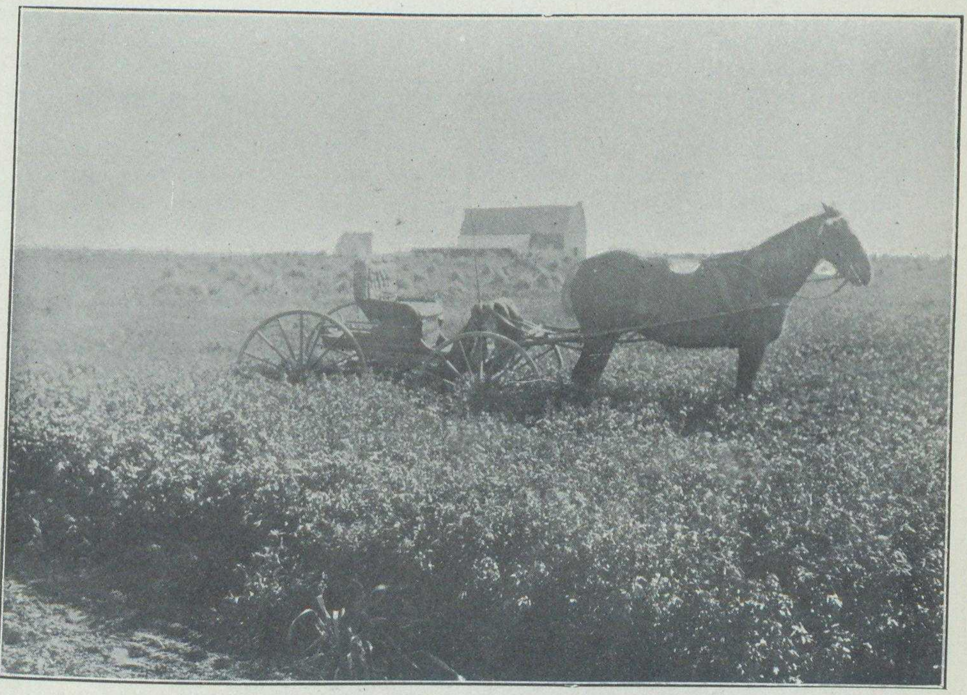
One acre of alfalfa was sown in the late spring of 1907, on land that had produced a crop of oats in 1906. This land was fall-ploughed and well cultivated during the spring up to the time when the alfalfa was seeded. The seed was used at the rate of about 15 pounds per acre, and was sown without a nurse crop. Soil secured from Mr. W. H. Fairfield, Superintendent, Experimental Farm, Lethbridge, from a field where alfalfa had become well established, was used at the rate of about 100 pounds per acre to inoculate three-quarters of the acre. Otherwise there was no difference in soil or treatment. The soil containing the necessary bacteria was sown by hand, the man sowing the soil being guided by stakes set to mark the boundary of the three-quarters of an acre. This was the only division in the areas.

During the balance of the season of 1907, the young plants were clipped back three times, the cutting bar of the mower being tilted up.

The plants came through the winter in good condition, no winter-killing being experienced. The line of demarcation between the inoculated and the uninoculated parts of the plot became very apparent as growth progressed. Two cuttings were made during the season, the first on July 13, and the second on August 25. The alfalfa was cut in the morning, after the dew was off, and was raked up and put in small piles that afternoon. These piles were left undisturbed for two or three days, then, by placing a fork underneath, were turned bottom side up and left for two or three days more and then hauled to the barn. This system saves the leaves to good advantage, which is most important, as they contain two and one-half times as much nutrients as the same weight of stem. Every man who rears live stock on his farm is strongly advised to try alfalfa. Soil for inoculation purposes can be secured from this farm by applicants living in the district it is intended to serve, i.e., in Alberta from Calgary north. Soil is sent in lots of 100 pounds to each applicant and is placed f.o.b. car at Lacombe, applicants paying freight.



Alfalfa not inoculated, Experimental Farm, Lacombe, Alberta, Aug., 1908.



Alfalfa inoculated (with soil), Experimental Farm, Lacombe, Alberta, Aug., 1908.

ALFALFA—Inoculated and Non-Inoculated.

Weight.	Green per Acre.		Dry per Acre as hauled.	
	Inoculated.	Non-Inoculated.	Inoculated.	Non-Inoculated.
First Cutting	10,320	4,880	4,160	1,960
Second Cutting	8,080	2,080	3,040	560
Total	18,400	6,960	7,200	2,520

An experiment is now under way comparing the merits of inoculation by means of soil from an alfalfa field and by means of culture supplied by the Bacteriological Laboratory, Department of Agriculture, Edmonton, Alta.

EXPERIMENTS WITH RED CLOVER.

Three acres were sown to Red Clover without a nurse crop in June of 1907 on fall-ploughed oat stubble, land a black clay loam.

The seed was used at the rate of about 8 or 10 pounds per acre and, though it did not germinate in large proportion, gave a fair stand. Like the alfalfa, it was also clipped during the season and came through the winter in good condition. While none of the land was inoculated, the field produced evidence, during the summer of 1908 that bacteria were present in places. The colour of the clover growing on these spots was a dark healthy green, while perhaps only three or four feet away plants would not be more than one-third as high and of a pale yellowish green; nodules could also be found present on the roots of the vigorous plants, while none were to be found elsewhere.

Both with Red Clover and alfalfa, the results thus far secured point to the advisability of inoculating and indicate that while inoculation would probably come about naturally in time, larger profits can be secured by hastening the introduction of the necessary bacteria by special means. One cutting only of Red Clover was made during 1908, that on July 31, and when the crop was cured it made exactly one ton of hay per acre.

EXPERIMENT IN WEED-CONTROL BY MEANS OF CHEMICAL SPRAYS.

Having some difficulty in controlling Ball Mustard (*Neslia Paniculata* L.), and having read of the success of Prof. Bolley, of North Dakota Experimental Station in controlling this weed, an experiment was conducted with iron and copper sulphates applied as a spray. In Bulletin No. 80 of the North Dakota Station, Prof. Bolley advises the following strength of solution: 'For destroying mustard 75 to 100 pounds of iron sulphate per acre is necessary to be dissolved in 50 gallons of water, when it will be ready for use. Twelve to 14 pounds of copper sulphate dissolved in 50 gallons of water are needed per acre in field spraying.' This strength of solutions was applied by means of a hand sprayer, but while the weeds were effectually destroyed the cereals were also injured. Prof. Bolley asserts that it is possible to achieve the former result and yet escape the latter. If iron sulphate can be effectively used it can be laid down in quantities at a sufficiently low rate, that it would become a practical and practised method of weed control in the weed-infested districts.

EXPERIMENTS WITH INDIAN CORN.

Fourteen varieties of corn were sown in rows 35 inches apart on May 28, on land broken out of timothy sod the preceding season. Frequent cultivation was given throughout the early summer, but on August 20 a frost nipped it and it was cut on August 22, while still immature.

Three varieties were sown in drills at different distances, under similar conditions of soil and cultivation.

CORN—Test of Varieties.

Number.	Name of Variety.	Character of Soil.	Date Sown.	Date Cut.	Height.	Weight per Acre.	
					In.	Tons.	Lbs.
1	Longfellow	Clay loam	May 28	Aug. 22	56	11	880
2	North Dakota White	"	" 28	" 22	53	11	..
3	Compton's Early	"	" 28	" 22	51	10	1120
4	Superior Fodder	"	" 28	" 22	57	10	680
5	White Cap Yellow Dent	"	" 28	" 22	55	9	480
6	Angel of Midnight	"	" 28	" 22	48	9	480
7	Early Mastodon	"	" 28	" 22	61	8	1160
8	Selected Leaming	"	" 28	" 22	57	8	280
9	Mammoth Cuban	"	" 28	" 22	51	7	1400
10	Pride of the North	"	" 28	" 22	54	7	960
11	Wood's Northern Dent	"	" 28	" 22	53	6	1640
12	Salzer's all Gold	"	" 28	" 22	58	6	1200
13	Eureka	"	" 28	" 22	53	6	320
14	Champion White Pearl	"	" 28	" 22	53	5	1880

INDIAN CORN—Test of Seeding at Different Distances.

Name of Variety.	Distance between rows.	Height.	Yield per Acre grown in rows.	
	In.	In.	Tons.	Lbs.
Longfellow	21	63	9	920
"	28	64	9	480
"	35	64	14	1480
"	42	65	16	560
Champion White Pearl	21	62	9	1800
" "	28	65	10	680
" "	35	58	9	480
" "	42	60	9	1360
Selected Leaming	21	64	11	440
"	28	66	11	880
"	35	66	12	640
"	42	64	13	1720

ROOT CROPS.

All the root crops of 1908 were grown on land from which a crop of Brome Grass had been taken in July of 1907, afterwards ploughed and manured and worked thoroughly till frost came. In the spring of 1908 the land was again thoroughly disked and a splendid catch was secured. The heavy rains of June favoured rapid growth and frequent cultivation kept them growing, so that a good crop was harvested. The yields were computed from the weights of roots on two rows, each 66 feet in length and 30 inches apart.

TURNIPS.

Twelve varieties of field turnips were tested this year. The seed was sown on black clay loam, drills 30 inches apart, and plants were thinned to a distance of about 10 inches in the row. All varieties did well and were practically free from disease.

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	Mammoth Clyde	June 2	June 15	Oct. 26	Oct. 27	31	304	1,038	24	24	840	614	—
2	Hartley's Bronze	" 2	" 15	" 26	" 27	30	720	1,012	—	37	1,240	1,254	—
3	Hall's Westbury	" 2	" 15	" 26	" 27	29	80	968	—	26	272	871	12
4	Kangaroo	" 2	" 15	" 26	" 27	22	220	737	—	14	1,436	490	36
5	Skirvings	" 2	" 15	" 26	" 27	21	240	704	—	13	400	440	—
6	Jumbo	" 2	" 15	" 26	" 27	20	392	673	12	16	1,000	550	—
7	Good Luck	" 2	" 15	" 26	" 27	20	128	668	48	19	940	649	—
8	Bangholm Selected	" 2	" 15	" 26	" 27	18	960	616	—	23	992	783	12
9	Magnum Bonum	" 2	" 15	" 26	" 27	18	168	602	48	17	584	576	24
10	Perfection Swede	" 2	" 15	" 26	" 27	16	1,792	563	12	15	96	501	36
11	Carter's Elephant	" 2	" 15	" 26	" 27	15	1,548	525	6	19	1,732	662	12
12	Halewood's Bronze Top	" 2	" 15	" 26	" 27	13	796	446	36	9	1,536	325	36

MANGELS.

Ten varieties of mangels were sown on clay loam, the first seeding being made on April 16, and the second on April 30. Cool weather delayed somewhat the growth of the roots first sown. They were all pulled September 28.

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	Giant Yellow Intermediate	14	1,568	492	48	21	592	709	52
2	Gate Post	17	848	580	48	20	1,888	698	8
3	Giant Yellow Globe	17	1,552	592	32	17	1,200	586	40
4	Prize Mammoth Long Red	14	512	475	12	16	1,440	557	20
5	Half Sugar Mangel	14	512	475	12	16	736	545	36
6	Perfection Mammoth Long Red	13	1,456	457	36	16	32	533	52
7	Yellow Intermediate	14	1,920	498	40	15	1,680	528	—
8	Mammoth Red Intermediate	9	1,360	322	40	13	48	434	8
9	Selected Yellow Globe	11	1,584	393	4	12	1,696	428	16
10	Crimson Champion	10	768	346	8	11	1,936	398	56

CARROTS.

Six varieties of field carrots were tested. Two sowings were made of each variety, the first on April 16 and the second on the 30th. They made a splendid growth and gave heavy yields. They were sown on clay loam in rows 30 inches apart and were thinned out to about 5 inches apart in the rows. These roots were all pulled September 29.

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	Giant White Vosges	17	496	574	56	19	720	645	20
2	Improved Short White	17	848	580	48	18	1,312	621	52
3	Ontario Champion	16	32	533	52	17	848	580	48
4	White Belgian	13	1,808	463	28	16	32	533	52
5	Half Long Chantenay	16	736	545	36	15	624	510	24
6	Mammoth White Intermediate	12	1,344	422	24	14	512	475	12

SUGAR BEETS.

Three varieties of sugar beets were sown on clay loam, and two sowings were made of each variety, the first on May 18 and the second on June 1. The yields were not particularly heavy, and as will be seen from results of an analysis made by Mr. F. T. Shutt, Chemist of the Dominion Experimental Farms, which is added in connection with table giving yields, they were low in sugar-content. These roots were all pulled October 1.

SUGAR BEETS—Test of Varieties.

Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.		Sugar in Juice.	Solids in Juice.	Co-efficient in Purity.
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.			
White French, very rich	12	640	410	40	14	160	469	20	11·16	14·3	78·04
Vilmorin's Improved	9	1,712	328	32	11	176	369	36	11·7	14·8	79·05
Klein Wanzleben	7	1,488	258	8	8	124	287	28	10·7	14·2	75·80

POTATOES.

Twenty-seven varieties of potatoes were planted on fall-ploughed timothy sod, which had been manured at the rate of about 20 tons of barn-yard manure per acre before ploughing.

Among those tested as to quality Rochester Rose, Holborn Abundance, Ashleaf Kidney and Table-talk were best.

Planting was done on May 22 and 23, and the potatoes were dug on September 30. Planting was done in rows 30 inches apart, and cuttings with from two to three eyes each were planted 1 foot apart in the rows. The soil was a black clay loam. The yield per acre has been calculated from the weight of crop produced from two rows each 66 feet long. No rot was observed on any of these plots.

POTATOES—Test of Varieties.

Name of Variety.	Ripened.	Size.	Total Yield.		Yield per Acre. Marketable.		Yield per Acre. Unmarketable.		Form and Colour.
			Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Ashleaf Kidney	Sept. 8..	Medium..	266	25	250	26	15	59	White, long.
Country Gentleman	" 8..	"	253	14	227	55	25	19	Pink, oval.
Table Talk	" 10..	"	248	25	223	35	24	50	White, oval.
Reeves' Rose	" 9..	"	246	39	221	59	24	40	Red, oval.
Everett	" 8..	"	239	36	168	31	71	05	" "
Uncle Sam	" 9..	"	237	36	226	27	11	09	White, oval.
Irish Cobbler	" 9..	"	230	01	195	31	34	30	White, round.
State of Maine	" 9..	"	225	33	203	28	22	05	White, oval.
Early Manistee	" 8..	"	227	01	215	58	11	03	Red, long.
Rochester Rose	" 9..	"	225	14	203	09	22	05	Pink, long.
Money Maker	" 9..	Small	211	01	147	43	63	18	White, long.
Vermont Gold Coin	" 9..	"	210	29	178	55	31	34	White, oval.
Burnaby Seedling	" 8..	Medium.	210	14	189	13	21	01	Red, oval.
Holborn Abundance	" 8..	"	210	14	194	06	16	08	White, oval.
Twentieth Century	" 6..	Small	109	51	77	44	32	07	" "
Empire State	" 8..	Medium..	208	22	184	12	24	10	" "
Late Puritan	" 9..	"	195	57	186	10	9	47	" "
Pioneer	" 10..	"	188	02	169	14	18	48	" "
Early White Prize	" 8..	Small	187	15	149	48	37	27	" "
Carman No. 1	" 8..	Medium..	184	43	175	19	9	24	" "
American Wonder	" 8..	"	172	32	155	17	17	15	" "
Vick's Extra Early	" 9..	"	165	56	149	21	16	35	" "
Dooley	" 8..	Small	159	06	151	09	7	57	" "
Dreer's Standard	" 8..	Medium..	159	02	146	19	12	43	" "
Canadian Beauty	" 8..	"	145	52	131	19	14	33	Pink, long.
Dalmeny Beauty	" 8..	"	139	43	132	44	6	59	White, long.
Morgan Seedling	" 9..	"	118	19	113	10	5	09	Pink, long.
British Queen	" 9..	"	124	54	106	10	18	44	White, oval.

FRUIT TREES.

The orchard of Russian, American and cross-bred apple trees planted in the spring of 1907, numbering in all about 350 trees, has shown a fair degree of hardiness, a large proportion of them having survived the winter of 1907-8 and made a fair growth during the season.

The writer last season saw matured Duchess apples grown on the farm of the late Thos. Daly, of Clover Bar, near Edmonton, Alta., and Martha crab apples which were produced by W. J. Barclay, of Lacombe. At the time of writing, March 29, 1909, most of the trees in the orchard now are living, many have successfully passed two winters, and it is hoped that many of these will come on and produce fruit in due time.

PLUMS.

Following are the varieties of plums set in 1907:—

1. Aitken.
2. Cheney.
3. De Soto.
4. Compass Cherry Plum.
5. Seedlings of Carsterson Plum.
6. Fifteen native plums from Brookings, South Dakota, Nos. 7 to 21, inclusive.

CHERRY.

South Dakota No. 3 Imp. Sand Cherry.
" " No. 5 " "

SMALL FRUITS.

As sufficient time has not elapsed since this farm was started to bring bush fruits to fruiting age, it will perhaps be sufficient for this report to say that no difficulty has so far been experienced in growing and fruiting red, white and black currant bushes in Central Alberta. Gooseberry bushes have sometimes winter-killed. Raspberries usually kill back partially, though not seriously.

STRAWBERRIES.

Owing to the work of cutworms, only a few plants were left of the six varieties set out in 1907. These few fruited in 1908, producing a fair crop of fruit of good quality. The varieties were:—

Lorett.
Senator Dunlop.
Beder Wood.
Haverland.
Parson's Beauty
Pocomoke.

Twenty-five other varieties were received from the Central Experimental Farm, Ottawa, in the spring of 1908. Most of these grew fairly well; of a few varieties scarcely a representative is left. Plants of eight of the same varieties were secured locally, most of which are living and making a free growth. These should fruit during the coming summer.

VEGETABLE GARDEN.

The hardier vegetables did well, but the season was not favourable to the more tender sorts, such as tomatoes, beans, &c. Only a limited variety of the different vegetables were tried and these are named in their order of merit.

BEANS.

Matchless.
Every Day.
Emperor of Russia
Green Pod Hodson.
Edible Podded.

BEETS.

Early Blood Turnip.
Egyptian.
Nutting's Dwarf Improved.

CARROTS.

Chantenay.
French Horn.

CELERY.

Giant Pascal.
Rose Ribbed Paris.
Paris Golden Yellow.

CORN.

No varieties matured.

CAULIFLOWER.

Early Snowball.
Extra Selected Earliest Erfurt.

CABBAGE.

Early Jersey Wakefield.
Paris Market.
Fottler's Improved Brunswick.
Large Flat Drumhead.

LETTUCE.

Cos Trianon.
Neapolitan.
Wheeler's Tom Thumb.
All the Year Round.

ONIONS.

Paris Silver Skin.
Large Red Wethersfield.
Danvers Yellow Globe.

PEAS.

Melting Marrow.

RADISH.

Early Scarlet White Tipped.
Extra Selected Earliest.

TABLE TURNIPS.

White Milan.

FLOWER GARDEN.

A number of the annual flowers were tried in the hot-bed, but greater success resulted from sowing in the open. Bloom was somewhat late, and, owing to the early frosts, rather short-lived, but was for a time very fine.

Variety.	Sown.	Remarks.
Abronia Umbellata	May 11	Medium.
Ageratum	" 9	"
Alyssum	" 9	"
Amarantus	" 9	"
Antirrhinum	" 9	"
Asters	" 12	Fine.
Brachycome Iberidifolia	" 11	Medium.
Balsam	" 11	"
Candytuft	" 11	Fine.
Calendula	" 11	Medium.
Celosia	" 11	"
Clarkia	" 11	Fine.
Chrysanthemum Coronarium	" 11	"
Coreopsis	" 11	"
Dianthus	" 11	"
Eschscholtzia California	" 12	"
Gaillardia	" 12	Medium.
Godetia	" 12	Fine.
Helichrysum lucidum	" 12	Medium.
Lobelia	" 12	"
Larkspur	" 12	"
Mignonette	" 12	Fine.
Nasturtium	" 12	Poor.
Nicotiana	" 12	Medium.
Phacelia	" 12	"
Phlox Drummondii	" 12	Fine.
Poppy	" 12	"
Portulaca Grandiflora	" 12	"
Salpiglossis	" 12	Medium.
Scabiosa	" 12	Fine.
Stocks	" 12	Medium.
Sweet Peas	" 12	Very Fine.
Verbena	" 12	Medium.
Tagetus	" 12	Fine.
Zinnia	" 12	Medium.

PERENNIALS.

Pansies sown in the hot-beds or, later, in the open produced fine bloom. Carnations also did well.

CANNAS AND DAHLIAS.

On account of the short season neither the Cannas nor Dahlias bloomed.

BULBS.

In October, 1907, a large collection of bulbs was received from the Central Experimental Farm, Ottawa, and were set out before the ground froze. They were protected during the winter by a covering of coarse barn-yard manure, about 6 inches deep. Tulips, Crocuses and Snow Drops succeeded in order mentioned, the first making a splendid showing.

TREES AND SHRUBS.

THE ARBORETUM.

The following is a list of those trees and shrubs planted in the spring of 1907, giving the name, number planted and number surviving one winter.

No.	Name.	Received.	Living.
1	A. Negundo, (Manitoba Maple)	2,188	2,035
2	A. Platanoides Purpurea	2	0
3	A. Platanoides Schwedleri	2	2
4	A. Saccharinum	6	0
5	A. Spicatum	4	4
6	A. Tataricum	6	0
7	A. Tataricum Ginnala	9	0
8	A. Tataricum Aidzuense	9	8
	Amelanchier (Juneberry).		
1	A. Vulgaris	0	0
	Aristolochia (Birthwort).		
1	Aristolochia Sipho	2	2
	Artemisia (Southernwood).		
1	Abrotanum	4	4
	Berberis (Barberry).		
1	B. Aquifolium	2	2
2	B. Canadensis	2	2
3	B. Heterophylla	2	2
4	B. Lycium	2	2
5	B. Thunbergii	30	30
6	B. Seedlings of hybrid Barberries	6	0
	Betula (Birch).		
1	B. Alba, (White Birch)	0	0
2	B. Alba Laciniata Pendula	4	0
3	B. Lutea	4	4
4	B. Populifolia	10	6
	Calycanthus (Carolina Allspice).		
1	C. Floridus	10	10
	Caragana.		
1	C. Arborescens	1,088	1,046
2	C. Arborescens Nana	2	2
3	C. Frutescens	70	66
4	C. Frutescens Macrophylla	4	4
5	C. Grandiflora	10	10
6	C. Mollis Glabra	4	4
7	C. Pygmaea	4	4
8	C. Redowsky	6	6
9	C. Spinosa	1	1
	Catalpa.		
1	C. Cordifolia	4	4
2	C. Koempferi	4	4
3	C. Speciosa	2	2
	Celastrus (Bitter Sweet).		
1	C. Articulatus	2	1
2	C. Scandens	4	3

No.	Name.	Received.	Living.
	Clematis.		
1	C. Flammula	2	0
2	C. Vitalba	4	0
3	C. Viticella	2	0
	Clethra (Sweet Pepperbush).		
1	C. Alnifolia	1	1
	Cornus (Dogwood).		
1	C. Alba Sibirica Spaethii	6	6
2	C. Alba Sibirica Variegata	2	2
3	C. Purpurea	4	4
	Cotoneaster.		
1	C. Acutifolia	6	5
2	C. Bacillaris	2	2
3	C. Frigida	2	1
4	C. Laxiflora	1	1
5	C. Nigra	2	2
6	C. Tomentosa	2	2
7	C. Integerrima	2	2
	Crataegus.		
1	C. Apiosa	2	0
2	C. Arkansana	2	1
3	C. Arnoldiana	2	2
4	C. Carrierei	2	2
5	C. Coccinoides	2	2
6	C. Collina	2	1
7	C. Fecunda	2	1
8	C. Spathulata	2	2
9	C. Submollis	2	1
	Cytisus (Broom).		
1	C. Hirsutus	1	1
2	C. Nigricans	2	2
3	C. Triflorus	2	1
	Diervilla (Weigelia).		
1	D. Florida Van Houttei	2	2
	Elaeagnus.		
1	E. Angustifolia	10	10
2	E. Umbellata	1	1
	Euonymus.		
1	E. Alatus	2	2
2	E. Bungeanus	3	1
3	E. Europaeus Ovatus	2	2
4	E. Linearis	4	4
5	E. Sieboldiana	4	4
	Fraxinus (Ash).		
1	F. Bungeana	2	2
2	F. Mandshurica	2	1
	Gleditschia (Honey Locust).		
1	G. Triacanthos Inermis	2	2
	Hydrangea.		
1	H. Paniculata Grandiflora	1	1

No.	Name.	Received.	Living.
	Kolreuteria.		
2	K. Paniculata	2	1
	Lespedeza.		
1	L. ———— ?	2	0
	Ligustrum (Privet).		
1	L. Amurense	2	2
	Lonicera (Honeysuckle).		
1	L. Alberti	2	2
2	L. Alpina	4	4
3	L. Fenzlei	4	4
4	L. Grandiflora	17	17
5	L. Grandiflora Rosea	20	20
6	L. Grata	3	3
7	L. Morrowi	4	4
8	L. Sempervirens	2	0
9	L. Voronesh No. 133	2	1
10	L. Flavescens	2	0
	Lycium (Matrimony Vine).		
1	L. Europaeum	2	0
	Neillia (Ninebark).		
1	N. Opulifolia Aurea	2	1
	Philadelphus (Mock Orange).		
1	P. Coronarius Foliis aureis	4	0
2	P. Grandiflorus	3	2
3	P. Hybridus Lemoinei Mont Blanc	2	2
4	P. Hybridus Lemoinei Manteau d'Hermine	4	2
	Populus (Poplar).		
1	P. Angustifolia	3	3
2	P. Deltoidea Aurea	2	2
	Prunus.		
1	P. Alleghenensis	2	1
	Ptelea (Wafer Ash).		
1	P. Trifoliata	2	1
	Pyrus.		
1	P. Aucuparia	3	3
2	P. Floribunda	4	4
3	P. Intermedia	2	2
4	P. Ioensis	1	1
5	P. Malus Sargenti	4	3
6	P. Mongeoti	4	4
	Quercus (Oak).		
1	Q. Alba	20	17
2	Q. Palustris	2	2
3	Q. Rubra	4	3
	Rhamnus (Buckthorn).		
1	R. Davurica	4	4
2	R. Frangula	4	4

No.	Name.	Received.	Living.
	Rhodotypos.		
1	R. Kerrioides	4	4
	Rhus (Sumach).		
1	R. Cotinus	2	2
	Ribes.		
1	R. Aureum	2	2
	Robinia (Locust Tree).		
1	R. Pseudacacia	20	12
	Rosa (Rose).		
1	R. Cinnamomea	2	2
2	R. Humilis	1	1
3	R. Lucida Alba	1	1
4	R. Lutea	3	3
5	R. Rugosa flore pleno	1	1
6	R. Rugosa	6	6
7	R. Spinosissima hispida	2	2
8	R. Tomentosa	2	2
9	R. Virginiana	3	3
	Rubus.		
1	R. Fasciculatum Chinense	2	2
	Salix (Willow).		
1	S. Rosmarinifolia	2	2
2	S. Voronesh	5	5
	Sambucus (Elder).		
1	S. Nigra aurea nova	2	2
	Spiraea.		
1	S. Ariaefolia	1	1
2	S. Arguta	2	2
3	S. Callosa Superba	4	4
4	S. Japonica Bumalda Anthony Waterer	1	1
5	S. Opulifolia	2	2
6	S. Sorbifolia	2	2
7	S. Van Houttei	4	3
	Symphoricarpus (Snowberry).		
1	S. Mollis	4	4
	Syringa (Lilac).		
1	S. Amurensis	2	2
2	S. Boussingault	2	2
3	S. Japonica	1	0
4	S. Josikea eximia	2	2
5	S. Pekinensis	5	5
6	S. Vulgaris Abel Carriere	2	2
7	S. " Alba Grandiflora	2	2
8	S. " Charles Joly	6	6
9	S. " Charles X.	6	6
10	S. " Condorcet	3	3
11	S. " Congo	4	4
12	S. " Dr. Troyanowski	1	1
14	S. " Francisque Morel	1	1
15	S. " La Tour d'Auvergne	2	2

No.	Name.	Received.	Living.
16.	S. Vulgaris Leon Simon	2	2
17.	S. " Louis Henry	2	2
18.	S. " Louis Spath	2	2
19.	S, " Madame Abel Chatenay	2	2
20.	S. " " Briot	2	2
21.	S. " " Casimir Perier	4	4
22.	S. " " Lemoinei	2	2
23.	S. " Mademoiselle Fernande Viger	4	..
24.	S. " Michel Buchner	4	4
25.	S. " Jacques Calot	4	4
26.	S. " Lemoinei	2	2
27.	S. " Rothamagensis Metensis	1	1
28	S. " Rubella Plena	1	1
29.	S. " Souvenir de L. Spath	4	4
30.	S. " Prince de Beauveau	1	1
	Tilia (Basswood).		
1.	T. Europæa platyphyllos	2	2
2.	T. Europæa	2	2
	Ulmus (Elm).		
1.	U. Americana	312	269
	Viburnum (Arrow Wood).		
1.	V. Dentatum	4	4
2.	V. Sargenti	2	1
3.	V. Venosum	1	2
	Vitis.		
1.	V. Riparia	2	2
	Abies (Fir).		
1.	A. Balsamea	20	0
2.	A. Concolor	2	0
3.	A. Remonti	4	0
	Retinospora.		
1.	Retinospora plunosa aurea	4	0
2.	Retinospora filifera	1	0
	Juniperus (Juniper).		
1.	J. Communis Aurea	2	1
2.	J. Sabina	2	1
3.	J. Sabina Variegata	1	0
	Larix (Larch).		
1.	L. Leptolepis	25	0
	Picea (Spruce).		
1.	P. Alba	24	12
2.	P. Alcockiana	4	2
3.	P. Engelmanni	2	2
4.	P. Excelsa Pygmæa	2	0
5.	P. Nigra	6	5
6.	P. Pungens	19	3
	Pinus (Pine).		
1	P. Sylvestris	6	0
2.	P. Resinosa	8	0
3.	P. Strobus	4	2
4.	P. Ponderosa	8	0

No.	Name.	Received.	Living.
	Pseudotsuga.		
1.	P. Douglasii	4	4
	Thuja (Arbor Vitæ).		
1.	P. Occidentalis Boothii	1	0
2.	P. " Columbia	2	1
3.	P. " Globosa	4	4
4.	P. " Hoveyi	6	2
5.	P. "	12	12

CATTLE.

The number of cattle kept has not been increased during the year. There are two dairy cows and a yearling heifer.

HORSES.

Four heavy draft and two general purpose horses are kept. A yearling filly, the progeny of one of the heavy mares, is developing well. These horses have been in good health during the year, and are in a thrifty condition at present .

CORRESPONDENCE.

From April 1, 1908, to March 31, 1909, 1,647 letters were received and 1,551 mailed.

MEETINGS ATTENDED.

During the year I addressed the annual convention of the Alberta Agricultural Fairs Association in Calgary in January; also the Convention of Farmers' Institute Fairs Association in Calgary in January as well as the Convention of Farmers' Institute Delegates in Calgary the same month. I was also one of the instructors with the travelling Stock Judging School, which was under the direction of the Provincial Department of Agriculture.

I attended the three-day school held in Morinville on February 8, 9 and 10, and Camrose and Daysland from February 18 to 25. These schools were well attended. Two cars of live stock were taken from place to place by the Department for demonstration purposes.

I assisted also as one of the lecturers in connection with the 'Short Course in Agriculture' inaugurated by the Provincial Department, and held in Lacombe from March 1 to 13. The attendance was large, and the interest was maintained throughout.

I also addressed several meetings of agricultural societies during the fall and winter.

DISTRIBUTION OF SAMPLES.

The first annual distribution of samples of grain from this farm, covering central Alberta, was begun this year. There was not a very large number of applications for grain, but applications for trees still continue to be received. The number of these distributed will of necessity be left for the report of next year.

Our potatoes were, unfortunately, caught by frost in the cellar, and under the circumstances the applications, which numbered 166, are being filled from the Brandon Experimental Farm.

INOCULATED SOIL.

Soil inoculated for alfalfa is being distributed in lots of 100 pounds to each applicant, for making a start in the culture of this crop. Quite a number are taking advantage of this offer, and it is expected that alfalfa will be tried this year over a wider area, and under more widely varying conditions than heretofore.

Following is a list of the samples of grain distributed to date:—

Wheat, 5-lb. bags	120
Oats, 4-lb. bags	55
Barley, 4-lb. bags	20

A small quantity of grain has been sold for seed.

BUILDINGS AND FENCING.

During the year improvements have been made which include a mile of woven-wire fence which was erected on the east and north boundaries of the farm, thus completing the outside fencing. A building has been erected to provide a granary, engine-room, work-room and museum. This is a substantial building 30 x 40 x 18, having a 12-inch concrete wall as a foundation, the cellar being 7 feet in the clear and being floored with concrete. This building adds much to the equipment, and also to the appearance of the farm.

METEOROLOGICAL RECORD.

Months.	Date.	Highest Temperature.	Date.	Lowest Temperature.	Précipitation.	Total hours Sunshine.
1908.						
April	20th	71·6	1st	—5·1	0	219·48
May	7th	84·6	1st	27·4	2·912	202·86
June	25th	79·4	27th	30·4	8·215	201·9
July	23rd	86·3	27th	35·7	2·1	314·34
August	19th	86·4	20th	26·5	2·37	292·42
September	13th	85·8	26th	14·4	·305	217·7
October	8th	74·8	29th	7·4	·4	112·2
November	4th	69·8	30th	—5·2	·0	133·3
December	12th	42·6	31st	—31·5	·25	133·3
1909.						
January	17th	40·5	7th	—56·1	·72	116·9
February	19th	47·2	12th	—47·6	·3	191·
March	31st	52·3	10th	—21·2	·345	171·8

I have the honour to be, sir,

Your obedient servant,

G. H. HUTTON.

EXPERIMENTAL FARM FOR SOUTHERN ALBERTA.

LETHBRIDGE, ALTA., March 31, 1909.

Dr. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit my second annual report of the work done on the Experimental Farm for Southern Alberta at Lethbridge for the year ending March 31, 1909. This is, however, the first report of the crops grown on the farm, as on account of the land being virgin prairie, it was necessary to devote the first spring and summer to breaking the sod, consequently a crop could not be harvested until the following season.

The winter of 1907-8 was, in general, normal. Range stock wintered well. Although land in Southern Alberta is being settled rapidly there is still a great deal of land unfenced, and on these areas thousands of cattle and horses pasture the year round.

The season of 1908 has been a very satisfactory year for grain in nearly all parts of Southern Alberta. Winter wheat established itself well in the autumn of 1907, and came through the winter in particularly good condition. The heavy rains of June brought the crops to a high state of perfection. Spring wheat, oats and barley, although yielding well, were inferior to the winter wheat.

The growing season was somewhat longer than usual. The last frost recorded in the spring was on the morning of May 2, when the thermometer registered 32°, and the first one in the autumn was on September 23, when 32° was recorded. Three days later, on the 26th, a killing frost occurred, the mercury going down to 19·2°. Harvest was rather early, as the first winter barley was cut July 23, and the first winter wheat on July 24.

The results given in the following report will be of particular interest to the many new-comers in the district, because it is the record of the first crop ever raised on this land. In the spring of 1907, the entire farm was virgin prairie, except some ten acres that had been broken the previous autumn.

Of the 400 acres in the farm, a strip of 100 acres on the extreme east side is irrigable. The remaining 300 acres is non-irrigable.

TWO FARMS.

Recognizing that the problems of the non-irrigated, or the 'dry' farm are distinct in great measure from those of the 'irrigated' farm, the work on each has been kept separate. As a matter of fact, two experimental farms are being operated. Their object is, not to compare the relative merits of the two systems, but to study their individual problems. To aid in doing this, and to prevent confusion, the report is divided into two parts. Part 1 deals with the results from the non-irrigated or 'dry' farm, and Part 2 with the results from the irrigated farm.

PART I—THE NON-IRRIGATED OR 'DRY FARM.'

Preparation of the soil.—The sod was broken 3 or 4 inches deep in May and June of 1907, and in August of the same year most of the land on which the crops mentioned below were raised, was backset.

Owing to an unavoidable delay in obtaining a gasoline engine for the small threshing machine, it was not possible to begin threshing the uniform test-plots until September 22. As the first grain was cut July 23, and remained out in shock until threshed, it is reasonable to suppose that exposure to weather, &c., appreciably reduced the yields.

EXPERIMENTS IN WINTER WHEAT.

On August 31, 1907, ten varieties of winter wheat were sown on sandy loam at the rate of 30 lbs. per acre in plots of one-sixtieth acre each. The Turkey Red No. 380 and the Kharkov are practically the same variety.

WINTER WHEAT—Test of Varieties (Non-Irrigated).

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Measured Bushel after Cleaning.
	1908.		In.	In.		Lbs.	Bush.	Lbs.	Lbs.
Turkey Red (No. 380, from Kansas)..	July 29...	333	42	2	Bearded..	5,006	53	4	63½
Kharkov........................	" 30...	334	43	2	" ..	4,181	52	49	63
Abundance......................	" 29...	333	44	3	Beardless.	3,596	44	4	61¼
Turkey Red (Alberta grown)........	" 30...	334	42	2½	Bearded..	4,834	43	56	63¾
Early Windsor..................	" 30...	334	46	4	Beardless.	3,487	43	30	60¾
Prosperity	" 29...	333	50	2	" ..	4,106	40	19	61½
Red Velvet Chaff...............	" 30...	334	48	2½	Bearded..	4,485	37	56	61
Reliable	" 29..	333	47	3	" ..	3,930	32	0	61¾
Dawson's Golden Chaff...........	" 29...	333	48	2¼	Beardless.	3,497	29	37½	60½
Red Chief	" 29...	333	47	3	" ..	4,132	26	7½	60

Average yield 40 bushels 20 lbs. per acre.

It may be well to point out that, although Turkey Red (No. 380 from Kansas) yields 15 lbs. per acre more than the Kharkov in this experiment, yet in two tests of field lots where there were three and four acres respectively in the fields, Kharkov outyielded the Turkey Red No. 380 in both cases.

FIELD LOT OF WINTER WHEAT.

A field of 23¼ acres of backsetting was sown with Kharkov at the rate of 30 lbs. of seed per acre, during the first few days of September. It was cut the last week in July and yielded at the rate of 54 bush. 11 lbs. per acre.

AN EXPERIMENT IN BREAKING VS. BREAKING AND BACKSETTING.

The fact that backsetting prepares the land very much better for the second crop is borne out by the following experiment:—

The field was broken about 3 inches deep in May, 1907. In August, part of it was backset 2 inches deeper than the breaking, and the whole piece was sown with three varieties of winter wheat. The sowing was done at right angles to the ploughing, so that each variety was sown partly on land merely broken and partly on backsetting. The three varieties resemble each other very closely. The last variety is the ordinary

5094—p. 368.

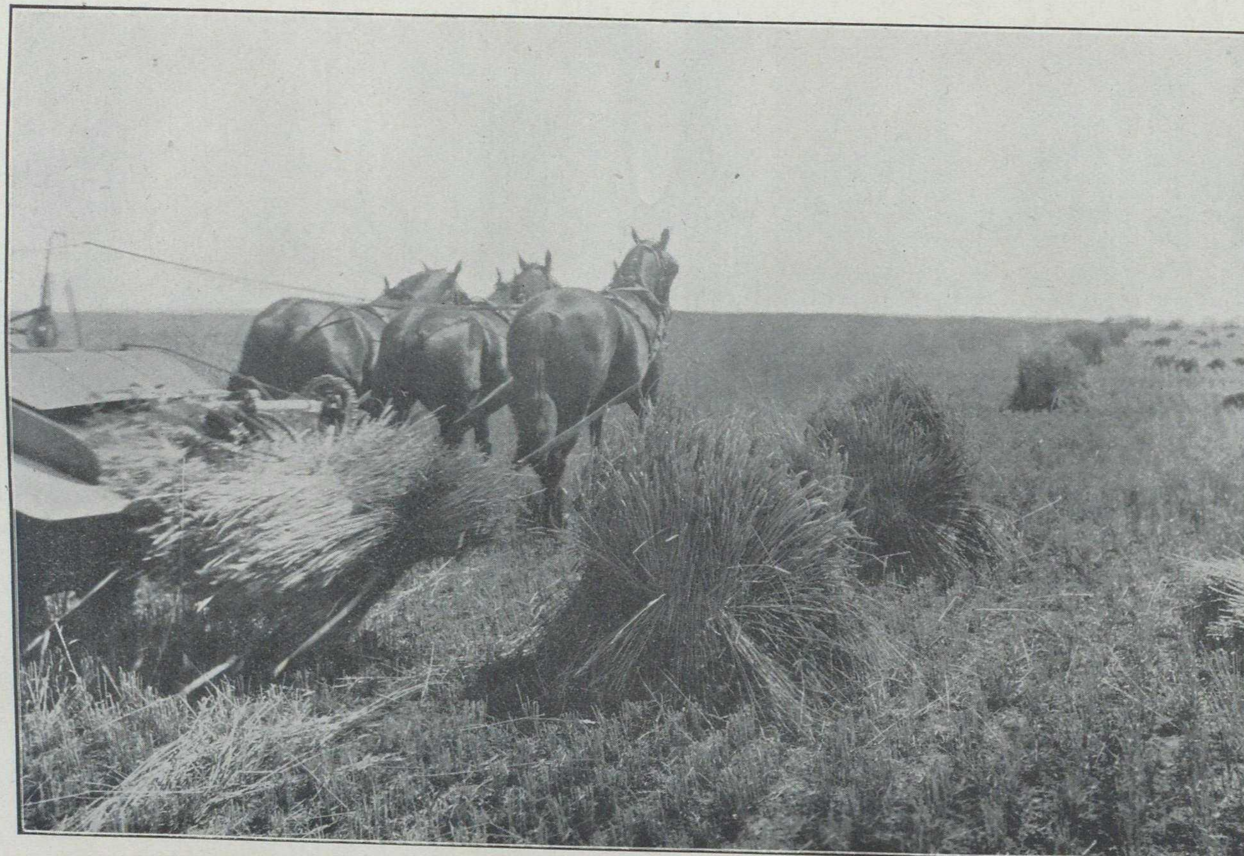


Photo by C. E. Saunders.

Cutting Red Fife Wheat on non-irrigated land, Experimental Farm, Lethbridge, Alberta, 1908.

Turkey Red, commonly grown under the name of Alberta Red, from the best locally grown seed that could be obtained. The first two are pure improved strains of the same, obtained from the Kansas Agricultural College, where they have been carefully selected and bred.

It might not be out of place to mention here that the word Alberta Red is often used in a sense that is not technically correct, for it is the term used in the Manitoba Grain Act in describing the various grades of hard red winter wheat. For example, the Act states that 'No. 1 Alberta Red shall be hard, pure red winter wheat, sound, &c., &c.,' consequently, any hard red winter wheat may be called Alberta Red, but on account of there being but one variety of this class of wheat, the Turkey Red, grown widely up to the present time in the district, the term Alberta Red has been used to apply to this one variety, whereas it is properly applicable to any hard, red winter wheat.

TEST OF BREAKING AND BACKSETTING.

Variety.	Breaking.			Breaking and Backsetting.			Increased Yield per Acre when Backset.	
	Area.	Yield per Acre.		Area.	Yield per Acre.			
	Acres.	Bush.	Lbs	Acres.	Bush.	Lbs.	Bush.	Lbs.
Kharkov	4·36	50	32	2·86	54	27	3	55
Turkey Red, No. 380	4·77	51	38	3·13	51	53	—	15
Turkey Red (Alberta-grown seed)	5·09	45	17	3·34	47	41	2	24

The average increase in yield in these experiments, apparently due to backsetting, is 2 bush. 8 lbs. per acre. It should be made plain, however, that this increase in the first crop does not represent all that is gained by the backsetting. In addition, all the native grass is killed and the land is in very much better condition in every way for a second crop.

To ascertain the quantity of seed most profitable to sow, an experiment, to be continued for a number of years, was begun with the following results:—

WINTER WHEAT—Rates of Seed Per Acre.

Area of plots used, one-eighth acre each. Variety, Turkey Red.

Amount of Seed per Acre.	Weight of Straw per Acre.	Yield of Grain per Acre.	
Lbs.	Lbs.	Bush.	Lbs.
15	5,128	50	0
30	4,760	54	0
45	5,680	56	48
60	5,528	59	12
75	6,216	61	12
90	5,544	60	16
105	6,280	60	48
120	5,440	60	0

Although the plots sown at the rate of 60 lbs. of seed and upward per acre gave the heaviest yields, it must be borne in mind that we had a favourable season, as, although the amount of rain was not abundant, it came at such a time as to insure a strong growth and a high degree of development in the winter wheat. In a season somewhat dry, the fields having thick stands are the first to show the effects of drouth. So it would hardly be wise for farmers in the district to change the customary amount of wheat sown (from 30 to 60 lbs. per acre) until a few further seasons' testing furnishes more reliable conclusions as to the best amount of seed to sow under the conditions in this district.

EXPERIMENT WITH DIFFERENT DATES OF SEEDING.

The first wheat was sown on August 15, 1907, and sowings were made twice a month from then to December 1, at the rate of 30 lbs. per acre with the following results:—

Date of Sowing.	Yield per Acre.	
	Bush.	Lbs.
Aug. 15	46	51
Sept. 1	54	0
" 16	38	48
Oct. 1	38	0
" 15	28	32
Nov. 1	25	41
" 15	12	16
Dec. 1	11	20

It might be of interest to mention here that the present indication (March 31) for the crop of 1909 is, that the sowing made August 15 is going to do better than that of September 1.

THE CULTURE OF WINTER WHEAT.

As there are a great many letters being received asking for information concerning the best method of cultivation for winter wheat, when to sow, the quantity of seed to use, &c., a brief outline of the method in vogue in this district is here given.

Although a winter wheat known as Odessa has been grown in the Cardston and Pincher Creek districts for the last twenty years or more, the first hard winter wheat raised on a commercial scale was not sown until the fall of 1901, when Mr. E. E. Thompson, then of Spring Coulée, imported a car of Turkey Red from Nebraska. Although there have been further importations of the same kind of seed into the province, most of the four million odd bushels threshed this past season are from that first car of seed.

For seven seasons this wheat has been sown from July to December, the seed varying in quantity per acre from two pecks to six pecks and more. Naturally, some failures have been met with, but one important fact has been established beyond question, that the district is peculiarly adapted to the growing of hard winter wheat. Of the details, such as the best mode of preparing the ground, the best time to sow, and the right quantity of seed to use, much is still to be learned. In all agricultural experiments, the average of a number of seasons is required before reliable conclusions may be drawn.

PREPARATION OF THE LAND.

If sod is to be used, it should be broken in May and June, while the soil is moist and before the rainy season is over. May breaking usually gives better results than June breaking. The sod should be rolled or flattened down as fast as it is broken, to facilitate the rotting process. It is the custom to break $3\frac{1}{2}$ to 4 inches deep and prepare a seed bed by the use of a disk, drag harrow and float. The latter is a contrivance made of four or five 2-inch planks a foot wide, 12 to 16 feet long, laid flatways and lapped to resemble somewhat a washboard. This implement, when weighted with stone or sods added to the weight of the driver, crushes quite effectively small pieces of sod which, when dry, could not be broken up well with the drag-harrow. The float should be followed immediately with the harrow, for evaporation takes place very rapidly from the land when the surface is left too smooth. If the floating is done just before seeding, the seed-drill will, of course, roughen the surface. A light harrowing immediately after seeding is advisable.

BACKSETTING.

Although it is not customary to backset in this district, it is a practice that cannot be too highly recommended. When backsetting is to be done, the sod should be broken as shallow as practicable and immediately rolled or flattened down by a weighted float. The earlier the breaking after the grass has started growth, the better will be the results. In the latter part of July or early in August the land is again ploughed (with stubble bottom ploughs), about 2 to 3 inches deeper than it was broken. A seed bed can then often be prepared by the use of the harrow only, but a disk should be used if the condition of the ground requires it. Special attention should be called to the importance of harrowing each day's ploughing at night before leaving the field. If an engine is used, the harrow should be attached to the plough, or if horses are used on a sulky or gang plough, one section of a harrow should be attached so that the land is harrowed as fast as it is turned. In fact, this practice of harrowing land immediately after it is ploughed should always be followed. Too much stress cannot be laid on this point.

TIME TO SOW.

Although our results for this season would indicate that September 1 is the best date to sow, this is one of the questions that will require some further years' experience and observation before a reliable opinion can be offered.

QUANTITY OF SEED TO SOW.

This, as well as the proper time to sow, is a point about which we have not sufficient data at hand to draw very satisfactory conclusions. It is reasonably safe to assume that thin sowing will fill better in a dry season, while in a normal or wet season, medium to heavy seedings will fill equally well, besides producing a larger yield. It is not wise to go to extremes either way. Thirty to 60 lbs. or 45 to 60 lbs. is probably the approximate amount of seed to sow per acre.

TREATING FOR SMUT.

Winter wheat should be treated for smut just as conscientiously as is spring grain. Either the formalin or bluestone method is satisfactory, providing that the work is done carefully. Very smutty grain should never be used for seed, for, even when treated thoroughly, some smut is apt to appear in the resulting crop. If seed wheat is treated every year whether any smut can be found in it or not, the trouble will be kept in subjection. With either method used, it is important that each kernel be thoroughly wet. As to the strength of the solution, it should be strong enough to kill the smut spores, but not so strong as to injure the vitality of the grain. The strength of solution most often recommended is 1 pound of formalin in 32 gallons of water. and in the case of bluestone, 1 pound thoroughly dissolved in 6 gallons of soft water. The sacks into which the grain is to be put after it is treated should have been dipped into the solution also.

HARROWING THE GROWING GRAIN.

The land is not apt to become crusted much in the fall, but should it become so in the spring after heavy rains, it is a commendable practice to harrow it.

EXPERIMENTS WITH SPRING WHEAT.

Sixteen varieties of wheat were sown on April 13, 1908, at the rate of about one bushel per acre, in plots of one-seventieth acre each, on backsetting. The land was a sandy loam.

SPRING WHEAT—Test of Varieties (Non-Irrigated).

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after cleaning.
		1908.		Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.
1	Percy A	Aug. 10	119	40	Strong	4	3,220	35	..	58
2	Red Fife H	" 17	126	37	"	3½	2,660	33	50	60
3	Chelsea	" 10	119	36	Medium	3½	2,625	33	15	60
4	Preston	" 6	115	36	Strong	3½	3,290	32	40	58
5	White Russian	" 10	119	36	"	4	3,045	30	55	57½
6	Pringle's Champlain	" 7	116	38	"	3½	3,640	30	20	58½
7	Bishop	" 3	112	33	Medium	3½	2,800	30	20	60
8	White Fife	" 10	119	33	Strong	3½	3,430	30	20	57½
9	Marquis	" 7	116	34	Medium	3½	2,520	29	10	62¾
10	Hungarian White	" 10	119	38	"	3½	2,450	29	10	59½
11	Huron	" 10	119	33	Strong	3½	2,170	29	10	60¼
12	Red Fern	" 7	116	36	"	4	2,870	29	10	60
13	Stanley	" 10	119	38	"	3	2,870	29	10	59¼
14	Kubanka (durum)	" 17	126	36	Weak	2½	2,310	26	50	64
15	Gatineau	" 10	119	37	Medium	3½	3,220	22	10	58
16	Riga	" 4	113	36	"	3	2,030	21	..	62

Average yield 29 bushels 33 lbs. per acre.

FIELD LOTS.

Owing to an accident in threshing, the yield from a field sown on June breaking and one on backsetting cannot be given. A field of fresh breaking, that is, broken in April, double disced twice, harrowed and immediately sown on April 15, at the rate of about one bushel per acre, yielded at the rate of 17 bush. 17 lbs. per acre. This practice of sowing spring grain on land freshly broken, although not as common now as it was a few years ago in this district, should be discouraged, as the yields are usually not satisfactory and the land is in poor condition for a second crop.

EXPERIMENT WITH DIFFERENT AMOUNTS OF SEED PER ACRE (NON-IRRIGATED).

Area of plots used, one-twentieth acre each; variety, Red Fife; sown April 21, 1908:—

Amount of Seed per Acre.	Weight of Straw per Acre.	Yield of Grain per Acre.	
Lbs.	Lbs.	Bush.	Lbs.
15	1,120	16	40
30	1,240	24	0
45	1,940	29	20
60	2,280	30	40
75	2,280	32	0
90	2,680	32	20
105	2,860	32	40
120	2,780	31	20

EMMER AND SPELT.

One plot each of one-seventieth acre was sown with Common Emmer and Red Spelt, respectively, on April 13, and cut August 22, thus taking 131 days to mature. A poor stand was obtained from both. The soil was a sandy loam.

EMMER AND SPELT—Test of Varieties (Non-Irrigated).

Number.	Name of Variety.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.	
		Inches.		Inches.	Lbs.	Bush.	Lbs.
1	Common Emmer				2,100	37	10
2	Red Spelt	39	Strong	4	2,100	37	10

EXPERIMENTS WITH OATS.

Twenty-four varieties of oats were sown on April 17, on sandy loam, at the rate of about two bushels per acre, on one-seventieth acre plots on backsetting.

Oats—Test of Varieties (Non-Irrigated).

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after Cleaning.
		1908.		Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.
1	Improved American	Aug. 1	105	38	Strong	8	3,745	85	15	31½
2	Banner	" 2	106	40	"	9	3,570	80	10	31
3	Abundance	" 4	108	40	"	7	3,255	80	10	30
4	American Triumph	" 4	108	42	"	7	3,482	74	21	30½
5	Irish Victor	" 1	105	39	Medium	7	3,640	74	4	32
6	Golden Beauty	" 6	110	36	"	8	3,185	73	3	33
7	Danish Island	" 2	106	38	"	8	3,570	72	2	32½
8	Improved Ligowo	" 1	105	36	Weak	6	3,570	72	2	35
9	Kendal White	" 2	106	38	Strong	7	3,010	70	..	33
10	Twentieth Century	" 2	106	36	Medium	7	3,220	64	24	35¼
11	Joanette	" 5	109	30	Strong	7	2,520	63	28	33¼
12	White Giant	" 2	106	38	Medium	8	2,380	63	28	33½
13	Wide Awake	" 1	105	31	"	6	2,310	63	28	32¾
14	Tartar King	" 2	106	32	"	7	2,450	63	28	35¼
15	Goldfinder	" 8	112	32	"	8	3,220	61	26	31¼
16	Lincoln	" 3	107	36	"	7	2,800	60	30	33
17	Siberian	" 2	106	36	"	7	3,220	59	24	33¼
18	Golden Giant	" 14	118	34	Strong	10	2,205	58	23	28¾
19	Pioneer	" 7	111	33	Weak	7	3,010	57	22	35¼
20	Virginia White	" 2	106	38	Strong	7	2,030	57	22	36
21	Milford White	" 5	109	36	Medium	8	2,870	55	20	32½
22	Swedish Select	" 1	105	36	"	7	2,590	55	20	36
23	Thousand Dollar	" 1	105	36	"	6	2,730	55	20	37
24	Storm King	" 7	111	40	Weak	8	2,310	51	16	31¼

Average yield 65 bushels 23 lbs. per acre.

Field Lots of Oats—Sown on Backsetting.

Variety.	Area.	Date of Seeding.	Amount of Seed used per Acre.	Yield per Acre.	
	Acres.		Lbs.	Bush.	Lbs.
Banner	2·6	April 17	130	80	26
"	1·5	" 17	65	65	30
"	6·0	" 18	65	78	17
Tartar King	3·1	May 29	65	40	3
Thousand Dollar	2·9	" 30	65	37	25

EXPERIMENTS WITH DIFFERENT QUANTITIES OF SEED PER ACRE (NON-IRRIGATED).

Area of plots one-twentieth acre; Tartar King Oats; sown April 22:—

Variety.	Date of Seeding.	Amount of Seed per Acre.	Weight of Straw per Acre.	Yield of Grain per Acre.	
		Lbs.	Lbs.	Bush.	Lbs.
Tartar King	April 22	15	1260	39	14
"	" 22	30	1580	51	6
"	" 22	45	1600	53	18
"	" 22	60	1760	60	20
"	" 22	75	1960	55	30
"	" 22	90	2520	62	32
"	" 22	105	2060	60	20
"	" 22	120	1900	55	30

Unfortunately, the gophers damaged these plots of oats so that the results cannot be relied upon implicitly. This may account for the yield from the plot seeded at the rate of 75 lbs. per acre being apparently irregular.

EXPERIMENTS WITH BARLEY

Thirteen varieties of six-rowed and eleven varieties of two-rowed barley were sown on April 22, at the rate of about 1½ bush. per acre in one-seventieth acre plots on backsetting. The land was a sandy loam.

Six-Rowed Barley—Test of Varieties (Non-Irrigated).

Number.	Name of Variety.	Date of Ripening.	No. of days Maturing.	Length of Straw, including head.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.
				In.		In.	Lbs.	Bush.	Lbs.	Lbs.
1	Blue Long Head	July 31	100	33	Stiff	2¼	3,570	56	42	43
2	Claude	" 30	99	36	"	3¼	2,590	55	20	44
3	Empire	" 30	99	35½	Medium	2¼	2,590	48	10	48
4	Mansfield	" 30	99	38½	"	2½	2,730	42	14	48
5	Albert	" 31	100	38	Stiff	3	3,570	39	8	41
6	Odessa	" 31	100	33	Medium	2½	3,290	37	44	49
7	Mensury	" 30	99	34	"	3	2,135	37	44	44½
8	Stella	" 31	100	40	Stiff	3	2,485	37	9	48¼
9	Nugent	" 30	99	34	"	2¾	2,310	36	22	47
10	Yale	" 31	100	39	"	2	2,730	32	4	51
11	Oderbruch	" 30	99	30	"	2¼	1,750	30	30	47
12	Trooper	" 31	100	39	Medium	3½	2,280	29	8	49
13	Champion	" 30	99	40	Stiff	2	2,240	20	20	45

Average yield 38 bushels 36 lbs. per acre.

Two-Rowed Barley—Test of Varieties (Non-Irrigated).

Number.	Name of Variety.	Date of Ripening.		No. of days Maturing.	Length of Straw including head.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after Cleaning.
					Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.
1	Swedish Chevalier	July	31	100	28	Medium	$2\frac{3}{4}$	3,710	55	20	46
2	Invincible	"	30	99	34	"	3	3,430	53	46	49
3	Sidney	"	30	99	37	"	$2\frac{1}{2}$	4,270	51	2	$49\frac{3}{4}$
4	Standwell	"	31	100	34	"	$2\frac{3}{4}$	3,640	49	28	45
5	Danish Chevalier	"	30	99	41	Stiff	4	3,780	45	10	$49\frac{1}{2}$
6	French Chevalier	"	30	99	38	"	$2\frac{1}{2}$	3,990	43	36	53
7	Gordon	"	30	99	42	"	3	4,095	41	27	$53\frac{1}{2}$
8	Clifford	"	30	99	38	"	3	3,255	41	27	49
9	Canadian Thorpe	"	30	99	27	Medium	3	3,430	40	40	$45\frac{1}{4}$
10	Jarvis	"	30	99	42	Stiff	$4\frac{1}{2}$	4,340	35	0	53
11	Beaver	"	30	99	37	"	4	2,590	30	50	46

Average yield 44 bush. 20 lbs. per acre.

A test of different quantities of seed per acre was so interfered with by gophers that the results were not considered worthy of record.

WINTER BARLEY.

Seed of an interesting novelty for this part of the country was received from the Kansas Agricultural College, in the form of winter barley. A small plot was sown August 31, along with winter wheats. A good stand was obtained in the fall, but during the winter a considerable portion died. The remainder was ripe July 23, and yielded at the rate of 23 bushels, $43\frac{1}{2}$ lbs. per acre.

EXPERIMENTS WITH PEAS.

Although a fair stand of peas was obtained, they lacked vigour and thrift all through the growing season and the results were disappointing. It has been suggested that this lack of vigour may have been due to the soil being deficient in the proper bacteria and that inoculation might have a beneficial effect.

Seventeen varieties were sown on April 15 at the rate of about two bushels per acre, this varying slightly on account of differences in the size of the grain, in plots of one-seventieth acre each on sandy loam.

PEAS—Test of Varieties (Non-Irrigated).

Number.	Name of Variety.	Date of Ripening.	Number of days Maturing.	Weight of Straw.	Yield per Acre.	Yield per Acre.	Weight per measured bushel after Cleaning.
				Lbs.	Lbs.	Bush. Lbs.	Lbs.
1	Paragon	Aug. 1	108	2,887	1,312	21 52	64½
2	Archer	" 3	110	2,607	1,313	21 53	65
3	English Grey	July 25	101	2,275	1,295	21 35	62¾
4	Prince	Aug. 1	108	2,502	1,278	21 18	65
5	Agnes	" 3	110	3,360	1,260	21 0	64¾
6	Prussian Blue	" 1	108	2,730	1,190	19 50	65½
7	Early Britain	" 1	108	2,747	1,172	19 32	63½
8	Golden Vine	" 1	108	2,747	1,172	19 32	64½
9	Arthur	" 1	108	1,995	1,155	19 15	63
10	Wisconsin Blue	" 1	108	3,115	1,155	19 15	65½
11	Mackay	" 1	108	2,362	1,137	18 57	64
12	Daniel O'Rourke	" 1	108	2,782	1,137	18 37	63
13	Chancellor	" 1	108	2,117	1,102	18 22	63½
14	White Marrowfat	" 1	108	2,852	1,068	17 48	63½
15	Black-eye Marrowfat	" 4	111	2,715	1,060	17 40	63½
16	Victoria	" 4	111	3,256	888	14 48	65
17	Gregory	" 1	108	2,135	735	12 15	64½

Average yield 19 bush. 3 lbs. per acre.

EXPERIMENTS WITH RYE.

One half-acre of winter rye was sown the first week in September, 1907. There was a good stand and a large quantity of straw was obtained, but the yield of grain was light, being at the rate of 26 bush. and 28 lbs. per acre.

A small plot of one-seventieth acre of spring rye was sown and yielded at the rate of 23 bush. and 42 lbs. per acre.

EXPERIMENTS WITH INDIAN CORN.

Fourteen varieties of corn were planted in a sandy loam on May 22. Two rows of each variety were planted in hills, with 3 feet between rows, and another two rows of each variety planted with the seed a few inches apart in the row. They were all cut September 17. The yield of green fodder per acre in each case was computed from two rows each 66 feet long.

INDIAN CORN—Test of Varieties (Non-Irrigated).

No. of Plot.	Name of Variety.	Size of Plot.	Height	Condition When Cut.	Weight per acre grown in rows.		Weight per acre grown in hills.	
			In.		Tons.	Lbs.	Tons.	Lbs.
1	North Dakota White......	2 rows, 66 ft. Long, 3 ft. between rows....	48	Tasselled. No Ears.......	7	1840	3	1480
2	Angel of Midnight...........	"	48	"	6	1860	3	1710
3	Superior Fodder............	"	38 to 42	"	6	1310	5	120
4	Mammoth Cuban............	"	48 to 54	"	6	210	5	1110
5	Salzer's All Gold..........	"	36 to 40	"	5	1880	5	10
6	Eureka....	"	36 to 48	"	5	1880	4	1680
7	Early Mastodon............	"	42 to 48	"	5	1770	3	1480
8	Selected Leaming...........	"	42 to 48	"	5	1440	4	30
9	Pride of the North	"	42 to 52	"	5	1000	6	650
10	Compton's Early..........	"	48	"	5	1000	3	490
11	Longfellow...............	"	40 to 48	"	4	1790	4	250
12	White Cap Yellow Dent.......	"	48 to 54	Very few small ears..	4	1680	4	360
13	Wood's Northern Dent.......	"	42 to 52	"	4	690	5	1110
14	Champion White Pearl*	"	42 to 48	No ears.......	3	1370	5	670

Average yield of 14 varieties in rows: 5 tons 1,408 lbs. per acre. Average yield of 14 varieties in hills: 4 tons 1,225 lbs. per acre. *One row partially destroyed.

EXPERIMENTS WITH TURNIPS.

On May 5, twelve varieties of turnips were planted in a sandy loam, in rows 30 inches apart, on backsetting, the same again on May 19. After being thinned, they were attacked by the flea-beetle so severely that the stand was badly affected. This accounts to a great extent for the low yields obtained. The yield per acre in each case was computed from two rows each 66 feet long. They were all pulled October 16.

TURNIPS—Test of Varieties (Non-Irrigated).

No. of Plot.	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	Kangaroo..............................	10	1648	360	48	3	600	110	
2	Hall's Westbury	10	1516	358	36	7	256	237	36
3	Hartley's Bronze..........................	10	788	346	28	5	1484	191	24
4	Halewood's Bronze Top	9	1536	325	36	6	144	202	24
5	Good Luck	9	216	303	36	3	1392	123	12
6	Mammoth Clyde	8	236	270	36	7	256	237	36
7	Magnum Bonum	7	1840	264		5	560	176	
8	Jumbo....................................	7	1444	257	24	3	1392	123	12
9	Perfection Swede..........................	7	520	242		5	824	180	24
10	Skirving's............................	6	1200	220		4	976	149	36
11	Carter's Elephant	6	408	206	48	5	164	169	24
12	Bangholm Selected	5	296	171	36	1	1828	63	48

EXPERIMENTS WITH MANGELS.

Ten varieties of mangels were sown on May 4, and again the same number on May 18, in rows 30 inches apart and 66 feet long on backsetting; the soil was a sandy loam. Both plantings were pulled October 16. The yield in each case was computed from the weight of roots obtained from two rows each 66 feet long.

MANGELS—Test of Varieties (Non-irrigated.)

Number.	Name of Variety.	Yield per Acre.							
		1st Plot.				2nd Plot.			
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Gate Post	13	1,984	446	24	8	896	281	36
2	Giant Yellow Globe	13	796	446	36	8	1,160	286	—
3	Selected Yellow Globe	13	136	435	36	6	1,860	231	—
4	Perfection Mammoth Long Red	12	24	400	24	6	1,200	220	—
5	Yellow Intermediate	11	1,760	396	—	8	1,556	292	36
6	Giant Intermediate	11	1,496	391	36	8	500	275	—
7	Crimson Champion	11	1,496	391	36	5	100	168	20
8	Half Sugar White	11	1,364	389	24	9	1,404	323	24
9	Mammoth Red Intermediate	10	1,912	365	12	6	1,728	228	48
10	Prize Mammoth Long Red	10	1,780	363	—	7	1,576	259	36

Average yield per acre: First sowing 12 tons, 275 lbs.; second sowing 7 tons, 1,398 lbs.

EXPERIMENTS WITH CARROTS.

Six varieties of carrots were sown on May 4 and the same number again on May 18, in rows 66 feet long 20 inches apart, on backsetting; the soil was a sandy loam. Both plantings were pulled October 16. The yield in each case was computed from the weight of roots obtained from two rows each 66 feet long.

CARROTS—Test of Varieties (Non-irrigated).

Number.	Name of Variety.	Yield per Acre.							
		1st Plot.				2nd Plot.			
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Giant White Vosges	10	1,186	353	6	7	1,405	256	44
2	Improved Short White	9	77	301	17	7	1,405	256	44
3	Ontario Champion	8	1,107	285	7	6	1,068	217	48
4	Mammoth White Intermediate	7	1,404	256	43	7	58	234	18
5	White Belgian	6	1,068	217	48	3	930	115	30
6	Half Long Chantenay	4	1,425	157	5	6	296	204	55

The average yield, first sowing, was 7 tons, 1,711 lbs. per acre; second sowing, was 6 tons, 860 lbs. per acre.

EXPERIMENTS WITH SUGAR BEETS.

Four varieties were planted on May 6 and the same varieties again on May 20, in rows 20 inches apart, in sandy loam that had been backset. Both plantings were pulled October 26. The yield in each case was computed from the weight of roots obtained from two rows each 66 feet long. Average specimens of roots from each variety were sent to the Chemist, Mr. Frank T. Shutt, and the per cent of sugar in juice and co-efficient of purity were obtained from the results of his analyses.

SUGAR BEETS—Test of Varieties (Non-irrigated).

Number.	Name of Variety.	Yield per Acre. 1st Plot. Tons.	Lbs.	Bush.	Lbs.	2nd Plot. Tons.	Lbs.	Bush.	Lbs.	Sugar Juice. p.c.	Co-efficient of Purity.
1	Klein Wanzleben (Seed from Raymond)	10	770	346	10	5	1,543	192	23	18·08	83·4
2	French Very Rich	9	1,602	326	42	4	1,801	163	21	15·86	86·2
3	Wanzleben	9	1,503	325	3	4	1,227	153	47	16·52	84·7
4	Vilmorin's Improved	9	454	307	36	4	1,581	159	41	17·80	86·2

Average yield per acre for the three varieties; 1st sowing 9 tons, 1,582 lbs.; 2nd sowing 5 tons, 13 lbs.

It is encouraging to the patrons of the Raymond factory to note that the crop from seed furnished by the Knight Sugar Company, in the above test, was superior to that from the other seeds, (which include another strain of the same variety), both in yield and sugar-content.

EXPERIMENTS WITH POTATOES.

The season was not very favourable for potatoes. The crop all through the district, including that on the Experimental Farm, was light.

Twenty-two varieties were planted May 19 on sandy loam that had been backset the previous season. The rows were 66 feet long and two and one-half feet apart. All the varieties were dug October 6. The yield in each case was computed from two rows each 66 feet long.

POTATOES—Test of Varieties (Non-irrigated).

Number.	Name of Variety.	Average Size.	Total Yield per Acre.		Yield per Acre of Sound.		Yield per Acre of Rotten.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Form and Colour.
			Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
1	Empire State	Large	138	36	138	36	None		107	48	30	48	Longwhite
2	Holborn Abundance	Medium	132	..	132	..	"		92	24	39	36	Round "
3	American Wonder	Large	127	36	127	36	"		96	48	30	48	Long "
4	Dreer's Standard	"	127	36	127	36	"		94	36	33	..	Oval "
5	Vermont Gold Coin	"	121	..	121	..	"		101	12	19	48	Round "
6	Carman No. 1	"	118	48	118	48	"		94	36	24	12	Flat "
7	Country Gentleman	"	118	48	118	48	"		74	48	44	.	Long pink
8	Morgan Seedling	"	117	42	117	42	"		75	54	41	48	" "
9	Rochester Rose	"	116	36	116	36	"		77	..	39	36	" "
10	State of Maine	"	116	36	116	36	"		96	48	19	48	Oval white
11	Canadian Beauty	"	116	36	116	36	"		77	..	39	36	Long pink
12	Everett	Medium	115	30	115	30	"		72	46	42	44	" "
13	Reeves' Rose	Large	114	24	114	24	"		77	..	37	24	" "
14	Burnaby Mammoth	"	114	24	114	24	"		61	36	52	48	" "
15	Uncle Sam	"	112	12	112	12	"		96	48	15	24	" "
16	Vick's Extra Early	"	110	..	110	..	"		77	..	33	..	Flat "
17	Late Puritan	"	107	48	107	48	"		63	48	44	..	Long pink
18	Early White Prize	Medium	103	24	103	24	"		57	12	46	12	Oval white
19	Dalmeny Beauty	"	100	6	100	6	"		53	54	46	12	" "
20	Money-Maker	Large	94	36	94	36	"		48	24	46	12	Round "
21	rish Cobbler	"	92	24	92	24	"		72	36	19	48	Flat "
22	Ashleaf Kidney	"	85	48	85	48	"		70	24	15	24	Oval "

Average yield 113 bushels 45 lbs. per acre.

FLAX.

A plot of seven-tenths of an acre was sown with flax at the rate of about 30 pounds per acre, on backsetting. The yield was low, being only 9 bushels per acre.

ALFALFA.

Four plots of alfalfa of one-fourth acre each were sown on June 9 and 10, with locally-grown seed, at the rate of 5, 10, 15 and 20 pounds of seed, respectively, per acre. Part of each of these plots was inoculated with soil from an old alfalfa field. An irregular piece containing a little over an acre joining these plots was sown at the same time, with the same kind of seed, at the rate of 12 pounds per acre. All of this plot was inoculated. A good stand was obtained. The plants on all the plots were clipped once during the summer, but, although the crop was thrifty, a great deal of growth was not made. No difference between the portion inoculated and that not inoculated could be noticed, but it is to be expected that the effect of this inoculation will be more apparent next season.

ALFALFA SOWN IN ROWS.

With the object in view of raising seed and also of ascertaining whether it would be possible to increase the yield on non-irrigated land by this means if an abnormally dry season were met with, a little over an acre was sown in drills 28 inches apart on June 10. The same kind of seed was used as in the previous experiment and the soil was all inoculated. During the summer the space between the rows was cultivated to kill weeds and also to stimulate the growth of the alfalfa. As would be expected, the crop made a much more vigorous growth than that made in the plots sown in the usual way. For a fuller discussion of the question of inoculation, see Part II.

CLOVERS.

Small plots of one-fiftieth acre each were sown with Red, Alsike and White clover. Good stands were obtained.

GRASSES.

On June 10, a half-acre each was sown with Western Rye Grass and with Brome Grass and a quarter acre with Timothy, at the rate of six pounds per acre in each case. A good stand of Timothy was obtained but the other two grasses were thin.

APPLE ORCHARDS.

Three orchards were set out with the trees placed 15 feet apart each way. The first contains cross-bred varieties and 54 were set out. The second contains seedlings of the cross-bred varieties and 66 were set out. The third consists of standard varieties and 110 were set out. The majority of these established themselves fairly well.

A windbreak was planted on the north, west and south sides of the block containing these three orchards. It consisted of a row of Caraganas two feet apart and four feet inside of these was planted a row of cottonwoods set four feet apart in the row. A space of thirty feet was left between the cottonwoods and the first row of apples.

RHUBARB.

Nineteen varieties of rhubarb were set out on one side of the orchard. For a list of these see under this heading in Part II.

PART II.—THE IRRIGATED FARM.

PREPARATION OF SOIL.

The preparation of the soil for this season's crops on the irrigated portion of the farm was the same as on the non-irrigated, except that the backsetting was done later in the previous season when the ground was somewhat dryer, so that, when the crops were sown in the spring, the soil was more loose and in not quite so good a condition as was the non-irrigated farm. The raw prairie was broken during May and June in 1907, and the backsetting was done in September and October of the same year.

WINTER WHEAT.

A field lot of 3½ acres of Kharkov was the only winter wheat sown on the irrigated farm. The rate of seed used per acre was thirty pounds. On account of the seed-bed not being in the best of condition, only a fair stand was obtained in the fall of 1907. In the early winter, some horses broke in and pastured the young plants off very closely, so, taken as a whole, the field did not have as favourable conditions as did the various field-lots of wheat on the non-irrigated farm. The field was irrigated once on July 10 and was cut August 3. The yield was 41 bu. and 5 lbs. per acre.

EXPERIMENTS WITH SPRING WHEAT.

Thirteen varieties of spring wheat were sown April 14 in 1/10 acre plots on sandy loam that had been backset. The seed was used at the rate of about one bushel and one peck per acre. The plots were irrigated once on July 11.

SPRING WHEAT—Test of Varieties (Irrigated).

Number.	Name of Variety.	Date of Ripening	Number of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Measured Bushel after Cleaning.
				Ins.		Ins.	Lbs.	Bush.	Lbs.	Lbs.
1	Chelsea	Aug. 15..	123	36	Medium..	3½	2,660	44	20	64
2	Percy A.	" 15..	123	36	Strong ...	3½	3,080	43	10	63¼
3	Pringle's Champlain	" 10..	118	36	"	3¼	3,010	43	10	63½
4	Marquis	" 10..	118	31	Medium..	3½	2,030	43	10	64
5	Preston	" 10..	118	34	Strong ...	3½	2,905	42	35	63
6	Hungarian White	" 10..	118	36	Medium..	3	3,500	42	..	62½
7	Huron	" 15..	123	32	Strong ...	3½	2,870	40	50	63
8	Bishop	" 8..	116	34	Medium..	3	3,010	38	30	64
9	Red Fern	" 10..	118	36	" ..	3½	3,220	37	20	63
10	Red Fife H	" 17..	125	36	Strong ...	3	2,695	34	25	62½
11	White Fife	" 17..	125	34	Medium..	3½	2,870	30	20	63
12	Stanley	" 17..	125	36	" ..	3½	2,345	22	45	61½
13	White Russian	" 18..	126	36	" ..	4	2,555	22	45	61

Average yield per acre 37 bushels 20 lbs.

FIELD LOT.

One acre of Red Fife was sown April 15 at the rate of one bushel and two pecks per acre The field was irrigated July 15 and cut August 22. The yield was 38 bush. and 20 lbs. per acre.

EXPERIMENTS WITH DIFFERENT AMOUNTS OF SEED PER ACRE.

The area of each plot was one-tenth acre and they were all sown with Red Fife wheat on April 20 and irrigated July 15.

Amount of Seed per Acre.	Weight of Straw per Acre.	Yield per Acre, Grain.	
Lbs.	Lbs.	Bush.	Lbs.
15	2,360	30	..
30	2,540	35	40
45	2,460	34	30
60	2,720	40	..
75	2,830	40	..
90	2,740	38	50
105	2,820	37	40
120	2,450	30	20

EXPERIMENTS WITH OATS.

TEST OF VARIETIES.

Twenty-four varieties of oats were sown on April 16 and 17 in 1/40 acre plots on sandy loam that had been backset. They were irrigated July 11.

OATS—Test of Varieties (Irrigated).

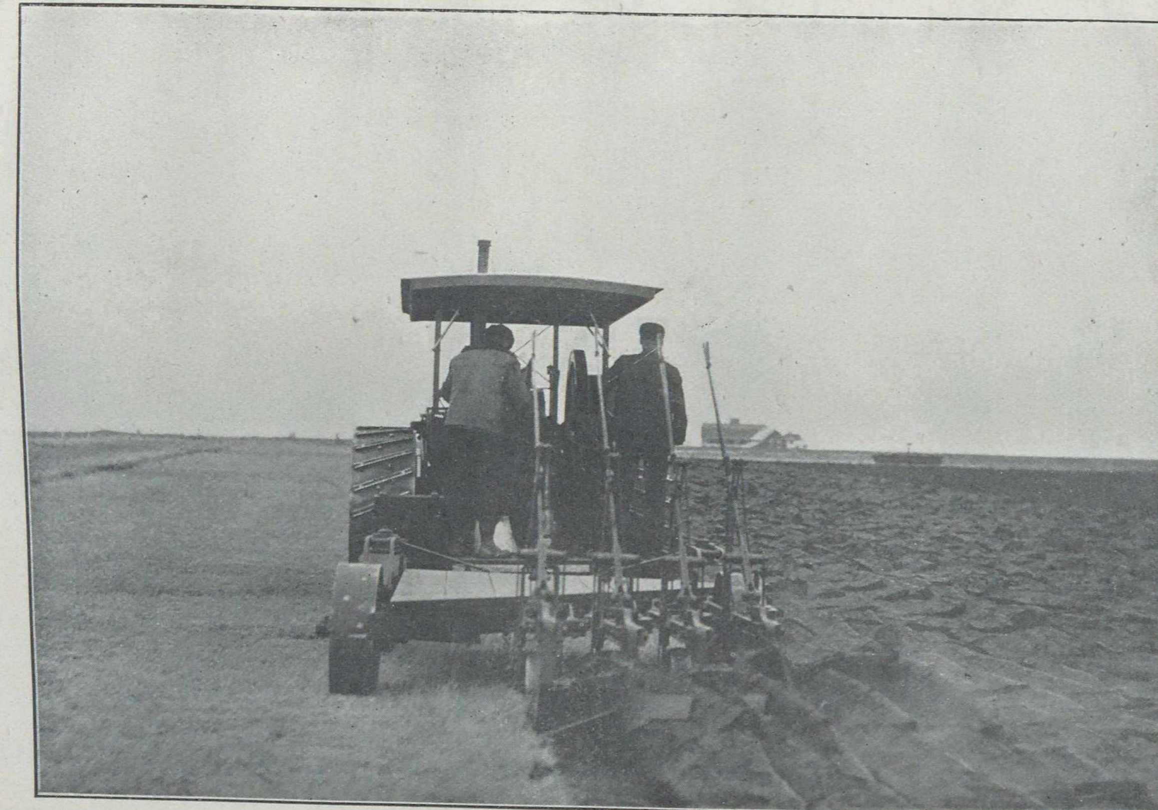
Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including head.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after Cleaning.
				Ins.		Ins.	Lbs.	Bush.	Lbs.	Lbs.
1	Improved American	Aug. 8	114	38	Strong	8	3,010	88	18	37¾
2	Banner	" 10	116	40	"	7	3,010	88	18	39½
3	Irish Victor	" 8	114	38	"	8	2,450	82	12	39
4	Abundance	" 7	113	41	"	8	3,255	81	11	36
5	Danish Island	" 15	121	38	"	8	3,220	80	10	39
6	Improved Ligowo	" 8	114	37	Medium	7	2,310	78	8	40½
7	Goldfinder	" 18	124	34	"	7½	2,835	77	7	39¼
8	Joanette	" 20	125	30	Weak	7	2,730	74	4	38½
9	American Triumph	" 8	114	37	Strong	8	2,625	71	1	33
10	White Giant	" 10	115	36	"	8	2,590	70	0	38
11	Pioneer	" 17	122	35	Medium	7	2,730	67	32	39
12	Kendal White	" 14	119	38	Strong	7	2,100	64	24	40
13	Twentieth Century	" 8	113	38	"	8	2,660	64	24	40½
14	Golden Beauty	" 10	116	36	"	7	2,450	63	28	39½
15	Milford White	" 14	119	40	"	8	3,325	62	27	39
16	Golden Giant	" 21	127	38	"	9	2,380	61	26	31½
17	Wide Awake	" 15	120	38	Medium	7	1,890	59	24	41
18	Virginia White	" 8	113	38	Strong	8	2,450	58	23	39½
19	Lincoln	" 14	119	38	"	8	2,240	57	22	39½
20	Storm King	" 15	120	42	Medium	8	3,080	55	20	36
21	Siberian	" 18	123	38	"	8	1,190	47	12	38½
22	Swedish Select	" 15	120	38	"	7	2,170	45	10	41¼
23	Thousand Dollar	" 8	113	36	"	8	1,680	43	8	40
24	Tartar King	" 7	112	32	Weak	7	2,100	33	28	41½

Average yield per acre 65 bush.

Field lots of oats sown on backsetting and irrigated once.

Variety.	Area.	Date of Seeding.	Amount of Seed used per Acre.	Date Irrigated.	Yield per Acre.	
	Acres.		Lbs.		Bush.	Lbs.
Banner	1·8	April 18	70	July 16	81	19
"	5·2	" 18	80	" 16	83	15
Tartar King	1·1	" 20	80	" 15	75	3

5904—p. 384.



Gasoline Engine at work on the Lethbridge Experimental Farm, pulling four 14-inch ploughs in native prairie soil.

EXPERIMENTS WITH DIFFERENT AMOUNTS OF SEED PER ACRE.

The area of each plot was one-twentieth acre and they were all sown with Tartar King oats on April 22 and 23 and irrigated July 14.

Variety.	Date of Seeding.	Date Irrigated.	Amount of Seed per Acre.	Yield of Straw per Acre.	Yield of Grain per Acre.	
			Lbs.	Lbs.	Bush.	Lbs.
Tartar King....	April 22....	July 14....	15	2,720	60	20
"	" 22....	" 14....	30	2,660	51	26
"	" 22....	" 14....	45	2,420	61	26
"	" 22....	" 14....	60	2,260	69	14
"	" 23....	" 14....	75	2,960	74	24
"	" 23....	" 14....	90	2,440	64	4
"	" 23....	" 14....	105	2,200	68	8
"	" 23....	" 14....	120	2,340	66	16

EXPERIMENTS WITH BARLEY.

TEST OF VARIETIES.

Thirteen varieties of six-rowed and eleven varieties of two-rowed were sown April 21, at the rate of about 1½ bushels per acre, in one-seventieth acre plots on backsetting. They were irrigated July 11. It may be stated that the irrigation of the uniform test-plots of wheat and oats as well as of barley was unavoidably delayed a few days, on account of a break in the Irrigation Company's main ditch, caused by the excessive floods in June. In the case of the barley plots, the effect of the delay is quite apparent. The two-rowed varieties, being later, were not so far advanced on July 11, when they were all irrigated, as were the six-rowed, and, therefore, had not suffered so much from drought. This, doubtless, is the reason that they yielded better than did the six-rowed varieties.

SIX-ROWED BARLEY—Test of Varieties (Irrigated).

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.
				In.		In.	Lbs.	Bush.	Lbs.	Lbs.
1	Claude	Aug. 5....	106	30	Stiff.......	2¼	2,450	59	38	48
2	Mansfield	July 29....	99	32	Medium....	2¼	2,520	49	28	52
3	Blue Long Head	Aug. 7....	108	26	Stiff......	3½	1,890	45	10	45
4	Yale	" 1....	102	30	"	2½	2,520	45	10	52½
5	Odessa	" 1....	102	32	Medium. ...	2¾	1,995	44	23	50½
6	Empire	" 3....	104	30	" ...	2¾	2,100	37	44	51
7	Mensury	July 29....	99	34	" ...	3	2,135	37	9	48
8	Nugent	" 29....	99	32	" ...	3	2,030	36	22	50½
9	Oderbruch	Aug. 1....	102	32	" ...	3½	1,820	36	22	51½
10	Albert	July 29....	99	30	" ...	3	2,800	30	30	46
11	Stella	" 29....	99	32	" ...	3	2,030	30	30	51
12	Champion	" 29....	99	34	Stiff..	3	1,330	27	34	48½
13	Trooper	29....	99	32	Medium....	2½	1,680	24	38	49

Average yield 38 bushels 44 lbs.

TWO-ROWED BARLEY—Test of Varieties (Irrigated).

	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after Cleaning.
				In.		In.	Lbs.	Bush.	Lbs.	Lbs.
1	Standwell........	Aug. 8...	109	30	Medium..	3	3,360	70	0	53
2	Sidney....	" 6...	107	30	" ..	$2\frac{3}{4}$	2,450	62	34	55
3	Swedish Chevalier	" 6...	107	26	" ..	4	3,360	61	12	$54\frac{1}{2}$
4	Danish Chevalier.	" 3...	104	30	" ..	4	3,080	45	10	$53\frac{1}{2}$
5	Canadian Thorpe.	" 3...	104	26	" ..	$2\frac{3}{4}$	2,170	43	36	51
6	Gordon	" 1...	102	32	" ..	$2\frac{1}{2}$	2,730	42	14	$53\frac{1}{2}$
7	French Chevalier..	" 3...	104	30	" ..	3	3,045	40	5	$53\frac{1}{2}$
8	Clifford	" 3...	104	32	" ..	$3\frac{1}{2}$	2,870	36	22	52
9	Invincible	" 6...	107	28	" ..	3	3,115	35	11	55
10	Jarvis...........	" 1...	102	36	" ..	4	3,395	32	39	54
11	Beaver...........	" 8...	109	32	" ..	$3\frac{1}{2}$	1,855	28	21	49

Average yield, 45 bush. 15 lbs.

FIELD LOT.

One and a half acres of Mensury barley were sown on May 29, at the rate of about $1\frac{1}{2}$ bushels per acre. The field was irrigated on July 18. It yielded at the rate of 30 bush. and 7 lbs. per acre.

EXPERIMENT WITH DIFFERENT AMOUNTS OF SEED PER ACRE.

The area of each plot was one-twentieth acre, and they were all sown with Mensury barley April 22, and irrigated July 14.

Amount of Seed per Acre.	Yield per Acre, Straw.	Yield per Acre, Grain.	
Lbs.	Lbs.	Bush.	Lbs.
15..	1,580	32	4
30..	2,380	35	20
45..	1,800	37	24
60..	2,200	39	28
75..	2,800	37	4
90..	2,540	39	8
105.......................................	2,140	34	28
120.......................................	2,900	35	0

EXPERIMENTS WITH PEAS.

TEST OF VARIETIES.

As on the non-irrigated farm, the peas did not do as well as expected. The average yield per acre of the eighteen varieties grown on irrigated land is practically the same as that of the seventeen varieties tested on the non-irrigated farm.

The eighteen varieties were sown April 14, on sandy loam that had been backset, at the rate of about two bushels of seed per acre, some varieties a little more, depending on the size of the grain. The size of the plots was one-seventieth acre. They were irrigated July 11.

PEAS—Test of Varieties (Irrigated).

	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Weight of Straw.	Yield per Acre.		Weight per Measured Bushel after Cleaning.
				Lbs.	Bush.	Lbs.	Lbs.
1	Victoria	Aug 17..	125	3,080	25	40	65
2	Mackay	" 15..	123	2,782	23	37	64¼
3	Paragon	" 10..	118	2,852	22	27	65
4	Archer	" 17..	125	2,310	21	0	65
5	Black-eye Marrowfat	" 20..	128	3,062	20	8	64¼
6	Gregory	" 20..	128	2,712	20	8	64¾
7	English Grey	" 10..	118	2,012	20	8	63½
8	Arthur	" 10..	118	1,680	19	50	66¼
9	White Marrowfat	" 18..	126	2,730	19	50	64½
10	Early Britain	" 10..	118	2,557	19	24	64
11	Prince	" 15..	123	2,082	18	57	64½
12	Golden Vine	" 15..	123	1,802	17	48	65
13	Picton	" 15..	123	2,170	17	30	65½
14	Agnes	" 15..	123	2,187	17	12	66
15	Wisconsin Blue	" 15..	123	2,537	17	12	66
16	Prussian Blue	" 10..	118	1,942	15	28	65½
17	Daniel O'Rourke	" 15..	123	3,027	14	53	64
18	Chancellor	" 10..	118	2,012	14	18	64¼

Average yield 19 bush. 12 lbs. per acre.

RYE.

A small plot of spring rye was sown on April 17, and was irrigated July 11. It grew about 4 feet high, was ripe August 20, and yielded at the rate of 16 bush. and 14 lbs. per acre.

EXPERIMENTS WITH INDIAN CORN.

TEST OF VARIETIES.

The object in view in growing this corn was to learn what varieties will produce the most green fodder. Fourteen varieties were planted May 21, on sandy loam that had been backset. Two rows of each variety were planted in hills with 3 feet between rows, and another two rows in drills, with the seed a few inches apart in the drill. The crop was irrigated July 22, August 1 and 10. All varieties were cut September 17. The yield in each case was computed from two rows, each 66 feet long, the corn having been weighed as it was cut.

INDIAN CORN—Test of Varieties (Irrigated).

Number.	Name of Variety.	Height.	Condition When Cut.	Weight per acre grown in rows.		Weight per acre grown in hills.	
		Inches.		Tons.	Lbs.	Tons.	Lbs.
1	Pride of the North	70—78	No ears	14	160	13	400
2	Mammoth Cuban	66	Early milk	13	1,940	12	1,960
3	Angel of Midnight	60	Barely in milk	12	1,960	8	500
4	Chanpion White Pearl	66—72	No ears	12	1,300	9	1,910
5	Compton's Early	60—66	Early milk	12	200	10	350
6	Eureka	70—76	No ears	11	1,870	10	1,010
7	North Dakota White	64	Barely in milk	11	1,210	9	40
8	Early Mastodon	72—78	"	11	880	9	260
9	Longfellow	66	"	10	1,780	10	350
10	Superior Fodder	66—72	No ears	10	1,560	7	1,510
11	Salzer's All Gold	64—72	"	9	1,360	7	740
12	Selected Leaming	72	Early milk	9	260	8	1,160
13	White Cap Yellow Dent	66—72	Barely in milk	9	40	6	1,200
14	Wood's Northern Dent	66—72	No ears	8	610	8	830

Average yield of 14 varieties in rows; 11 tons 652 lbs.
" " hills; 9 tons 872 lbs. per acre.

TURNIPS.

Twelve varieties of turnips were sown, but they were so badly injured by the turnip-fly soon after they came up, that before their injury was noticed, the crop was practically destroyed.

EXPERIMENTS WITH MANGELS.

TEST OF VARIETIES.

Ten varieties were sown on May 4, and again on May 18, in rows 30 inches apart on backsetting. The crop was irrigated four times: July 22, August 1, 10 and 29. Both plantings were pulled on October 10. The yield in each case was computed from the weight of roots from two rows, each 66 feet long.

MANGELS—Test of Varieties (Irrigated).

Number.	Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.	
		Tons.	Lbs.	Tons.	Lbs.
1	Gate Post	19	1,864	13	532
2	Giant Yellow Globe	18	828	13	400
3	Perfection Mammoth Long Red	17	1,772	8	368
4	Giant Yellow Intermediate	17	716	12	1,202
5	Half Sugar White	17	56	6	276
6	Yellow Intermediate	15	360	11	1,100
7	Crimson Champion	14	248	7	1,444
8	Prize Mammoth Long Red	13	928	8	1,556
9	Mammoth Red Intermediate	12	1,344	7	652
10	Selected Yellow Globe	11	836	7	1,972

Average yield first sowing, 15 tons 1,495 lbs.
" second sowing, 9 tons 1,350 lbs. per acre.

EXPERIMENTS WITH CARROTS.

TEST OF VARIETIES.

Six varieties were sown on May 4 and the same again on May 18, in rows 20 inches apart; on backsetting. The crop was irrigated four times; July 22, August 1, 10 and 29. Both plantings were pulled October 12. The yield in each case was computed from the weight of roots from two rows each 66 feet long.

Carrots—Test of Varieties (Irrigated).

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	Ontario Champion	16	868	547	48	11	295	371	35
2	Giant White Vosges	15	1,145	519	5	11	1,265	387	45
3	Improved Short White	15	947	515	47	11	1,463	391	3
4	Mammoth White Intermediate	14	1,997	499	57	11	641	377	21
5	Half Long Chantenay	12	1,740	429	0	10	592	343	12
6	White Belgian	12	790	413	10	6	1,088	218	8

The average yield first sowing was 14 tons 1,247 lbs. per acre.
" second sowing was 10 tons 890 lbs. per acre.

EXPERIMENTS WITH SUGAR BEETS.

TEST OF VARIETIES.

Four varieties were planted May 6 and again May 20, in rows 20 inches apart, in sandy loam that had been backset. They were irrigated three times on July 22, August 1 and 10. Both plantings were pulled October 13. The yield in each case was computed from the weight of roots obtained from two rows, each 66 feet long. As was done on the non-irrigated farm, average specimens of roots from each variety were sent to the Chemist, Mr. Frank T. Shutt, and the percentage of sugar in juice and the co-efficient of purity were obtained from the results of his analyses.

Sugar Beets—Test of Varieties (Irrigated).

Number.	Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.		Sugar in Juice.	Co-efficient of Purity.
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.	p. c.	p. c.
1	French Very Rich	14	1,601	493	21	5	1,920	198	40	15·97	87·6
2	Klein Wanzleben (seed from Raymond)	12	1,740	429	..	9	1,503	325	3	18·13	89·9
3	Wanzleben	12	790	413	10	10	1,721	362	..	15·60	82·0
4	Vilmorin's Improved	10	374	339	34	9	454	307	36	16·69	86·7

Average yield per acre of the four varieties. {First sowing: 12 tons 1,126 lbs.
{Second " 8 tons 1,899 lbs. per acre.

EXPERIMENTS WITH POTATOES.

TESTS OF VARIETIES.

Twenty-five varieties of potatoes were planted on May 19 on sandy loam, that had been backset the previous season. The rows were two and one-half feet apart. They were irrigated three times on July 22, August 1 and 10. They were all dug October 9. The yield was computed in each case from the weight of potatoes obtained from two rows each 66 feet long.

POTATOES—Test of Varieties (Irrigated).

Number.	Name of Variety.	Average Size.	Total Yield per Acre.		Yield per Acre, Marketable.		Yield per Acre, Unmarketable.		Form and Colour
			Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
1	Early Manistee	Very large	453	12	426	48	26	24	Flat, pink.
2	Holborn Abundance	Medium	275	..	242	..	33	..	Round, white.
3	Rochester Rose	Large	275	..	253	..	22	..	Long, pink.
4	Money Maker	"	270	36	257	24	13	12	Round, white.
5	Reeve's Rose	"	268	24	248	36	19	48	Long, pink.
6	American Wonder	"	264	..	244	12	19	48	Long, white.
7	Carman No. 1	"	264	..	253	..	11	..	Flat, white.
8	Late Puritan	"	259	36	237	36	22	..	Long, pink.
9	Morgan Seedling	"	257	24	237	36	19	48	" "
10	Country Gentleman	"	255	12	231	..	24	12	" "
11	Ashleaf Kidney	"	255	12	246	24	8	48	Oval, white.
12	State of Maine	"	250	48	242	..	8	48	" "
13	Twentieth Century	"	250	48	231	..	19	48	Flat, white.
14	Burnaby Mammoth	"	242	..	224	24	17	36	Long, pink.
15	Uncle Sam	"	235	24	228	48	6	36	" "
16	Irish Cobbler	"	235	24	217	48	17	36	Flat, white.
17	Dreer's Standard	"	226	36	216	9	10	27	Oval, white.
18	Canadian Beauty	"	226	36	209	..	17	36	Long, pink.
19	Vermont Gold Coin	"	222	12	211	12	11	..	Round, white.
20	Vick's Extra Early	"	217	48	202	24	15	24	Flat, white.
21	Early White Prize	Medium	213	24	189	12	24	12	Oval, white.
22	Everett	"	208	28	184	16	24	12	Long, pink.
23	Dooley	Large	204	36	195	48	8	48	Round, white.
24	Empire State	"	202	24	192	36	19	48	Long, white.
25	Dalmeny Beauty	Medium	160	36	101	12	59	24	Oval, white.

Average yield for the 25 varieties, 7 tons 867 lbs., or 247 bushels 47 lbs. per acre.
There was no rot in any of the varieties.

FORAGE CROPS.

ALFALFA.

On account of the land being so new, it was thought best not to plant a very large area of alfalfa, for this crop usually thrives better on older land. Consequently only about five acres were sown. The ideal preparation of the soil for alfalfa is to summer fallow a field on which at least one or two crops of grain have been raised. The seed should be sown in May or early in June, without a nurse or cover crop.

The alfalfa plots were all irrigated on August 4 and 5 and again on October 8 and 9 so that the ground might be thoroughly wet for the winter and to avoid the necessity of having to irrigate before the first cutting was made in the spring.

INOCULATION.

It has been found in this province that to make alfalfa thrive it is necessary for the land on which it is sown to be inoculated with the germs of certain bacteria that live on the roots of the plant. The simplest way to do this is to take some soil from an old alfalfa field and scatter it over the surface of the land to be sown, at the rate of 100 or 200 pounds per acre.

This is worked into the soil as the seed bed is being prepared. Nearly all of the ground on which the alfalfa was sown was inoculated this way but some was left untreated. All of the plots sown came up well and a good uniform stand was obtained. The plants were clipped once with a mowing machine but they had not made sufficient growth to make it worth while to rake up what was cut. The second growth was 6 to 10 inches high at time of frost.

No difference could be noticed between that which was inoculated and that which was not till about September, when the latter began to appear less thrifty and did not make within two to four inches as much growth. The difference in the colour of the foliage was particularly striking.

A small plot was sown with seed that had been treated with a culture furnished by the Provincial Department of Agriculture, Edmonton, but there was no noticeable effect on the growth resulting from this treatment.

EXPERIMENTS WITH DIFFERENT AMOUNTS OF SEED.

Six plots of one-fourth acre each were sown at the following rates of seed; 5, 10, 15, 20, 25 and 30 pounds per acre. A good stand was obtained on all of them.

DIFFERENT KINDS OF SEED.

Small plots of one-fiftieth acre each were sown with the following kinds of alfalfa seed; home grown seed, taken from a field that had itself been grown from locally threshed seed, so that it will be starting the third generation of plants grown in the district, Turkestan seed supplied from the Central Farm, and seed bought on the market under the name of Turkestan.

MIXTURE OF ALFALFA AND GRASSES.

Plots of one-quarter acre each were sown with mixtures of Alfalfa and Brome grass, Alfalfa and Timothy, Alfalfa and Western Rye grass and Alfalfa and a mixture of all three grasses. A good stand of alfalfa was obtained in each case but the grasses were very thin. These were all irrigated along with the other plots of alfalfa.

CLOVERS.

Small plots of one-fiftieth acre were sown with Red, Alsike and White clover and a good stand was obtained on all three plots.

GRASSES.

A quarter of an acre of timothy and a half-acre each of Brome grass and Western Rye grass were sown. The seed in each case was sown at the rate of 6 pounds per acre. A rather poor stand was obtained, as germination was feeble owing to lack of showers after the seeding was done. Half of these plots were top-dressed with some very coarse barn-yard manure in November. These plots were irrigated at the same time that the alfalfa plots were.

HAY.

About thirty loads of native hay were cut on the farm. In addition to this, a small field was sown with a mixture of wheat and peas and was cut green for feed.

TREES AND SHRUBS.

A strip two rods wide just inside the boundary fence on all four sides of the farm was broken and backset in 1907 preparatory to setting out three rows of trees. The two outside rows were planted in the spring of 1908, with various arrangements of cottonwood, elm, ash, Manitoba maples, willows and evergreen trees. The inner row is to be set later with smaller trees and shrubs of various kinds. A large supply of trees and shrubs were received from the Central Farm and these were set in the nursery, to be available for transplanting later.

As a whole the material in the nursery, set out in the spring of 1907, wintered in a very satisfactory manner.

APPLE ORCHARDS.

As on the non-irrigated farm three orchards were set out, the trees being placed 15 feet apart each way. The first consisted of cross-bred varieties of apple and 51 were set out. The second consisted of seedlings of the cross-breds and 63 were set out. The third consisted of standard varieties and 48 were set out. Most of these established themselves fairly well.

STRAWBERRIES.

Forty-eight varieties of strawberries were obtained in the spring and set out in rows 3 feet apart. Fifty plants each were set out in double rows 50 feet long, with the exception of ten varieties where only twenty-five plants each were received. Most of the varieties were shipped from Ontario by mail and some of them were in poor condition when they arrived, so that a good stand was not obtained in all cases, in fact in a few instances all the plants died. But the plants that established themselves sent out runners which will be used in the spring to fill in the blank places in the rows. The following is a list of the varieties of which there are some plants living.

Tennessee Prolific,
Buster,
Warfield,
Haverland,
Early Beauty,
Senator Dunlap,
William Belt,
Aroma,
Ruby,
Carrie,
Parson's Beauty,
Bubach,
Uncle Jim,
Irene,
Gandy,
Staples,
World's Wonder,
Nettie,
Van Deman,
Aug Luther

Glen Mary,
Williams,
Ridgeway,
Bismark,
Steven's Late Champion,
Senator Dunlap (from locally grown plants),
William Belt (from locally grown plants),
Splendid,
Beder Wood,
Abingdon,
Fountain,
Brandywine,
Clyde,
3 W's,
Wild Native,
Pocomoke,
Chipman,
Elba,
King Edward,
Minute Man,

VEGETABLES.

A fairly large assortment of vegetables were planted and the results as a whole were fair, but on account of the newness of the land some kinds did not do as well as they otherwise would.

All the hardier varieties of vegetables tested did well, such as lettuce, radish, spinach, cabbage, cauliflower, turnips, beets, carrots, parsnips, peas, &c., &c.

The Squaw corn produced a good crop and ripened seed. Several of the earlier varieties of sweet corn produced a good supply of roasting ears.

But two varieties of tomatoes were tried. These were Spark's Earliana and the same variety from a strain of seed selected at the Central Experimental Farm. The latter ripened a few tomatoes.

English Vegetable Marrow was ready for use August 20, and was quite prolific.

Cucumber—McKenzie's Prolific was ready for use August 20 and was a good bearer.

Several Golden squash and a few Hubbard squash were matured.

RHUBARB.

Roots of the following varieties of rhubarb were supplied from the Brandon Experimental Farm in the fall of 1907, and were set out in the spring of 1908:—

Early Crimson.
Brabant's Colossal.
Victoria.
Tottle's Improved.
Strawberry.
Royal Albert.
Giant.
Marshall's Linnaeus.
General Taylor.
Scarlet Nonpareil.
Queen.
Magnum Bonum.
Prince Albert.
Paragon.
Tobolsk.
Sangster's Prince of Wales.
Early Prince.
Early Scarlet.
Excelsior.

FLOWER GARDEN—ANNUALS.

Several varieties were started in the hot-bed, but those sown in the open gave more satisfactory results on the whole, although they were somewhat later in coming into bloom. The showing made by them in the latter part of the summer was good and they were admired greatly by visitors. The outside sowing was made on May 28 and 29. The following is a list of the flowers planted:—

Abronia umbellata.
Antirrhinum.
Balsam.
Calendula.
Clarkia.
Eschscholtzia californica.
Nasturtium.
Salpiglossis.
Scabious Dwarf mixed.
Sweet Sultan.
Ageratum.
Asters.
Brachycome.
Chrysanthemum coronarium.
Dianthus.
Godetia.
Poppy.
Scabious Major mixed.
Stocks.
Tagetas.

MEASUREMENT OF IRRIGATION WATER.

To ascertain the exact amount of water used in irrigating the farm, a box two feet deep was placed in the lateral canal that supplies water to the farm. A Lalli Water Register was purchased and installed. An attempt was made to keep a continuous record of the depth of water passing over the box at all times during the summer.

There were, unfortunately, numerous breaks in this record, one of the principal causes being that the clock movement was not reliable. On account of these breaks, it was found that it was impossible to compute the quantity of water used with any degree of accuracy. This was certainly unfortunate, for information along these lines will be of value to the users of water in the irrigated districts of the province.

A Friez Water Register, which is very highly spoken of by engineers and irrigation investigators in the Western States, has been purchased, so that it is hoped our measurements of the water for the coming season will be more satisfactory. The Lallie instrument will be thoroughly gone over and put in good working condition. Two registers are required, as the water for the Farm is supplied by two laterals from the company's ditch, on account of the railroad cutting the irrigated farm into two portions.

HORSES.

We have eight work horses weighing about 1,400 pounds apiece. These are common grade stock but they are young and serviceable. In addition to the above, a team of lighter horses are kept for driving. This team is not idle a great deal, for our being nearly four miles from the post office, in addition to other necessary driving, gives them quite a little to do.

Two of the mares were with foal when the horses were purchased in 1907, but as they had been bred on the open range, the sires of the two colts were unknown. The colts are now two years old but they are of inferior quality. During the summer and fall of 1907, the horses were allowed to run on the range on Sundays and another of the mares got with foal, dropping a filly in August.

CATTLE.

Two grade cows are kept to supply milk to the families living on the farm. A heifer calf of one of these cows has been raised and is now nearly a year old.

TRACTION ENGINE.

A twenty horse International gasoline traction engine was purchased in the fall, and in March a Cockshutt engine gang-plough was obtained. The working of the machine is very satisfactory.

MEETINGS.

During the year I addressed Institute meetings at Gleichen and Taber, attended seed fairs where I acted as one of the judges, also speaking at the meetings on the conclusion of the judging at the following places: Irvine, Cardston, Macleod, Nanton, Gleichen and also at Gainsborough and Cardiff in Saskatchewan. I acted as one of the judges at the Provincial Seed Fair at Calgary.

On August 10 to 11, I was in attendance at the annual convention of the Western Canada Irrigation Association at Vernon, British Columbia. On September 11 and 12 I travelled with a delegation of Scotch farmers as they were passing through this portion of the province. On October 6, I attended a meeting in Winnipeg of the Grain Standards Board of which I am a member for Alberta.

I had the pleasure of being present at the conference of those interested in the westward shipment of grain, held at Calgary, February 3 and 4. I also attended the conference of Institute Workers of Alberta held at Calgary in January. On February 23, 24 and 25, I was in attendance as a delegate at the Trans-Missouri Dry-Farming Congress held at Cheyenne, Wyoming, where I delivered an address.

DISTRIBUTION OF SAMPLES.

The samples of wheat contained 5 pounds and those of oats and barley contained 4 pounds. There were in all 104 of these sent out to applicants. There were 28 samples of potatoes and 178 small packets of tree seedlings sent out.

SALE OF GRAIN.

In disposing of the surplus of Kharkov and Turkey Red winter wheat, a rule was made limiting each applicant to not more than four bushels. This is sufficient to sow from four to seven or eight acres and so provide the recipient with ample seed for the following year. Up to March 31, 119 of these four bushel lots together with 10 two bushel lots have been sold.

CORRESPONDENCE.

For the twelve months ending March 31, 1909, there were 1,250 letters received and 1,239 letters were sent out, not including circulars.

METEOROLOGICAL REPORT.

Months.	Highest Temperature.		Lowest Temperature.		Total Precipitation.	Bright Sunshine.
1908	Day.	Degrees.	Day.	Degrees.	Inches.	Hours.
April	19	81·1	1	0·0	0·688	202·4
May	7	85·4	1	30·0	2·595	184·5
June	25	86·2	22	38·9	7·009	253·8
July	30	91·6	6	33·7	0·365	360·1
August	1	91·9	27	35·6	0·904	322·9
September	6	91 0	26	19·2	0·575	217·6
October	8	76·6	28	10·5	0·572	149·8
November	7	73·5	11	—3 8	....	122·2
December	8	67·2	31	—28·3	0·36	143·1
1909						
January	21	48·8		—45·4	0·3	120·0
February	3	56·2	12	—28·5	0·2	122·9
March	31	65·5	7	3·5	0·5	194·2
Totals	....	....	....	....	14·068	2393·5

In the above, 10 inches of snow is computed as one inch of precipitation.

I have the honour to be, sir,

Your obedient servant,

W. H. FAIRFIELD,

Superintendent.

EXPERIMENTAL FARM FOR BRITISH COLUMBIA.

REPORT OF THOMAS A. SHARPE, SUPERINTENDENT.

AGASSIZ, B.C., March 31, 1909.

To DR. WM. SAUNDERS, C.M.G.,
Director of Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to present herewith my report for the year ending March 31, 1909.

The winter of 1907-08 was very mild, with no severe storms, but the spring opened in April with cold winds from the north, northeast and northwest, accompanied by showers of rain which kept the ground cold and wet, and the growth was very slow. Many fields of mangels had to be sown twice, and in some instances, three times.

The cold wet weather prevented the pollination of fruit blossoms, and as a consequence, most varieties of fruits were a light crop. The wet spring favoured the meadows and pastures, and hay was a good crop on most farms. In June, the weather turned dry, and from June 1 until September 30, the precipitation was the lightest for some years, and for the whole year, from April 1, 1908, to March 31, 1909, the precipitation has been the lightest we have had since records have been kept at this station.

Corn did not make much growth until July and was so late that even the earliest of the Flint varieties failed to ripen.

The dry summer favoured the curing of the clover crop, which is often very difficult to save in ordinary seasons, and what fruit was raised was, owing to the bright warm summer and autumn, very fine in quality and appearance.

The yield of grain and roots was about the average and of superior quality, and the weather very favourable for harvesting. November was as usual wet, the rainfall amounting to very nearly seven and a half inches, but the lowest temperature recorded was 32 on the 27th. December was mild with more than the average sunshine, and, for the month, a very light rainfall. January began mild, but a cold rainstorm set in and the weather turned colder, the rain freezing on the limbs of the trees, until they were so weighted that many trees were split, had their limbs broken off, or the whole tree overturned. The thermometer registered five degrees below zero on the 8th, which was the lowest record here since 1894, and the only time we have had zero since that date.

Fortunately the ice storm only extended about eight miles east and a like distance west of this place and consequently the damage done to orchards was not extensive. The rain froze on the ground, covering it with a coat of smooth ice several inches thick, and fall wheat and clover suffered. February and March were mild and pleasant, but there is not much growth yet either in meadows or fruit trees.

CLEARING.

A very little clearing has been done, and no ditching this year.

CATTLE.

Since my last report, all of the cattle have been tested with tuberculin by Dr. Tolmie, the Government Veterinary Inspector, and I am pleased to report that there were no reactions. Several young bulls have been sold for breeding purposes, and a number of animals have been fattened and sold for beef. There are still on hand one stock bull, one young bull, sixteen females and two steers, all in good health.

SHEEP.

The flock of sheep consists of one ram, seventeen ewes and one lamb, at this date. During the year several lambs were killed by dogs or wild animals, several rams were sold to head flocks, and several to the butcher. All of our flock are registered Dorset Horned.

PIGS.

The stock of pigs at present on the Farm consists of one very fine Berkshire sow received from the Central Experimental Farm herd, and twenty-seven pure bred Yorkshires. Since my last report, a number of both breeds and both sexes have been sold as breeders, and in every instance so far as heard from, the animals sold have been satisfactory to the purchaser.

HORSES.

The stock of horses remains the same as at my last report, viz.: three teams of young work horses, and one of those horses originally bought at the beginning of the Farm work. This horse is still useful as a cart horse on the farm. We have also one general purpose mare.

BEES.

Last season was not a very good one for bees, but thirteen swarms went into the winter with a fair supply of stores, eleven have wintered, and at this date are busy on sunshiny days.

NUT PLANTATION.

The nut trees are all making a strong growth, and many of them fruited this year. The English Walnut is quite hardy here, and our trees are producing a few nuts each year. A few trees of the Franquette variety have been planted and are doing very well.

The Black Walnut grows very well, and the trees are commencing to bear. These nuts are not of much value commercially, but once the tree gets well established, it is pretty well able to take care of itself, and many rocky hillsides could be turned to future profit, if planted with any or all of the different varieties of walnut.

The Japanese Walnut is a strong grower, with luxuriant foliage, and makes a very fine shade tree It begins to bear when quite young and bears regularly and very freely, the nuts being borne in clusters, ranging from five to as many as sixteen. This nut has a moderately hard shell, but the kernel is easily removed, is very sweet and richly flavoured, and the tree is quite hardy.

The nuts from our trees have been distributed to farmers and planters throughout the province, and reports are beginning to come in of trees making strong, healthy growth. They will make very handsome shade trees, as well as produce abundant crops of nuts.

The different varieties of chestnuts have grown well, but the tree blooms so late in the season that the nuts do not always come to maturity. The tree, however, makes a fine spreading shade tree, with a wealth of handsome foliage.

The butternut grows into a thrifty spreading tree, but, up to the present, our trees, although they have a spread of from 25 to 30 feet, have not produced more than a cluster or two of nuts each. Perhaps, with greater age, they may become more productive.

The shell-bark hickory makes a fine growth, and two of our trees have produced nuts.

The Pecan trees make a fair annual growth, but have not yet borne fruit.

Filberts.—The plantation of Filberts has made a splendid growth, and each variety produces a few clusters of nuts each year, but the only really productive sort in a collection of over forty named varieties is Pearson's Early Red. The bushes of this variety do not grow as large as many of the others, but they fruit freely every year. The nuts range from five to ten in a cluster; this nut is small, but very fine in flavour. It is almost impossible to get ripened nuts, owing to the blue jays which come in flocks and carry off the fruit.

MOUNTAIN ORCHARDS.

These orchards bore a heavy crop of apples and a fair crop of pears, plums and peaches on the highest bench, and a fair crop on No. 2, but the bears were so plentiful that none of the fruit got ripe. The crop of wild berries was a light one and the bears were driven in to the orchards on both sides of the river, and much of the fruit on the level, as well as that in the mountain orchards, was taken. There were nineteen bears killed in this vicinity during the autumn.

When the trees were small they got the fruit by bending the limbs down, and did not do the trees much harm, but, now that the trees are older and have grown large, the bears climb up the branches, their weight splits or breaks many branches down, and the trees are being gradually destroyed.

FOWLS.

We have had, during the past year, five pens of pure-bred fowls. Rhode Island Red, White Wyandotte, Barred Plymouth Rock, Buff Orpington and Black Minorcas.

We have an excellent strain of Rhode Island Red fowls; they have laid well; their eggs are large, they hatched well, and the chickens were strong; not one of them died from sickness, although some were taken by hawks. The chickens mature early, are quiet and easily handled. When mature, they are about the size of the White Wyandottes. All accounts received from those who bought Rhode Island Red eggs here for hatching were good hatches and strong chickens.

All of the other breeds mentioned we have had for several years, and they have varied but little as to results, comparing one year with another.

The Black Minorcas are good layers of large eggs, their chickens are perhaps rather delicate the first six weeks of their lives, but after that, are usually strong and healthy, but they do not make a good table bird.

Barred Plymouth Rocks are good layers, as well as large, plump table birds. They are larger than the Rhode Island Reds and White Wyandottes, but do not mature as early as these two breeds.

The Buff Orpingtons are fine large fowls and good layers; they are quiet in disposition, good table birds, and mature at about the same age as Barred Plymouth Rocks.

The White Wyandottes are also good layers, quiet and easily handled the chickens are strong and easily raised and mature early.

In most cases, it is the strain, together with the care and feed, as much as the breed which produces good or poor layers.

The fowls are kept confined, each breed in a separate pen with a yard attached, from January 1 to July 1. During the balance of the year they are at large. While they are in pens, the hens of one pen, each breed in its turn, are at large. We think that giving them their liberty, one day in five, when they have the range of the farm, and eat grass and insects of different kinds, will be likely to ensure a better hatch and stronger chickens.

The hens are fed mixed grain, wheat, oats, peas and barley; about one-half wheat, one-quarter oats and one-quarter of peas or barley. In winter they have a cabbage-head or turnip to pick, also small potatoes boiled and mashed with any chop we may have. They also get any milk there is to spare. They have also fresh water, grit and broken clam shells always before them.

The pens are cleaned once a week, when fresh chaff or straw three or four inches deep is put on the floors. The whole of the inside of the building is cleaned by spraying several times a year with whitewash, to which is added carbolic acid. The roosts are frequently washed with Cooper's Sheep Dip. The hen houses and fowls are almost free of insects of any kind. The yards are frequently limed and dug over, keeping them pure and clean. It is more necessary to pay particular attention to keeping the hen houses and yards clean in this climate, as we have considerable mild, wet weather.

There has been no sickness of any sort among the fowls this year, except a few cases of what appears to be rheumatism, caused, probably, by the wet weather in the spring and autumn.

We find dampness much more trying to the fowls than bright, frosty weather.

There is a good demand for eggs for setting, and for any birds, either male or female, which there are to spare.

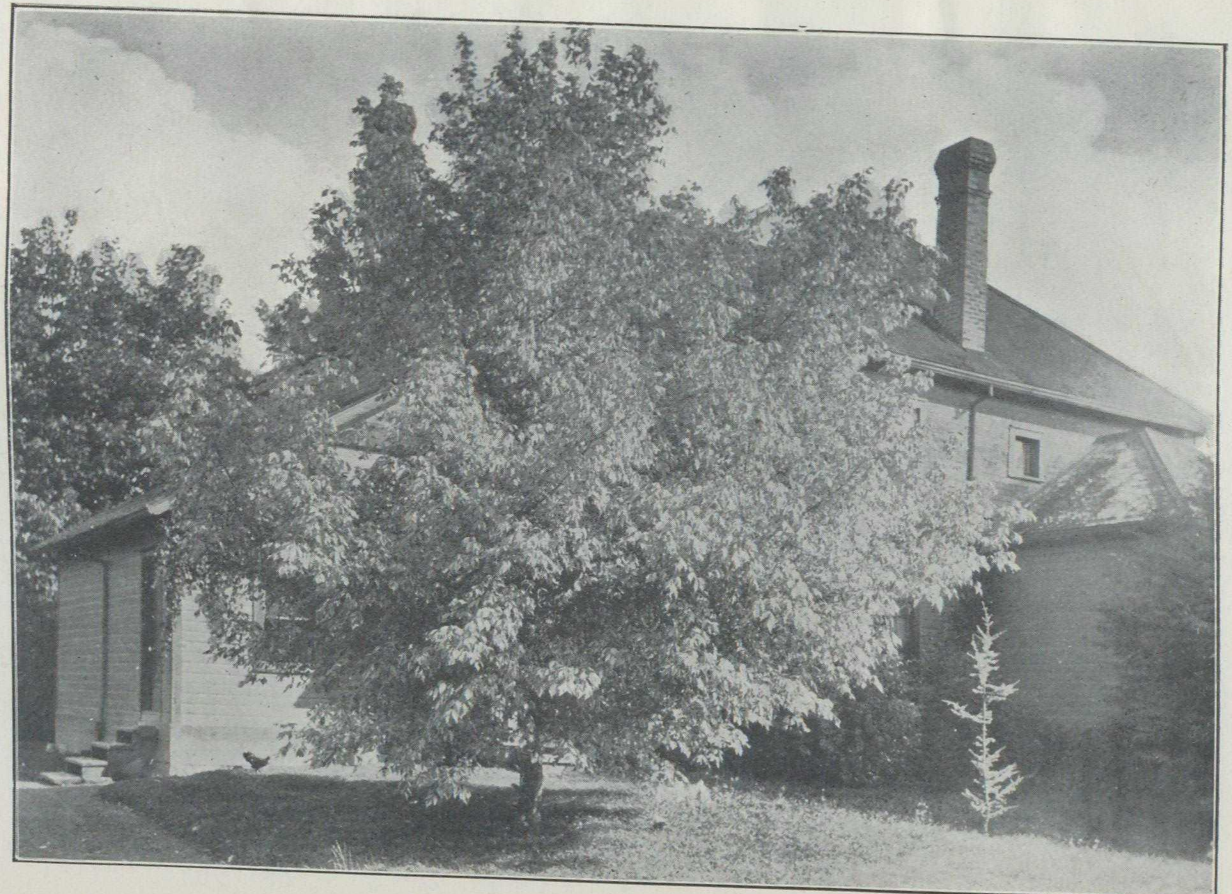
EXPERIMENTS WITH FALL WHEAT.

Six varieties of fall wheat were sown in the variety test. The previous crop was peas on a clover sod, and the land was in very good condition, but the winter was rather unfavourable, and the plots suffered from the freezing and thawing, many plants being thrown out and the yield thus reduced. The seed was treated with formaldehyde and there was no smut. The seed was sown at the rate of one and a half bushels per acre, and the size of the plots was one-fortieth of an acre each.

FALL WHEAT—Test of Varieties.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw including head.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after Cleaning.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.
Turkey Red	Oct. 15	July 28	285	40	Stiff	4	Bearded	2780	24	40	64
Abundance	" 15	"	285	42	"	3	Beardless	3800	23	40	64½
Dawson's Golden Chaff	" 15	" 27	284	41	"	3	"	3480	23	20	63
Kharkov	" 15	"	285	38	Weak	2½	Bearded	2640	22	40	64
Red Velvet Chaff	" 15	"	285	39	Stiff	3½	Beardless	1840	21	..	63½
American Banner	" 15	"	285	43	"	3	"	2640	20	20	63

5094— p. 400.



Acer Negundo Variegata Aurea, Experimental Farm, Agassiz, B. C., 1908. *Photo by C. E. Saunders.*

EXPERIMENTS WITH FALL RYE.

Four plots of one-fortieth of an acre each of fall rye were sown alongside of and under the same conditions as the fall wheat. The rye plants are hardier and these plots did not suffer as much as the wheat plots and the yield was much better. The grain is not of much value here and there is no market for rye straw, so that it is not much sown.

FALL RYE—Test of Varieties.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw including head.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after Cleaning.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.
Mammoth White	Oct. 15	July 20	282	62	....	6	Bearded	2680	34	16	58¾
Giant	" 15	" 24	281	60	....	6	"	2580	32	28	60
Thousand Fold	" 15	" 25	282	59	....	6	"	3800	28	32	59½
Emerald	" 15	" 24	281	60	....	6	"	3010	27	48	59

EXPERIMENTS WITH SPRING WHEAT.

Fourteen varieties of spring wheat were sown on April 10. The previous crop was corn, which followed clover, and, the clover stubble having been manured with about ten tons of barnyard manure per acre and carefully prepared for the seed wheat and the seed treated with formaldehyde, there was, if the season proved favourable, every reason to hope for a heavy crop. The growth was strong and the heads long and promising, but enough midge appeared to survive, to considerably injure the crops, many of the heads being only half filled or the grain shrunken. The plots were one-fortieth of an acre each and there was no rust.

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.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after Cleaning.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.
1	Chelsea	Aug. 11	122	46	Stiff	4 to 4½	Beardless	2520	30	..	65
2	Marquis	" 8	119	45	"	3½ to 4	"	2760	28	40	64¾
3	Riga	" 15	126	42	"	2½ to 3	"	2320	28	..	63½
4	Bishop	" 14	125	42	"	3½	"	3160	27	20	64¼
5	Stanley	" 13	124	46	"	3½	"	3080	25	20	63
6	Percy	" 13	124	44	"	3 to 4.	"	2520	24	40	64
7	Huron	" 13	124	44	"	3 to 3½	"	2880	22	..	64
8	Preston	" 10	121	46	"	4	Bearded	2680	20	40	64
9	Hungarian White	" 13	124	44	"	3 to 4.	"	2980	20	20	63
10	White Russian	" 12	123	46	"	3½	Beardless	3920	18	..	62½
11	Red Fern	" 14	125	46	"	3 to 3½	Bearded	3120	18	..	64½
12	Pringle's Champlain	" 14	125	48	"	3 to 4.	"	3480	16	40	63¼
13	Red Fife	" 11	122	44	"	3 to 3½	Beardless	3280	15	20	63
14	White Fife	" 11	122	44	"	3½ to 4	"	3560	14	..	62½

EXPERIMENTS WITH OATS.

Twenty-four varieties of oats were sown in this test. As in previous years, the oats followed a hoed crop, the land having produced a crop of corn in 1907 and clover in 1906. The clover had received about twelve tons of barn-yard manure to the acre, the winter before it was broken up for the corn. The land was ploughed as early as possible in the season and harrowed to start any weed seeds, then harrowed and disked before the seed was sown.

The size of the plots was one-fortieth of an acre each and the soil was a sandy loam. The seed was sown on April 10, at the rate of two and a half bushels per acre.

All the seed was treated with formalin, and the crop was very free from smut, the grain being plump and bright.

OATS—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.		Number of days Maturing.	Length of Straw including head.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after Cleaning.	Rusted.
					Ins.		Ins.		Lbs.	Bush.	Lbs.	Lbs.	
1	Wide Awake.....	Aug.	7	118	41	Stiff ...	9 to 10	Branching	3,040	87	2	36½	Very little.
2	Abundance... ..	"	8	119	40	" ...	10	"	2,740	86	16	33¼	No rust.
3	Golden Beauty.. .	"	9	120	38	" ...	11	"	2,440	85	30	35	"
4	Improved Ligowo .	"	4	115	46	" ...	10	"	2,260	84	4	38	"
5	Improved American	"	11	122	38	Medium	10	"	2,560	83	18	36½	Very little.
6	Golden Giant	"	11	122	41	Stiff ...	12	Sided. ..	3,220	81	26	33¼	"
7	Pioneer..........	"	4	115	46	" ...	10	Branching	2,840	81	16	38½	No rust.
8	White Giant	"	9	120	39	" ...	10	"	2,240	81	6	36½	"
9	Lincoln	"	7	118	37	" ...	9	"	2,650	80	30	34½	"
10	American Triumph	"	9	120	41	" ...	10	"	2,520	78	28	37	Very little.
11	Kendal White.....	"	5	116	46	" ...	9	"	2,650	76	16	36	No rust.
12	Banner...........	"	5	116	38	" ...	11	"	2,320	75	30	34½	"
13	Twentieth Century	"	7	118	41	" ...	9 to 10	"	3,040	75	20	37	"
14	Danish Island.....	"	4	115	36	Weak ..	9	"	2,040	75	10	34	"
15	Milford White	"	5	116	38	Stiff ...	9	"	2,850	74	24	37¼	"
16	Goldfinder	"	4	115	42	" ...	11	"	3,090	74	14	34½	"
17	Tartar King.	"	4	115	40	" ...	12	Sided.....	2,280	73	4	37¼	"
18	Siberian..........	"	8	119	36	" ...	9	Branching	2,360	71	26	33½	"
19	Swedish Select ...	"	5	116	40	" ...	11	"	1,890	67	22	36¼	"
20	Storm King..... ..	"	3	114	41	" ...	12	Sided....	2,040	67	2	38	"
21	Irish Victor.......	"	6	117	38	" ...	10	Branching	1,960	65	30	36	"
22	Joanette..........	"	3	114	44	Medium	9	"	2,970	64	14	35	"
23	Virginia White....	"	6	117	40	Stiff ...	12	Sided.....	2,360	60	..	35	"
24	Thousand Dollar...	"	5	116	38	" ...	10	Branching	2,600	50	20	35¾	"

EXPERIMENTS WITH BARLEY.

The soil of these plots was sandy loam which had been planted to corn in 1907, which followed a clover crop, and had received a dressing of about twelve tons of barn-yard manure per acre on the clover sod.

This was harrowed and cut with the spading harrow to break any lumps and fine it before ploughing. The corn crop was a very good one and the land was in good condition for the barley.

It was ploughed in autumn after the corn was removed, and disked and harrowed repeatedly before the barley was sown. The plots were one-fortieth of an acre each and the seed was sown at the rate of two and a half bushels per acre. The seed was treated, as in former years, with formaldehyde, and there was no smut or rust on this crop. The weather was very dry and hot when the grain was ripening, which hastened the maturing a little, but the sample was very fair and bright.

Thirteen varieties of six-rowed, and eleven varieties of two-rowed barley were sown in this series of plots. All were sown April 10.

SIX-ROWED 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.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after Cleaning.
				In.		Inches.	Lbs.	Bush.	Lbs.	Lbs.
1	Blue Longhead	July 28..	108	34	Stiff	2½ to 3	2,120	55	40	43
2	Trooper	" 29..	109	38	"	3 " 3½	3,640	49	8	49¼
3	Odessa	" 29..	109	42	"	2½	2,520	47	24	50
4	Mensury	" 28..	108	42	"	4	2,560	46	32	47½
5	Oderbruch	" 28..	108	42	"	3	2,080	44	28	51½
6	Empire	" 31..	111	43	"	2½	2,880	44	8	50½
7	Stella	" 28..	108	36	"	3½	2,400	40	—	50
8	Albert	" 29..	109	40	"	3	2,600	39	8	53
9	Yale	" 30..	110	40	"	2½	2,400	37	24	49½
10	Nugent	" 30..	110	38	"	3½	2,420	36	32	48¼
11	Mansfield	" 29..	109	42	"	2½	2,228	35	40	49½
12	Claude	" 29..	109	40	"	3½	2,720	33	16	52
13	Champion	" 24..	104	38	"	3	2,600	30	40	41

TWO-ROWED 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.	Weight of Straw.	Yield. per Acre.		Weight per measured Bushel after Cleaning.
				In.		Inches.	Lbs.	Bush.	Lbs.	Lbs.
1	Danish Chevalier......	Aug. 1..	112	40	Stiff	3½ to 4	3,000	58	16	51
2	Sidney	" 3..	114	42	"	4½	3,150	52	34	51½
3	Standwell	" 3..	114	39	"	2½ to 3	2,280	52	24	51
4	French Chevalier.......	" 3..	114	38	Medium....	4	2,400	51	32	52¼
5	Invincible.............	" 3..	114	41	Stiff........	3	3,080	50	40	50½
6	Beaver	July 31..	111	40	Medium....	3½ to 4	2,800	50	—	53
7	Jarvis	Aug. 1..	112	48	Stiff........	4½	3,480	49	28	51½
8	Swedish Chevalier	" 3..	114	40	Medium....	3½ to 4½	2,360	49	8	50½
9	Clifford	" 1..	112	44	Stiff..	4	2,880	48	36	53¼
10	Canadian Thorpe.......	" 3..	114	40	Medium....	3	2,940	42	44	51
11	Gordon	July 31..	111	43	Stiff........	3 to 3½	2,640	38	16	51½

EXPERIMENTS WITH PEAS.

Seventeen varieties of peas were sown in the test plots this year. The land was a sandy loam which had been in clover in 1906, and received a dressing of about twelve tons per acre of farm-yard manure in the winter of 1906 and 1907. This was turned under in the spring of 1907 and planted with corn. The land was clean and in good condition when prepared for the peas, and, as will be seen by the results, the crop has been a very fair one. No doubt the yield would have been better but for the drought in midsummer, when the peas were filling. All were sown April 10, the large varieties at the rate of three bushels per acre and the small varieties at the rate of two and a half bushels per acre.

PEAS—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of days Maturing.	Length of Straw.	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per measured bushel after Cleaning.
				Inches.	Inches.		Bush.	Lbs.	Lbs.
1	Early Britain	Aug. 7	119	53	3	Medium	51	20	62½
2	Chancellor	" 9	121	50	2½	Small	50	40	63½
3	Agnes	" 12	124	56	3	Large	49	20	64½
4	Paragon	" 10	122	64	3½	Medium	48	40	63¼
5	Victoria	" 10	122	48	3	Large	47	40	65
6	Picton	" 11	123	54	3	Medium	46	30	63½
7	Daniel O'Rourke	" 3	115	50	2½	Small	46	20	63¾
8	Wisconsin Blue	" 9	121	53	3	"	46	..	64¾
9	Black-Eye Marrowfat	" 10	122	60	3½	Large	44	..	62¾
10	Prussian Blue	" 5	117	48	2½	Medium	43	..	65¼
11	Golden Vine	" 9	121	54	2½	Small	42	20	64¼
12	Mackay	" 6	118	48	3	Medium	42	..	63½
13	Gregory	" 7	119	53	2½	"	41	..	63
14	Arthur	" 7	119	50	2½	Large	40	40	64
15	English Grey	" 10	122	52	3	Medium	40	..	63⅓
16	Prince	" 12	124	44	3	Large	38	40	63½
17	White Marrowfat	" 11	123	54	3	"	37	10	63½

EXPERIMENTS WITH INDIAN CORN.

This has been a very unfavourable year for Indian corn. The spring was wet and cold, both before seeding and for a considerable time after, and, when the corn did come up, much of it was pulled by the crows, although the seed had been carefully tarred before planting which had protected it in previous years.

After the weather turned warm, a drought set in, which prevented as fine a growth as we usually have. The crop was light in consequence, the ears very immature in the early varieties and only formed in some of the late varieties.

The yield per acre was computed from the yield of sixty-six feet of two rows in both hills and drills. The drills were three feet apart and, where necessary, the stalks were thinned to about six inches apart. The hills were 3 feet apart each way and three or four stalks left in each hill. The corn was all planted May 19 on a clover sod which had a good aftergrowth on it in the fall. During the winter about ten tons per acre of barn-yard manure was applied and broken up fine with the disk and dragged before ploughing. Fourteen varieties were planted in this test.

INDIAN CORN—Test of Varieties.

Number.	Name of Variety.	Character of Growth.	Leafiness.	When Tas-selled.	Early Milk.	Condition When Cut. Oct. 8.	Weight per Acre grown in Rows.	Weight per Acre grown in Hills.
							Tons. Lbs.	Tons. Lbs.
1	Compton's Early	Strong	Very	Aug. 28	Oct. 8	Late Milk	12 1,300	13 510
2	Longfellow	"	"	Sep. 4	" 8	"	12 1,740	11 880
3	Champion White Pearl	"	Medium	" 8	" 8	"	12 1,190	12 640
4	Selected Leaming	Medium	"	" 1	" 8	"	11 1,320	12 1,850
5	White Cap Yellow Dent	"	"	" 5	....	Ears formed	11 1,100	12 1,960
6	Superior Fodder	"	"	" 5	....	"	10 1,560	10 1,120
7	Pride of the North	Fair	Very	" 5	....	Early Milk.	10 1,340	10 1,230
8	Angel of Midnight	Medium.	"	" 1	....	Ears formed	10 240	10 1,780
9	Mammoth Cuban	Fair	"	" 1	....	"	9 1,800	11 1,450
10	North Dakota White	"	Medium	" 1	....	Roasting ear	9 1,580	10 1,130
11	Early Mastodon	Weak	"	" 2	....	Early milk	9 881	10 1,350
12	Eureka	Strong	"	" 3	....	Ears formed	9 40	9 1,690
13	Wood's Northern Dent	Weak	"	" 5	....	Early milk	7 1,840	7 630
14	Salzer's All Gold	"	"	Aug. 2?	....	"	7 300	7 1,950

INDIAN CORN SOWN AT DIFFERENT DISTANCES BETWEEN ROWS.

Three varieties of Indian corn were planted in this test. The seed was planted on land prepared for this variety test as in former years; the distances apart were 21, 28, 35 and 42 inches in each case.

The rows planted closer together gave the heaviest yield per acre but the corn was much greener and not so well developed as it was where the rows were farther apart, up to 35 inches apart, but the corn was as well matured and as well developed at this latter distance as at 42 inches between the rows. The stalks were thinned to about six inches apart in the rows in each case.

INDIAN CORN—Different Distances Apart.

Name of Variety.	Distance Apart.	Date of Sowing.	Condition When Cut.	Date When Cut.	Weight per Acre Grown in Rows.	Weight per Acre Grown in Hills.
					Tons. Lbs.	Tons. Lbs.
Selected Leaming	21 inches	May 19	Ears formed	Oct. 9	20 1485	21 1840
" "	28 "	" 19	" "	" 9	16 1094	16 1094
" "	35 "	" 19	" "	" 9	14 1880	15 840
" "	42 "	" 19	Early milk	" 9	11 345	11 723
Champion White Pearl	21 "	" 19	No ears formed	" 9	19 468	20 731
" " "	28 "	" 19	Very green, ears formed	" 9	16 811	16 528
" " "	35 "	" 19	Ears formed	" 9	16 160	16 760
" " "	42 "	" 19	Early milk	" 9	13 1980	13 494
Longfellow	21 "	" 19	Small cobs formed	" 9	19 1223	18 1903
"	28 "	" 19	Ears formed	" 9	15 265	16 1520
"	35 "	" 19	Early milk	" 9	13 1960	13 520
"	42 "	" 19	Roasting ear	" 9	11 1591	10 650

EXPERIMENTS WITH TURNIPS.

Thirteen varieties were sown in this test, which was made alongside of the mangels. The soil was the same and the preparation of the soil the same. As in former years, the Elephant was one of the best, being a heavy cropper and the roots even in size and smooth with small tops and very little waste. The year has been unfavourable for turnips as the roots made little growth until late in the season, after the rains came and the weather became cooler. As in previous years, two sowings were made, the first on May 9 and the second on May 23, and all were pulled and weighed on October 31. Two rows of 66 feet each was the size of the plot weighed in the field for this test, but the whole crop was weighed as it was hauled to the root cellar, and the result of the field was practically the same as that of the plots.

Turnips—Test of Varieties.

Number.	Name of Variety.	Yield per Acre.							
		First Plot.				Second Plot.			
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Elephant (Carters)	28	1552	959	12	30	588	1098	..
2	Kangaroo	28	232	937	12	28	496	941	36
3	Jumbo	27	1968	932	48	26	800	880	..
4	Skirvings	25	1744	862	24	21	240	704	..
5	Magnum Bonum	25	1612	860	12	25	292	838	12
6	Mammoth Clyde	24	48	800	48	25	292	838	12
7	Halewood's Bronze Top	21	1032	717	12	21	240	704	..
8	Good Luck	21	768	712	48	22	1012	750	12
9	Hartley's Bronze	21	240	704	..	20	1184	686	24
10	Hall's Westbury	20	128	668	48	22	852	739	12
11	Perfection Swede	19	1600	660	..	19	1992	666	32
12	Bangholm Selected	19	1072	651	12	17	848	580	48
13	Derby	17	716	578	36	21	243	704	..

EXPERIMENTS WITH MANGELS.

This has been an unfavourable year for mangels, as the cold rains in spring prevented the germination of the seed and the stand was uneven in consequence. Eleven varieties were tested under the same conditions. The land was a light sandy loam and had been in clover in 1906, receiving a dressing of about ten loads of manure on the clover stubble. This was turned under early in the spring of 1907, and, after careful preparation, planted in corn. Ploughed and put in good condition early in the spring of 1908, the mangel seed was sown in two sowings, the first on May 9 and the second on May 23 and all were pulled on October 21. The drills were thirty inches apart and in June, when the plants were well established, they were thinned, where necessary, to about six inches apart in the row. The yield per acre was computed from the yield of two rows each sixty-six feet long. Where there was a fairly even stand, the earliest sowing has yielded the best crop, but, as the first sowing suffered more from the unfavourable spring weather, the comparison, this season, is not a fair one.

MANGELS—Test of Varieties.

Number.	Name of Variety.	Yield per Acre. 1st Plot. Tons.	Lbs.	Bush.	Lbs.	2nd Plot. Tons.	Lbs.	Bush.	Lbs.	Description of Variety.
1	Perfection Mammoth Long Red	26	1,196	886	36	19	808	646	48	Long red.
2	Mammoth Red Intermediate	26	932	882	12	18	960	616	..	Large oblong red.
3	Gate Post	20	1,712	695	12	18	1,224	620	24	Long red.
4	Giant Yellow Globe	19	940	649	..	19	412	640	12	Round yellow.
5	Prize Mammoth Long Red	19	16	633	36	17	320	572	..	Long red.
6	Jumbo	18	1,224	620	24	17	452	574	12	Long oval white.
7	Giant Yellow Intermediate	17	980	583	..	16	1,396	556	36	Short oblong yellow.
8	Crimson Champion	17	848	580	48	12	288	404	48	Oblong crimson.
9	Yellow Intermediate	17	584	576	24	19	1,600	660	..	Oblong yellow.
10	Half Sugar White	15	1,152	519	12	16	1,528	558	48	Oblong white.
11	Selected Yellow Globe	14	1,832	497	12	13	928	448	48	Globe shape yellow.

EXPERIMENTS WITH CARROTS.

Six varieties of carrots were sown in drills thirty inches apart, two sowings of each variety being made, the first on May 9 and the second on May 23. The soil was a light sandy loam and had received a dressing of about twelve tons of barn-yard manure per acre on a clover stubble, and ploughed in the fall of 1907, and thoroughly worked up with disc and harrow before planting the carrot seed. As in previous years, the Improved Short White was the best yielder, and the roots are smooth and easily harvested. The yield per acre was computed from the yield of two rows, each 66 feet long. All the plots were pulled on October 21.

CARROTS—Test of Varieties.

Number.	Name of Variety.	Yield per Acre. 1st Plot. Tons.	Lbs.	Bush.	Lbs.	2nd Plot. Tons.	Lbs.	Bush.	Lbs.	Description of Variety.
1	Improved Short White	29	1,796	996	36	24	312	805	12	Short smooth white.
2	Giant White Vosges	28	660	944	20	26	1,724	895	24	" "
3	Mammoth White Intermediate	26	1,328	888	48	20	1,976	699	36	" "
4	White Belgian	26	800	880	..	24	576	809	36	Long white.
5	Ontario Champion	22	352	739	12	17	1,112	585	12	Short smooth white.
6	Chantenay	16	1,000	550	..	15	1,212	520	12	Short thick red.

POTATOES.

Twenty-five varieties of potatoes were planted in this test, on a light sandy loam that was cultivated in the summer of 1907 to get rid of grass and had been manured that spring. The land was in fine tilth when the seed was planted on April 22, and there was a promise of a heavy crop, but the sandy land soon showed the effect of the hot, dry weather and the tops dried up before the roots were matured. The yield was computed from two rows of 66 feet each, dug September 23 and 24. The seed was planted in drills two and a half feet apart, about one foot apart in the drill. The seed was cut to two eyes each. There was no rot in any of the varieties and the tubers are smooth, of average size and of very fine quality.

POTATOES—Test of Varieties.

Number.	Name of Variety.	Dug.	Total Yield per acre.		Yield per acre of marketable.		Yield per acre of Unmarketable.		Form and Colour.
			Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
1	American Wonder	Sept. 24	435	36	370	16	65	20	Long, flat white.
2	Late Puritan	" 24	407	00	355	00	52		Long, white.
3	Vermont Gold Coin	" 24	391	36	352	36	39		Oblong, white.
4	Carman No. 1	" 24	390	56	336		54	56	Round, white.
5	Morgan Seedling	" 23	367	36	323	16	44	20	Long, pink.
6	Burnaby Mammoth	" 23	365	12	310	36	54	46	Oblong, rose.
7	Everett	" 23	360	48	270	36	90	12	Long, red.
8	Holborn Abundance	" 24	352		288	40	63	20	Round, white.
9	Country Gentleman	" 24	347	36	285		62	36	Oblong, pink.
10	Empire State	" 23	338	48	284		54	48	Long, white.
11	Dooley	" 24	320	40	288	30	32	10	Oblong, white.
12	Twentieth Century	" 25	319		271	10	47	50	Round, white.
13	Early White Prize	" 23	316	48	247		69	48	Long, white.
14	Reeves' Rose	" 24	316		246	12	69	48	Round, rose.
15	Uncle Sam	" 23	314	36	245	24	69	12	Round, white.
16	Moneymaker	" 23	314		257	20	56	40	Long, white.
17	State of Maine	" 24	312	24	265	44	46	40	Long, pink.
18	Rochester Rose	" 24	294	48	224		70	48	Oblong, rose.
19	Irish Cobbler	" 24	272	48	218	18	54	30	Round, white.
20	Dreer's Standard	" 25	272		234		38		Long, white.
21	Early Manistee	" 25	272		231	12	40	48	Round, red.
22	Canadian Beauty	" 24	268	24	236	12	32	12	Oblong, flat white.
23	Ash-Leaf Kidney	" 25	264		224	30	39	30	Oblong, white.
24	Vick's Extra Early	" 25	255	11	200		55	11	Round, rose.
25	Dalmeny Beauty	" 25	216	32	162	24	54	8	Round white.

FODDER PLANTS.

The following fodder plants were sown in plots of one-fortieth of an acre each. The land was a light sandy loam that had been given a dressing of stable manure, at the rate of ten loads per acre, which was well worked into the soil with spading harrow and drag and the seed sown May 8.

Plot 1. White Round French Millet.—Stalks 18 to 24 inches long, heads 2 to 4 inches. Season too dry and crop light; weight of crop dried, 183 lbs.; 3 tons 132 lbs. per acre.

Plot 2. Italian Millet.—Stalks 26 to 30 inches long and fairly leafy. Weight of crop, 297 lbs.; 5 tons, 1,880 lbs. per acre.

Plot 3. German Millet.—Stalks 20 to 24 inches long, and fairly leafy, heads 2 to 5 inches. Weight of crop, 131 lbs.; 2 tons, 124 lbs. per acre.

Plot 4. Pearl Millet.—Stalks 22 to 28 inches long, heads very short, a poor stand. Weight of crop, 116 lbs.; 2 tons, 640 lbs. per acre.

Plot 5. Horse Beans.—Sown in drills 21 inches apart. Cut October 8. Length of stalk, 16 to 22 inches, fairly well podded, pods 1½ to 3 inches long. A very uneven stand. Weight of crop, 300 lbs.; 6 tons per acre.

Plot 6. Horse Beans.—Sown in drills 28 inches apart. A very uneven stand, and a light poor crop. Weight of crop, 210 lbs.; 4 tons, 400 lbs. per acre.

Plot 7. Horse Beans.—Drills 35 inches apart. Stalks 20 to 24 inches long, pods short and not well filled. Weight of crop, 198 lbs.; 3 tons, 1,920 lbs. per acre.

SUMMARY OF CROPS.

	Tons.	Lbs.	Tons.	Lbs.
Hay	80	1,588		
Ensilage (corn)	89			
Total	—	——	169	1,588
Roots—				
Mangels	8	1,020		
Turnips	36	1,700		
Carrots	6	1,245		
Total	—	——	51	1,965
Fall wheat, 36 bushels	1	160		
Rye, 7½ bushels	..	420		
Seed oats, 130 bushels	2	420		
Seed barley, 28 bushels	..	1,346		
Seed peas, 118 bushels	3	1,080		
Spring wheat, 7 bushels	..	420		
Mixed grains grown for feed	14	80		

SAMPLES DISTRIBUTED.

	Packages.
Scions and cuttings	302
3-lb. samples of seed potatoes	271
3-lb. samples of oats	223
3-lb. samples peas	107
3-lb. samples barley	80
3-lb. samples spring and fall wheat and rye	43
3-lb. samples of Indian corn	61
Nuts, tree seeds, and bulbs	485
	1,572

CORRESPONDENCE.

Letters received	4,881
Letters despatched	4,717

GARDEN VEGETABLES.

This has been the most unsatisfactory season for vegetables in many years. The ground was kept cold and wet by the frequent showers and lack of sunshine all through the spring, and several plots of the smaller seeds had to be resown, as the seed did not germinate at all, or so feebly that they were valueless, as, when the hot, dry summer weather set in, many of them were not well rooted and never made a vigorous growth.

TABLE BEETS—Sown April 21.

Extra Early Egyptian Blood Turnips.—Only a few seeds germinated. Fit for table July 28. Sweet, but not crisp.

Early Blood Turnip.—Fit for the table July 28. Very dark blood-red, sweet and of fine flavour.

Crimson Globe.—A rapid grower and superior in quality, fit for table July 28.

Eclipse.—A quick grower, very smooth shaped, dark red, of good flavour, fit for table August 10.

Long Blood.—Fair quality, but not as good as the early varieties, owing to the very hot, dry weather when making most of their growth.

TABLE TURNIPS—Sown April 21.

Milan Early Purple Crown.—Fit for table June 16. Very crisp, very sweet, of fine flavour, one of the best.

Early Snowball.—Very small, a quick grower, sweet and pleasant, fit for table June 18.

Early White Strap Leaf.—Early, very white, crisp, sweet. Fit for table June 20

Early Stone.—Good, if forced or grown very rapidly, but not tender or crisp this year, as they made most of their growth when the ground was dry and hot. Fit for table July 8.

Golden Ball.—A strong grower and smooth, with a fair flavour. Fit for table July 22.

RADISHES—Sown April 7.

Early Scarlet Turnip.—Very rapid grower and very crisp, sweet and pleasant. Fit for table May 18.

Early Scarlet Tipped.—Fit for table May 18; very smooth, sweet, crisp and pleasant.

Crimson Globe.—Round, smooth and handsome, crisp, sweet and good. Fit for table May 20.

Olive Gem.—A rapid grower and very fine quality. Fit for table May 20.

Long Black Spanish.—Sown July 16. Very poor growth owing to drought, roots small, tough and poor.

Scarlet China.—Roots of fair size, but hot and of rather poor flavour.

LETTUCE—Sown April 13.

Simpson's Early Curled.—A rapid grower, leaves crisp and very fine. Fit for table use May 20.

Iceberg.—A vigorous, rapid grower, forming solid heads of crisp, fine flavour; a very good variety. Fit for table May 29.

Early Prize Head.—A very fine early-heading variety; heads solid and crisp, very sweet and good. Fit for table May 30.

Paris White Cos.—Very fine quality, crisp, sweet. Fit for table July 18.

GARDEN PEAS—Sown April 20.

Rennie's Extra Early.—Fit for table June 20. Peas of medium size; pods well filled; vines 24 to 30 inches long and productive.

Alaska.—An early productive variety of very fine flavour. Fit for table June 27; vines 24 to 30 inches and productive.

Thomas Laxton.—Fit for table June 30; pea large, pods long and well filled, of very superior quality.

American Wonder.—Fit for table July 4. Vines very dwarf but productive; pods medium length, well filled; pea medium size with very fine flavour.

Gradus.—Vines 2½ to 3 feet; fairly productive; pods long and well filled with large, very finely flavoured peas. Fit for table July 6.

Nott's Excelsior.—Vines 12 to 14 inches and productive; pods long and well filled. Of very good quality. Fit for table July 6.

British Wonder.—Fit for table July 8. Vines 24 to 30 inches and very productive; pods long and well filled with large peas of very superior quality.

Queen.—Fit for table July 12. Vines 2½ to 3 feet long and productive; pods very long; pea very large and of very fine quality.

Duke of Albany.—Vines 3 to 3½ feet and moderately productive; pods medium length and well filled with very sweet, fine-flavoured peas. Fit for table July 16.

Beans—Planted April 20.

Extra Early Valentine.—Fit for table July 8. Pods round, plump and fine flavoured. Vines very productive.

New Round Pod Kidney Wax.—Fit for table July 14. Pods 4 to 5 inches long, round, firm, crisp and stringless; a very good variety. Vines strong growers and productive.

Dwarf Black Speckled.—Fit for table July 14. Pods small and thin. Vine a weak grower and not productive.

Stringless Green Pod.—Fit for table July 20. Pod 4 to 6 inches long; crisp, plump and stringless. Good flavour and vines strong and productive.

Wardwell's Kidney Wax.—Fit for table July 24. Pods 4 to 6 inches long, plump, stringless and of very good flavour. Vines vigorous and productive.

Dwarf Emperor of Russia.—A strong grower and productive. Pods 3 to 5 inches long, plump and crisp. Fit for table July 24.

Prolific Golden Wax.—Plants vigorous and fairly productive. Pods medium length, plump, crisp and stringless with good flavour. Fit for table July 26.

Refugee.—Vines strong and fairly productive. Pods 3 to 5 inches long, plump and crisp variety. Fit for table July 26.

Keeney's Rustless Wax.—Fit for table last of July. Vine a vigorous grower and productive. Pods long, crisp and of very fine flavour.

California Pea Bean.—A strong grower and fairly productive. Pods 4 to 6 inches long and fairly well filled with handsome yellowish-white beans of excellent quality. Ripe August 28.

Canada Field.—Vines fairly strong and productive. Pods 3 to 5 inches long and well filled with fine, white beans. Ripe last of August.

Cabbage.

Seeds sown in beds in open garden April 17 and transplanted June 4.

First and Best.—A good true header, head solid and of medium size, good quality with a delicate flavour. Fit for table July 8.

Extra Early Paris Market.—Heads small but solid, crisp, white, of fine flavour, a very good variety. Fit for table July 10.

Early Jersey Wakefield.—Fit for table July 10, heads very solid, crisp, fine quality; a very good variety.

Glory of Enkhuizen.—Fit for table August 4. Heads round, medium size, very solid and very sweet, crisp and white.

Early Winningstadt.—Heads large, pointed, solid, crisp, and very good quality Fit for table August 24.

Danish Ball Head.—Heads round, medium size, solid and good quality. A very even crop and a regular header. Fall and winter variety.

Fottler's Drumhead.—Heads large, flat, very heavy and solid. An even crop, a regular header and an excellent keeper.

Giant Brunswick.—A regular, even header; heads very large, flat, round, solid, very crisp and white and of very good quality; an excellent late or winter variety.

Mammoth Red Rock.—Heads large, very solid and heavy, very deep red colour and of good flavour. A good keeper.

Netted Savoy.—Heads of medium size, very solid and heavy; of very delicate flavour; one of the best. Fit for table early September and keeps well.

Savoy Drumhead.—Heads large, flat, circular and solid, very crisp and sweet, very fine quality, and a good winter keeper.

Carrots—Sown April 13.

Early Scarlet Horn.—Stump rooted and a good cropper, grows rapidly and is very sweet. Fit for table June 19.

Chantenay.—A rapid grower and a good cropper, very crisp and sweet. Fit for table June 29.

Half Long Scarlet Luc.—Fit for table early in July, crisp and good.

Cauliflowers.

Sown in open beds April 21 and transplanted June 6. The summer was so dry and hot that the cauliflower plants did not head well and did not endure long after the head developed.

Selected Extra Early Dwarf Erfurt.—Heads very small, but firm, crisp, very white and sweet. Fit for table late in July.

Extra Early Snowball.—Fit for table July 30. Heads of fair size, very white, firm, crisp and sweet.

Lenormand Short Stem.—Heads large and firm, white, crisp and good. Fit for table by the middle of August; stands the heat very well.

Autumn Giant.—Fit for table middle of September. Heads large, firm and white, sweet and of very pleasant flavour.

Brussels Sprouts.

Seed sown in open beds April 17 and transplanted June 2.

Improved Half Dwarf.—A medium growth but thickly set with solid sprouts of very fine flavour.

Giant.—A tall growing variety and stalk well set with large firm sprouts of excellent quality, a good keeper.

Brocoli.

Sown in open beds April 17, transplanted June 2.

Early White.—A very reliable heading sort, heads medium large, solid, white, sweet and delicate. Fit for table early in August.

Walcheren.—Fit for table middle of August. Heads large, very compact, white, crisp and very good flavour.

Table Corn.

Planted in hills three feet apart each way, May 8.

Golden Bantam.—Stalks short, ears short, but filled out to tip, corn very sweet and of pleasant flavour, remaining tender for a long time. Fit for table August 4.

Premo.—Stalks strong and moderately tall, ears fairly large and very perfect, corn very sweet and tender. A very fine variety. Fit for table August 8.

Ringleader.—Stalks of medium size, vigorous and productive, ears of medium size, very well filled out to tip; corn very sweet and tender. Fit for table August 12.

Early Market.—Stalks fairly tall and stout. Ears 6 to 9 inches long, corn sweet and remains in good table condition for a long time. Fit for table August 22.

Early White Cory.—Stalks short but productive. Ears from 4 to 6 inches long; a good size and well filled out, grains large, very sweet and finely flavoured, very good variety. Fit for table August 14.

Crosby's Early Sugar.—Stalks of medium height, stout and productive, ears 6 to 9 inches long, well filled out to tip with plump grains, very sweet and of a delicious flavour. Fit for table September 8.

White Rice Pop Corn.—Stalks 36 to 44 inches long, ears slender and from 3 to 5 inches long, sometimes four ears on a stalk. Ripe early in October.

Onions—Sown April 13.

Large Red Wethersfield.—Medium size, solid, even in size and mild flavoured. An excellent keeper.

Trebons Large Yellow.—A good cropper, onions solid, mild, sweet, pleasant, but many go to necks and do not ripen well.

Red Wonder.—An early ripening variety of medium size and good quality, a good keeper.

Yellow Globe Danvers.—A good main crop variety as it bottoms evenly with small necks. Bulbs solid and crisp, of a good flavour and an excellent keeper.

Australian Brown.—An early variety and an even grower; bulbs very uniform in size and a very good keeper.

Pumpkins—Planted May 18 and 19.

Large Field.—A very strong grower and productive. Pumpkins large, and very thick meated.

Jumbo.—A strong grower; pumpkins very large, coarse, only fit for stock feed.

Quaker Pie.—Vines vigorous and very productive. Fruit of medium size, creamy-yellow in skin and flesh, which is thick and fine grained.

Large Cheese.—Vines strong and productive; pumpkins large, orange colour, flesh yellow, fine grained, of very good flavour.

Squash.

White Bush Scalloped.—Vines bushy and very productive. Squash 3 to 6 inches in diameter. Fit for table August 10. Of very pleasant flavour.

Giant Crookneck.—Vines vigorous and very productive, squash much larger than the common crookneck. Fit for table August 20.

English Vegetable Marrow.—Vine a strong grower and very productive, squash 10 to 16 inches long, skin greenish-yellow, flesh thick, of very fine flavour. Fit for table August 29.

Delicata.—Vine a very strong grower and very productive. Squash small, 5 to 6 inches in diameter, globular, solid and fine grained, a good keeper and of fine quality.

Golden Hubbard.—Similar to the Green Hubbard, but reddish-orange, skin very thick fleshed, fine grained and of fine table qualities, a good keeper.

Delicious.—Vine medium in growth and productive. Squash 7 to 15 pounds in weight, and thick fleshed, of very fine quality for table and a good keeper.

Celery.

Sown in open beds April 13 and transplanted June 24. The land, being a sandy gravelly loam, is not good for celery, and this summer was so dry and hot that the plants did not grow until late and the quality was not very fine.

White Plume.—A fair grower, stalks firm and pleasant in taste. Fit for table September.

Giant Pascal.—A strong grower with large solid heads of very good flavour; a late variety and a good keeper.

New Rose.—A very handsome grower and very finely flavoured, crisp, sweet and nutty.

APPLES.

The spring was very unfavourable for all the large fruits. The weather during March, April, May and the first half of June was cold and showery, the prevailing winds being north and northeast, with very little sunshine, and the fruit did not set. There have been no new varieties to report this year, but several that have fruited for several years are worthy of a place on the list of fruits adapted to British Columbia.

Beauty of Bath.—Tree a strong grower and a regular producer of fair crops. Fruit of medium size, greenish russet with a blush. Flesh white, crisp, mildly acid. Season last of July.

Lord Sudley.—Tree a healthy free grower and productive. Fruit of medium size, bright yellow, striped and splashed with bright red. Flesh white, crisp, juicy, very pleasant, with a sprightly flavour. Season August.

American Rambour.—Tree a healthy strong grower, and a regular cropper. Fruit above medium size, very handsome, with red stripes over an almost clear yellow skin. Flesh yellowish, firm, juicy, mildly acid, very pleasant. Season September.

Cornish Gilliflower.—Tree a fair grower and a regular producer. Fruit of medium size and very uniform, skin russet yellow, with a fine blush. Flesh yellowish, crisp, fine-grained, juicy, with a rich flavour. Season November to February.

Red Reinette.—Tree a strong spreading grower and a regular producer. Fruit of medium size, very uniform. Skin bright yellow, with a handsome blush in the sun. Flesh yellowish white, fine-grained, crisp, juicy, mild, pleasantly sub-acid. Season December and January.

Red Eiser.—Tree a strong grower and a fine producer. Fruit above medium size, very uniform, smooth and handsome, yellow with bright red over nearly the whole surface. Flesh yellowish white, crisp, fine-grained, juicy, mild, pleasantly acid, of good flavour. Season January and March.

Queen of the Pippins.—Tree a strong upright grower and a regular producer of heavy crops. Fruit of medium size or above and fairly uniform. Skin bright yellow splashed with bright red. Flesh yellowish white, firm, crisp, aromatic, mildly acid. Season November to February.

COMMERCIAL ORCHARDS.

No additions were made to the commercial apple orchard, but several varieties have been budded and these will be planted out as soon as they are fit.

Several of the first planted trees bore fruit this year.

The twelve trees of Ontario produced this year 305 lbs. of fruit, 228 lbs. No. 1 large handsome apples without a blemish, 40 lbs. of No. 2, smaller than No. 1, but clean and fine fruit, and 37 lbs. of more or less blemished apples. Eleven out of the twelve trees of this variety planted in the spring of 1905, fruited this year, and all made a fine healthy growth. These trees were two years old when planted.

Jonathan.—Produced 80 lbs. No. 1, good size, well coloured and without blemish, and 30 lbs. No. 2, good colour and clean, but too small to rate as No. 1. Eight trees fruited, two died and the other two made a fine growth.

Salome.—Produced 67 lbs. of fruit all of which was full size, well coloured and free from blemishes. Only four trees fruited, but all made a fine healthy growth and are very promising for another year. These trees were all one-year old when planted in the spring of 1905.

Mother.—This variety produced 45 lbs. No. 1, large well coloured handsome apples and 9 lbs., smaller but well coloured apples. Eleven trees made a healthy growth and nine trees produced each a little fruit. This variety produced a few apples in 1906, the second year after planting and a few again in 1907.

Monmouth Pippin.—Eleven trees are alive and have made a strong growth; one is dead. Four trees fruited and produced 52 lbs. of apples, 40 lbs. of which was No. 1, and 12 lbs. smaller apples, but without blemish.

King.—The twelve trees of this variety planted in the spring of 1905 have grown very well, and this year five trees fruited, producing 44 lbs. of fruit, 36 lbs. extra large and handsome, very well coloured and free from blemish; 8 lbs. No. 2, perfect and well coloured, but smaller than the No. 1.

Grimes' Golden.—The twelve trees of this variety planted in the spring of 1905 are all alive and in fine thrifty condition. This variety commenced fruiting the second year after planting, having produced several apples on several of the trees in 1906, and again in 1907. In 1908 four trees produced 20 lbs. of fair, smooth apples of good size, all No. 1.

Aiken.—Of the twelve trees of this variety planted in the spring of 1905, ten are alive and in thrifty condition. There were 12 lbs. of fruit produced this season, but all of it was too small to grade any better than No. 2 for this variety. The foliage is not as luxuriant as on most of the other varieties in this orchard and a dry summer affects it more readily, as shown by the fruit being small and poor.

The Winter Banana, Wagener, Coxs', Orange Pippin and Rhode Island Greening are too young to bear but look very promising, and fruit may be expected on some of them next year.

Apple Orchard No. 4.

This orchard is composed of varieties which were not considered of sufficiently high commercial value to include them in the commercial orchard, and yet were deserving of further comparative test. Four trees will be planted of each variety selected. Some of these have been procured and a number will be propagated here from varieties which are not very much known in the west, but which, on further trial, may be desirable commercial varieties in other sections of British Columbia, if not here, as the climate and conditions vary so widely in such comparatively short distances. Scions of a great many apples have been sent out from time to time for a number of years, and those who received them are beginning to report progress. Some of the varieties not commonly listed by nurserymen are giving satisfaction as producers of good fruit and as being adapted to the conditions where they are planted. It is partly with a view to have scions true to name for carrying on this work that some of these varieties are being continued in this new orchard.

PEARS.

The pear crop was a very light one this year and there are no new varieties to report on. The trees have not been troubled with disease or insects, they have made a satisfactory growth and are promising for another year.

Of the varieties reported on in previous years, that are not generally known in this province, the following deserve mention.

Marguerite Marillat.—Tree a strong upright grower, and a regular bearer. Fruit large, obtuse, pyriform. Skin a greenish yellow, sprinkled with gray dots and a handsome blush on the sunny side. Flesh white, juicy, sweet, buttery, very pleasant flavour. Season, last of August and early September.

Marie Lesueur.—Tree a strong grower, with very luxuriant foliage; a free producer. Fruit above medium size, obovate, acute, pyriform, skin greenish yellow, with a few patches of russet. Flesh white, buttery, very juicy, sweet, of a very pleasant flavour. Season early September.

Delpierre.—Tree a fair grower and a regular producer. Fruit moderately large, obovate, acute, pyriform. Skin yellowish, sprinkled with brown dots. Flesh whitish, juicy, fine grained, sweet, vinous, of good flavour. Season, September.

Conference.—Tree a vigorous grower and a free producer. Fruit large, oblong, pyriform; skin dull yellow with patches of russet. Flesh whitish, juicy, buttery, sweet, of very fine flavour. Season, early October.

Bon Vicaire.—Tree a strong upright grower with very rich foliage. Fruit large, oblong, pyriform; skin greenish yellow with small stripes and patches of russet, and a bright red blush in the sun; flesh whitish, fine grained, juicy, sweet, with a very fine aromatic flavour, a very good variety. Season, early October.

Durondeau.—Tree a free, slender grower, and a free producer. Fruit above medium in size, acute pyriform. Skin yellow nearly overspread with a warm russet and a handsome russet blush in the sun with many brown dots. Flesh white, very fine grained, juicy, sweet, vinous, with a rich flavour. Season, October.

Pierre Corneille.—Tree a vigorous upright grower and an early and free producer. Fruit of medium size, obovate, acute pyriform; skin a rich russet. Flesh whitish, buttery, melting, juicy, very sweet, with a rich high flavour; a very good variety Season, October.

Eva Baltet.—Tree a strong healthy grower with fine foliage; fruit large, obtuse pyriform, stalk short and fleshy. Skin greenish yellow with many brown dots and a russet red blush on the sunny side, yellowish, juicy, buttery, sweet and fine flavour. Season, October.

Fondante Thirriot.—Tree a slender but vigorous grower, and a very free producer. Fruit large, obtuse pyriform. Skin greenish yellow with many gray dots Flesh white, juicy, fine grained, sweet, vinous. Season, last of October and early November.

Ferdinand Gaillard.—Tree a strong vigorous grower, and an early and free producer. Fruit of medium size, obtuse pyriform; skin, handsome greenish yellow, freely sprinkled with russet dots, and sometimes a faint blush. Flesh yellowish, juicy, melting, sweet, somewhat vinous and perfumed. Season, early November and December.

Alexander Lucas.—Tree a vigorous upright grower and an early bearer. Fruit large, obovate, obtuse pyriform. Skin greenish yellow with many russet dots, and small patches of russet about stalk and calyx and a reddish cheek in the sun. Flesh white, very juicy, sweet, buttery, vinous, aromatic. Season, November and December.

Doyenne Madame Corneau.—Tree a strong upright grower and an early and free producer. Fruit of medium size, obovate, skin greenish yellow, with splashes of russet and many gray dots. Flesh white, very juicy, fine grained, almost buttery, very sweet with a fine pleasant flavour. Season January to March.

President Fortier.—A free grower and producer. Fruit above medium size, obovate, acute, pyriform; skin smooth, yellowish green, freely sprinkled with gray dots. Flesh whitish, very juicy and very sweet, with a rich pleasant flavour. Season, January and February.

L'Inconnue.—Tree a vigorous, upright grower, and an early and very free producer. Fruit of medium size, oval pyriform. Skin, yellow with a few patches of russet and freely sprinkled with russet dots. Flesh white, juicy, melting, very sweet with a rich pleasant flavour. Season, January to March.

There are several others of very considerable merit which require two or three years longer to show whether they would be commercially profitable, or only suited to the amateur.

PLUMS.

The plum crop was light in some varieties, especially those which bloomed the earliest, but the dry, clear summer developed the fruit in a healthy way and there was very little rot. Many of the varieties in our experimental orchards are too small to be profitable and not small enough to be classed with the damsons. There are, however, a number of very superior plums in the newer varieties of the 'domestica' class and these will be propagated and given a more extended trial in the commercial plum orchard.

COMMERCIAL PEAR ORCHARD.

A commercial pear orchard was begun in the spring of 1907 and will be added to from time to time as varieties of sufficient merit are tested in the experimental orchard. The following varieties are planted: Doyenne du Comice, Bartlet, Beurre Clairgeau, Princess, Dr. Jules Guyot, Howell and Emile d'Heyst. Several varieties have been grafted and are in nursery and will be planted later on.

COMMERCIAL PLUM ORCHARD.

A small commercial orchard of select plums of good size and quality, and resistent to the rot, has been planted and the trees have mostly done very well. This orchard will be enlarged with several of the newer European varieties. The following varieties are already in this orchard: Niagara, Duane's Purple, Washington, Curlew and Prince's Red Gage. All these are strong growing and productive varieties, fine looking and good shippers, and are very regular and free producers and fairly resistant to the plum rot. A number of other valuable varieties are being propagated and will be planted out later on.

CHERRIES.

The weather was wet and cold for some time previous to, during, and after the cherries blossomed and the crop of fruit was very small in consequence. No new varieties fruited, for, although several young trees blossomed, no fruit set.

The Heart and Bigarreau cherries are not a commercial success in this valley, owing to the frequent recurrence of unfavourable weather in spring when the trees are in bloom and also to the showery weather when the fruit is ripening.

The following is a list of the most satisfactory sorts: Angleterre Hative, Olivet, Empress Eugenie, De Planchoury, Von der Natte, Shadow Amarelle and Vladimir.

PEACHES.

Two varieties (named) and one seedling peach on the level land bore, this year, a few peaches each. The seedling fruit is above medium size, yellowish-white with a red cheek, but was taken before fully matured and, consequently, no description can be given. The trees Amsden, Hale's Early, Early Silver and Early Crawford in the second and third mountain orchards had a small crop but these were taken before quite ripe.

APRICOTS.

The weather was wet and cold with cold winds during the blossoming of the apricot trees and no fruit set.

MEDLARS.

The medlars were very late in blooming this year, not being fully out until June, but they set a full crop as usual.

MULBERRIES.

All the mulberry trees set a full crop of fruit, but, the trees being on light sandy land the dry hot weather affected them and the fruit was smaller and less juicy than in former years.

PERSIMMONS.

Two persimmon trees blossomed and set fruit but did not develop or mature.

SMALL FRUITS.

The hot, dry weather which we had from the last of June until well on in August was very trying to all the small fruits. The raspberries, red and white, and blackcaps suffered most, in fact were almost a failure. The currants and blackberries suffered very little, as will be seen in the following reports:—

RED AND WHITE CURRANTS.

All the better sorts of red, white and black currants bore a good crop of fine fruit. The bushes had been well mulched in the autumn previous, and pruned during winter, and the currants were nearly ripe before the dry weather began.

The following are the varieties which we find best here, out of 41 sorts tested.

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Red Cherry	June 23.	Vigorous	Large, medium	Sweet, very good quality	Productive.
London Red	" 23.	"	"	" "	"
White Grape	" 25.	"	Large	" "	"
Raby Castle	" 25.	"	"	" "	"
La Conde	" 25.	"	Large, medium	Very good quality	"
La Fertile	" 26.	"	"	" "	"
Prince Albert	" 26.	"	"	" "	"
Eyatt's New	" 27	"	Medium	" "	"
White Cherry	" 27.	"	"	Sweet, good quality	"
La Turinese	" 28.	"	"	A little acid, good quality	"
Gondoin Red	" 28.	"	Large, medium	" "	"
Large White Brandenburg	" 28.	"	Large	Sweet, good quality	"
White Pearl	" 28.	"	Medium	Very good quality	"
Victoria	" 28.	"	"	" "	"

Besides the above, the following varieties have been tested but found less valuable here. White Transparent, White Gondoin, Red Dutch, Knight's Early Red, North Star, New Red Dutch, White Dutch, Fay's Prolific, Moore's Ruby, Versailles, No. 51 (L.S.), Langstraubige, White Esperin, Rankin's Red, Large White Frauendorfer, Verrier's White, Chenonceau, De la Rochepoze, Ringens, Beauty of St. Giles, Champaigner, English Red, Rouge Admirable, Large Red, White Kaiser, White Imperial.

BLACK CURRANTS.

There are forty-four varieties of Black Currants under test; of these the following have been found the best.

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Dominion	July 3.	Vigorous	Large medium	Mild, sweet, good quality	Productive.
Middlesex	" 3	"	"	" "	"
Merveille de la Gironde	" 3	"	"	Slightly acid, good quality	"
Prince of Wales	" 6	"	Large	Sweet, very good quality	"
Boskoop Giant	" 6	"	Very large	" "	"
Black Naples	" 6	"	Large	Sweet, good quality	"
London	" 6	"	Medium large	" "	"
Lee's Prolific	" 6	"	Medium	Mild, good quality	"
Pearce	" 7	"	"	" "	"
Victoria	" 7	"	Large	Sweet, good quality	"
Climax	" 7	"	Medium	Mild, good quality	"

Besides the above there are the following varieties which are not so good, being lacking in one or more quality. Lennox, Bang Up, Gewohnliche, Eclipse, Sterling, Kerry, Perry, Ruler, Madoc, Kentish Hero, Ambrafarbige, Charmer, Beaudry, Ontario, Eagle, Lanark, Baldwin, Wood, Louise, Stuart, Kentville, Success, Star, Champion, Ethel, Parker, Monarch, Bella, Norton, Oxford, Orton and Henry.

BLACKBERRIES.

The blackberries were a good crop and good in quality, not suffering from the dry, hot weather as did the raspberries. They are always satisfactory shippers, as they hold their position firmly in the boxes and will thus carry a considerable distance without injury to the berries. They command a ready sale and good prices. The following are some of the varieties found most satisfactory here:—

Name.	Date of Ripening.	Growth of Plants.	Size of Fruit.	Quality.	Productiveness.
Early King....	July 18	Vigorous....	Large	Firm, sweet, good quality ...	Productive
Agawam.............	" 20	" ..	Large medium	Firm, good quality..........	"
Eldorado.............	" 22	" ..	Very large....	Firm, sweet and very good quality, perhaps the best we have	"
Stone's Hardy.........	" 22	" ..	Large	Firm, sweet, good quality ...	"
Maxwell	" 23	" ..	"	Firm, good quality..	"
Erie.................	" 23	" ..	"	Firm, very good quality.....	"
Taylor................	" 23	" ..	"	Firm, good quality	"
Ohmer................	" 24	" ..	Large medium	" "	"
Tecumseh............	" 25	" ..	" .	" "	"
Snyder..............	" 27	" ..	" .	" "	"
Lawton.	" 27	" ..	" .	Firm, sweet, good quality....	"
Taylor's Prolific.......	" 28	" ..	Medium......	Firm, good quality..........	"
Oregon Everbearing ..	Aug. 1 to Oct. 1..	" ..	"	Very firm, fair in quality when very ripe............	"

Besides the above, a number of other varieties have been tested but none of these are equal in quality here to those on the list.

RED AND YELLOW RASPBERRIES.

There have been 75 varieties of red and yellow raspberries under test, and although many of these have proven inferior here, there are a large number which give good crops of fine berries.

The following have been uniformly good for a number of years.

Name.	Date of Ripening.	Growth of Plant.	Size of Berry.	Quality.	Productiveness.
Phœnix..............	June 23..	Vigorous..	Large	Firm, sweet, good quality............	Productive.
Pauline..............	" 25..	" ..	"	Firm, sweet, good. Continues long in bearing	"
Duke of Brabant......	" 25..	" ..	"	Firm, good quality.................	"
Northumberland Fill Basket.	July 1..	" ..	Very large	Firm, a little acid but good quality...	"
All Summer	" 1..	" ..	Medium..	Firm, sweet, good quality, continues long in bearing..................	"
London..............	" 2..	" ..	" ..	Firm, good quality................	"
Sarah................	" 4..	" ..	" ..	Firm, sweet, rich flavour, very good quality, continues long in bearing, one of the most desirable..........	"
Cuthbert............	" 5..	" ..	Large	Firm, sweet, very good quality	"
Herbert..............	" 5..	" ..	Medium..	Firm, good quality.................	"
French Vice-President	" 5..	" ..	Very large	Firm, sweet, good quality.	"
Golden Queen........	" 5..	" ..	Large	Firm, sweet, very good quality	"
Large Yellow.........	" 5..	" ..	"	Firm, good quality................	"

Besides the above the following varieties have been tested, all of which are, with us, lacking in some one or more desirable qualities. Battler's Giant, Paragon, Charles, Hornet, Carter's Prolific, Belle de Fontenay, Baumforth's Seedling, Muskingum, Turner, Franconia, Hudson River Antwerp, Thompson, White Antwerp, Columbia, Arnold's Hybrid, Red Herrenhauser, Sugar of Metz, Carleton, Empire, Sharpe, Muriel, Craig, Autumn, Surprise, Knevits Giant, La Mercier, Guinea, Garnet, Mary, Percy, Fastolf, Marlboro, Clarke, Heebner, Norwich Wonder, King, Chili, Garfield, Shaffer's Colossal, Queen Victoria, Sir John, Cariboo, Col. Wilder, Brinckle's Orange, Goliath, Lizzie, Miller, Minnie, Beehive, Spineless Yellow, Yellow Antwerp, Malta, Barnet, Lady Anne, Nonpareil, Billard's Perpetual, Prince of Wales, Champion, Crimson Beauty and Hansel.

BLACK CAP RASPBERRIES.

Last season was very trying for the Black Cap raspberries. From the time that they were two-thirds grown until past their ripening, the weather was so hot and dry that the berries dried on the canes and of the 19 varieties here under trial, not one was up to the usual size or quality or even worth picking.

METEOROLOGICAL RECORD.

Date of Highest Temperature.	Temperature.	Date of Lowest Temperature.	Temperature.	Rain-fall.	Snow-fall.	Sunshine.	
1908.				Inches.	Inches.	Hrs.	Min.
April 29	73	April 21 & 28	33	4·60	....	117	24
May 12	70	May 30	35	2·66	....	119	48
June 30	91	June 13	41	5·28	....	164	..
July 21	92	July 21	42	2·60	....	244	6
August 18	96	August 31	42	1·24	....	298	24
September 5	79	September 29	36	1·90	....	102	42
October 7	74	October 13	32	3·93	....	91	18
November 12	57	November 27	32	7·45	....	48	30
December 16	56	December 6	20	2·42	1	63	12
1909.							
January 27	46	January 8	-5	3·28	11·5	27	12
February 21	50	February 9	15	5·38	....	39	30
March 25	71	March 19	30	2·3	....	128	42
Totals	....	....	....	42·77	12·5	1,444	48

Total rainfall for year ending March 31, 1909	42 77
Total snowfall reduced to rainfall	1 25
Total precipitation	44 02
Ttoel precipitation for year ending March 31, 1908	55 40

I have the honour to be, sir,

Your obedient servant,

THOS. A. SHARPE,

Superintendent.

INDEX

J. B.