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SIXTY-SECOND ANNUAL REPORT

Agricultural Experiment Station
University of Minnesota

JULY 1, 1954 TO JUNE 30, 1955



UNIVERSITY OF MINNESOTA

ST. PAUL CAMPUS

* Leave of absence October 1, 1954 to August 15, 1955

LETTERS OF TRANSMITTAL

University of Minnesota, Minneapolis, Minn.

July 1, 1955

To His Excellency, Orville Freeman,
Governor of Minnesota.

Sir: I have the honor to transmit to you herewith the report of the Agricultural Experiment Station of the University of Minnesota for the fiscal year ending June 30, 1955.

Respectfully transmitted,

JAMES L. MORRILL,
President of the Board of Regents
University of Minnesota, Minneapolis, Minn.

July 1, 1955

To the Honorable Board of Regents,
University of Minnesota.

Gentlemen: I have the honor to transmit herewith the report of the Director of the Agricultural Experiment Station of the University of Minnesota for the fiscal year ending June 30, 1955.

Respectfully transmitted,

JAMES L. MORRILL,
President of the University of Minnesota
University of Minnesota, St. Paul, Minn.

July 1, 1955

James L. Morrill,
President of the University of Minnesota.

Sir: I have the honor to submit herewith the report of the Agricultural Experiment Station for the fiscal year ending June 30, 1955.

Respectfully submitted,

H. J. SLOAN, Director

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SIXTY-SECOND ANNUAL REPORT

JULY 1, 1954 TO JUNE 30, 1955

H. J. Sloan, Director

FOREWORD

OCCASIONALLY THE QUESTION is raised concerning the need for the Agricultural Experiment Station to become involved in so many different areas of research activity. This question commonly stems from the ever-expanding cost of research. Frequently associated with the question is the suggestion that there might be fewer subject matter areas, with more emphasis on those that are of greater economic importance to the state.

One of the important reasons for a broad program in Minnesota is the large number of agricultural products produced within its borders. A second reason, frequently overlooked, is the great variety of technical skills that are required to solve some types of problems. These skills are distributed through some 15 research departments in the Experiment Station. A single example will illustrate the breadth of interest that may be involved in a problem, and the importance of having at hand a number of specialists with a great diversity of interest and professional talent.

As an example, let us consider a problem in chemical weed control. On the surface, this might simply appear to be a matter of someone trying chemicals on various types of weeds to see which are effective in killing or preventing the development of certain ones. However, on analysis the problem is not so simple.

Once the study is started, all of the plant sciences immediately become interested. In the Agricultural Experiment Station those would include Forestry, Horticulture, Plant Pathology, and Agronomy. In the case of Forestry, it is not only a matter of the effect of the chemicals on the weeds but also the effect of the chemical on the associated trees.

Agronomy, likewise, would be interested not only in the effect of the chemicals on the weeds but also on the crops with which they are associated. Certain effective chemicals are so harmful to the crops themselves that their use cannot be justified. This same principle would apply to horticultural crops.

The Department of Plant Pathology, having to do with the diseases and physiology of the economic crops, becomes greatly concerned with such things as the determination of which character-

istics of weeds are responsible for the effectiveness of the chemicals. Once this is determined, the selection of the appropriate chemical for a particular group of plants could be predicted with much greater accuracy.

Agricultural Engineering soon becomes involved, because these chemicals need to be applied on a large scale and by mechanical means in most cases. This involves the development of machines which can supply the appropriate pressures, and with the right mechanical devices, so as to provide an even distribution of chemical in the proper place in relation to the soil and the plants.

The animal sciences also are much concerned about these chemicals. In spraying weeds in pastures, for instance, the pasture crops also become treated. This immediately raises the question as to the possible effect on the palatability of the crops and their nutritive value. This would apply as well to grain crops, pasture, and hay crops. In some instances it has been an important consideration in limiting the use of certain chemicals. With poultry, the possible harmful effect of these chemicals on the birds themselves and on the nutritive value of the cereal grains would certainly be an important consideration.

Another aspect of animal life that must be given consideration, particularly in Minnesota where wildlife is so important, is the matter of the effect of the chemicals on the natural wildlife. This brings into the picture the Department of Entomology and Economic Zoology where there are specialized interests in game mammals, birds, fish, and other types of wildlife.

A very important consideration in connection with the spraying of vegetables would be the possible effect on humans. The question would also need to be raised as to whether the chemicals would be stored in animals in sufficient amounts to be harmful to humans. This immediately brings Home Economics and human nutrition into the picture, and is one of the present considerations of the Food and Drug Administration in connection with pesticide work.

By the same token, Veterinary Medicine becomes interested and directly involved. This is partly because of the public health aspect, partly because of the undesirable side effects that sometimes result in animals, traceable either to direct application or consumption of the chemicals used.

Soil scientists become immediately interested, because inevitably some of the chemicals applied by spray or dust application

would reach the soil. Since much of the productivity of the soil is determined by the living organisms present, the possible effect of weed chemicals on the microbiological activity as well as the chemical composition of the soil would be of great concern.

Agricultural Biochemistry becomes important to a large number of departments, likewise, to assist in more fundamental studies of the problems involving biochemical reactions in both plants and animals.

And an aspect that must not be overlooked, of course, is the possibility that even though an effective chemical were found, it might not have sufficient economic advantage. Aside from the expense of the material is the cost of its application, the cost of the necessary equipment, and such other items which might make the use of any particular substance impractical.

This is simply one of a great many examples that could be cited which involve almost every research department in the Experiment Station. It is obvious that it is not always possible, because of lack of funds and in some cases because of lack of the appropriate personnel, to approach some of these broad problems from every possible direction. However, with the diversity in agriculture that we find in Minnesota, we must have great diversity and great strength in a wide variety of subject matter specializations to properly serve the needs of the state.

CHANGES IN STAFF

Appointments

E. D. Besch, D.V.M., instructor, School of Veterinary Medicine, effective September 1, 1954.

G. R. Blake, Ph.D., research associate, Department of Soils, effective February 1, 1955.

W. F. Cates, D.V.M., instructor, School of Veterinary Medicine, effective July 1, 1954.

F. I. Frosheiser, Ph.D., research fellow, Department of Plant Pathology and Botany, effective October 1, 1955.

E. F. Graham, Ph.D., research fellow, Department of Dairy Husbandry, effective January 1, 1955.

John Grava, Ph.D., research fellow, Department of Soils, effective November 16, 1954.

R. A. Hinton, M.S., instructor, Department of Agricultural Economics, effective July 1, 1954.

D. R. Knauff, D.V.M., instructor, School of Veterinary Medicine, effective July 1, 1954.

H. A. Lampe, B.S., instructor, Department of Agricultural Economics, effective September 1, 1954.

A. J. Linck, Ph.D., research fellow, Department of Plant Pathology and Botany, effective April 1, 1955.

W. P. Martin, Ph.D., professor and head, Department of Soils, effective July 1, 1954.

Mary Ann Morris, Ph.D., assistant professor, School of Home Economics, effective September 16, 1954.

S. S. Pauley, Ph.D., associate professor, School of Forestry, effective April 1, 1955.

A. A. Piringer, Ph.D., assistant professor, Department of Horticulture, effective August 16, 1954.

L. A. Richardson, M.S., instructor, Department of Dairy Husbandry, effective March 1, 1955.

E. L. Schmidt, Ph.D., associate professor, Department of Soils, effective September 16, 1954.

R. J. Stadtherr, M.S., instructor, Department of Horticulture, effective October 1, 1954.

W. T. S. Thorp, D.V.M., M.S., professor and assistant dean, School of Veterinary Medicine, effective July 1, 1954.

Shirley R. Trantanella, B.S., instructor, Department of Horticulture, effective July 1, 1954.

P. E. Waibel, Ph.D., assistant professor, Department of Poultry Husbandry, effective September 20, 1954.

I. A. Watson, Ph.D., research associate, Department of Plant Pathology and Botany, effective May 3, 1955.

Promotions

R. P. Dahl, Ph.D., as assistant professor, Department of Agricultural Economics, effective August 16, 1954.

A. G. Peterson, Ph.D., as assistant professor, Department of Entomology and Economic Zoology, effective July 1, 1954.

E. T. Sullivan, Ph.D., assistant professor, School of Forestry, effective July 1, 1954.

Resignations

P. D. Boyer, Ph.D., professor, Department of Agricultural Biochemistry, to accept position in the Department of Physiological Chemistry, Medical School, University of Minnesota, effective July 1, 1955.

R. L. Butler, M.S., research associate, Department of Entomology and Economic Zoology, resigned, effective August 15, 1954.

H. E. Dziuk, D.V.M., instructor, School of Veterinary Medicine, ordered back to active duty with U. S. Army, effective January 16, 1955.

C. F. Foreman, Ph.D., assistant professor, Department of Dairy Husbandry, to accept position as assistant professor at Iowa State College, effective January 15, 1955.

H. G. Heggeness, M.S., instructor, Department of Plant Pathology and Botany, resigned, effective June 30, 1955.

F. E. Hilton, D.V.M., instructor, School of Veterinary Medicine, to accept a position with the USDA Regional Poultry Laboratory at East Lansing, Michigan, effective September 1, 1954.

R. R. Nelson, Ph.D., research fellow, Department of Plant Pathology and Botany, to accept position with the North Carolina State College, Raleigh, North Carolina, effective April 1, 1955.

M. J. Pallansch, Ph.D., research fellow, Department of Agricultural Biochemistry, to accept position as chemist, USDA, Agricultural Research Service, Washington, D. C., effective May 1, 1955.

J. B. Rowell, Ph.D., research associate, Department of Plant Pathology and Botany, to accept position with USDA at the University of Minnesota, effective March 10, 1955.

A. W. Rudnick, Jr., Ph.D., instructor, Department of Dairy Husbandry, to accept position at University of Kentucky, effective February 1, 1955.

J. M. Sieburth, M.S., research fellow, School of Veterinary Medicine, to accept position at the Virginia Agricultural Experiment Station, effective April 1, 1955.

H. W. Thoele, M.S., research fellow, Department of Dairy Husbandry, to accept position at Pennsylvania State University, effective December 1, 1954.

Retirements

Alice Biester, A.M., professor, School of Home Economics, retired, effective June 16, 1955.

W. G. Brierley, Ph.D., professor, Department of Horticulture, retired, effective July 1, 1955.

Ethel Phelps, M.S., professor, School of Home Economics, retired, effective June 16, 1955.

C. O. Rost, Ph.D., professor and head, Department of Soils, retired, effective July 1, 1954.

Mc Miller

Leaves of Absence

J. R. Beebe, M.S., instructor, Department of Agricultural Engineering, on military leave, September 1, 1954, to August 31, 1956.

W. E. Petersen, Ph.D., professor, Department of Dairy Husbandry, on leave to tour New Zealand and Australia, March 28, 1955, to June 11, 1955.

A. E. Schneider, Ph.D., professor, School of Forestry, on leave as Professor and Chief Advisor in Korea on the Cooperative Project with Seoul National University, effective September 5, 1954.

Deaths

V. H. Townley, Ph.D., research associate, Department of Dairy Husbandry, January 1, 1955.

PUBLICATIONS

Agricultural Experiment Station

GENERAL BULLETIN SERIES

425. (Reprinted) Control of stored grain insects in the North Central States. North Central States Regional Technical Committee on Entomology, 24 pages, 7,500.

428. Starting farming today. George A. Pond, Henning W. Swanson, and William L. Cavert, Agricultural Economics and St. Paul Farm Credit District, 36 pages, 7,500.

429. Agricultural production loans of Minnesota country banks. R. P. Dahl and O. B. Jesness, Agricultural Economics, 24 pages, 8,500.

430. Accounts receivable credit in Minnesota farm supply cooperatives. Arvid C. Knudtson and E. Fred Koller, Agricultural Economics, 32 pages, 8,500.

431. Insect and rodent contamination of grain in Minnesota, North Dakota, South Dakota, and Montana. Robert L. Butler and Clarence E. Mickel, Entomology and Economic Zoology, 20 pages, 12,000.

TECHNICAL BULLETIN SERIES

213. The effect of trace elements on alfalfa and oats in Minnesota. John M. MacGregor and John F. Mulvehill, Soils, 16 pages, 3,000.

214. Effects of fertilizers and stand on corn and of stand on soil moisture. Fred E. Shubeck and A. C. Caldwell, Soils, 24 pages, 3,000.

215. The Prevalence and Importance of Damaged Seed in Flax. Thor Kommedahl, J. J. Christensen, J. O. Culbertson, and M. B. Moore, Plant Pathology and Botany, and Agronomy and Plant Genetics, 40 pages, 3,000.

216. Mathematical analyses of birth order data for Minnesota, 1941-1950. Roy G. Francis, Rural Sociology, 20 pages, 3,000.

MINNESOTA FARM AND HOME SCIENCE

Volume XII, Number 1, 16 pages, 16,500.

Volume XII, Number 2, 20 pages, 16,700.

Volume XII, Number 3, 20 pages, 16,500.

REPORT SERIES

Sixty-first annual report of the Minnesota Agricultural Experiment Station, July 1, 1953, to June 30, 1954, 40 pages, 2,500.

Miscellaneous Report 20. (Revised) Maturity ratings for corn hybrids in Minnesota, 1955-56. E. H. Rinke, Gertrud Joachim, and N. C. Olmeim, Agronomy and Plant Genetics, 12 pages, 6,000.

Miscellaneous Report 24. (Revised) Varietal trials of farm crops. W. M. Myers, E. R. Ausemus, J. O. Culbertson, E. H. Rinke, J. W. Lambert, H. L. Thomas, E. L. Pinnell, L. J. Elling, R. G. Robinson, K. S. Koo, K. J. Hsu, O. C. Soine, and D. W. Sunderman, Agronomy and Plant Genetics, 48 pages, 14,000.

Miscellaneous Report 25. New garden chrysanthemums—Wenonah and Vulcan. Robert A. Phillips and Richard E. Widmer, 4 pages, 5,000.

(Reprint) Welcome to St. Paul Campus. 8 pages, 5,000.

Agricultural Extension Service

BULLETIN SERIES

141. (Revised) Sheep on Minnesota farms. W. E. Morris and P. A. Anderson, Agricultural Extension and Animal Husbandry, 20 pages, 7,500.

204. (Revised) Beekeeping in Minnesota. M. H. Haydak, Entomology and Economic Zoology, 40 pages, 7,500.

215. (Revised) Sheep equipment. W. E. Morris and H. G. Zavoral, Agricultural Extension, 16 pages, 7,500.

224. (Revised) Fruit varieties for Minnesota. Orrin C. Turnquist and Leon C. Snyder, Agricultural Extension and Horticulture, 16 pages, 10,000.

253. (Revised) Insulation and ventilation of animal shelter buildings. D. M. Ryan, Agricultural Extension, 24 pages, 10,000.

263. (Reprinted) Insecticides for the home, garden, and field. L. K. Cutkomp, Entomology and Economic Zoology, 28 pages, 7,500.

267. (Revised) Woody plants for Minnesota. Leon C. Snyder and Marvin E. Smith, Horticulture and Agricultural Extension, 28 pages, 10,000.

272. (Reprinted) Building better farm fences. John R. Neetzel, Forestry, 12 pages, 25,000.

273. (Reprinted) Grafting fruit trees. T. S. Weir, Horticulture, 16 pages, 7,500.

274. (Revised) Care of house plants. Richard E. Widmer and Leon C. Snyder, Horticulture, 32 pages, 15,000.

278. Soils of Minnesota. P. R. McMiller, Soils, 8 pages, 50,000.

PAMPHLET SERIES

184. (Revised and reprinted) Home fruit spray guide. A. C. Hodson, L. K. Cutkomp, T. H. King, and O. C. Turnquist. Entomology and Economic Zoology, Plant Pathology and Botany, and Agricultural Extension, 6 pages, 15,000.

192. Getting along together in the family. Louise Danielson, Agricultural Extension, 4 pages, 40,000.

FOLDER SERIES

22. (Revised and reprinted) Varieties of farm crops, 1955. Minnesota Agricultural Experiment Station, 24 pages, 40,000.

68. (Revised) More profits from malting barley. Harold C. Pederson, Agricultural Extension, 8 pages, 10,000.

75. (Reprinted) Controlling pocket gophers. H. L. Parten, Agricultural Extension, 6 pages, 7,500.

147. (Revised) Livestock pest control. W. E. Morris, H. L. Parten, H. J. Griffiths, and L. K. Cutkomp, Agricultural Extension, Veterinary Medicine, and Entomology and Economic Zoology, 6 pages, 10,000.

149. (Reprinted) Cannibalism and egg eating in poultry. Cora Cooke, Agricultural Extension, 6 pages, 10,000.

154. (Revised) Vegetable varieties for Minnesota. Orrin C. Turnquist, Agricultural Extension, 8 pages, 12,500.

156. (Reprinted) Freezing fruits and vegetables. Grace D. Brill, Agricultural Extension, 8 pages, 20,000.
164. (Reprinted) Getting started with your vegetable garden. Orrin C. Turnquist, Agricultural Extension, 10 pages, 10,000.
165. (Revised) The home lawn. Richard J. Stadtherr and Leon C. Snyder, Horticulture, 16 pages, 10,000.
172. (Reprinted) Harvesting and storing garden vegetables. Orrin C. Turnquist, Agricultural Extension, 8 pages, 10,000.
174. (Reprinted) Know the eggs you buy. Eleanor Y. Loomis, William H. Dankers, and Cora E. Cooke, Agricultural Extension, 6 pages, 10,000.
176. (Reprinted) Know the milk you buy. Eleanor Loomis, Agricultural Extension, 8 pages, 10,000.
177. (Reprinted) Know your Minnesota apples. Eleanor Loomis, Agricultural Extension, 8 pages, 10,000.
179. (Reprinted) Rental arrangements for your farm. Marvin Kottke and S. A. Engene, Agricultural Economics, 8 pages, 7,500.
180. (Revised) Sweetclover weevil and its control in Minnesota. B. A. Haws and F. G. Holdaway, Entomology and Economic Zoology, 8 pages, 5,000.
184. (Reprinted) Know the meat you buy. Eleanor Loomis, Agricultural Extension, 8 pages, 10,000.
186. Know bread and other cereal products. Eleanor Loomis and Harold C. Pederson, Agricultural Extension, 8 pages, 10,000.
187. Culling pays. R. W. Wayne, H. R. Searles, and R. D. Leighton, Agricultural Extension, 6 pages, 25,000.
188. (Original and revision) Short cuts in the home. Lucile Holaday, Agricultural Extension, 8 pages, 20,000.
189. Making soft cheese at home. W. B. Combs and Ina B. Rowe, Dairy Husbandry and Agricultural Extension, 6 pages, 25,000.
190. Summer feeding of dairy cattle. R. W. Wayne, H. R. Searles, and R. D. Leighton, Agricultural Extension, 6 pages, 15,000.
191. Cultural and chemical weed control in Minnesota, 1955. (Original and reprint) R. S. Dunham, H. L. Hansen, R. E. Ny-lund, and E. H. Jensen, Agronomy and Plant Genetics, Forestry, Horticulture, and Agricultural Extension, 32 pages, 40,000.
192. Fly control for livestock. L. K. Cutkomp, Entomology and Economic Zoology, 6 pages, 10,000.
193. Range shelters for pullets. Cora Cooke, Agricultural Extension, 4 pages, 10,000.

194. Know the poultry you buy. Eleanor Loomis and William H. Dankers, Agricultural Extension, 8 pages, 10,000.

YOUNG FARMER AND HOMEMAKER CIRCULARS

1. When you borrow money. Henning W. Swanson, School of Agriculture, 10 pages, 10,000.
2. Taking part in your community. Robert R. Pinches, Agricultural Extension, 10 pages, 10,000.

NEWSLETTERS

Name of publication	Issues	Pages	Circulation
Agronomy Information	2	4	4,000
Agronomy and Soils Newsletter (Agronomy Information)	6	54	1,200
Buy Best Buys	12	36	5,784
Club Leader Letter	4	24	18,652
Dairy Herd Improvement Monthly Letter	12	48	41,220
Dairy Herd Improvement Association Summary	1	52	3,585
Farm Business Notes	6	24	15,350
Forestry Notes	11	22	5,621
Garden Fact Sheet	8	24	1,472
Helps for Home Agents	24	96	1,628
Home Garden Tips	34	34	7,956
Minnesota Feed Service	4	18	5,956
Minnesota State Florists' Letter	6	58	2,502
Nurserymen's Newsletter	6	24	3,300
Our Land	52	52	20,904
Radio Shorts	52	156	5,252
Reaching Rural People	12	48	2,892
Rural Youth News	6	36	11,922
Visual Aids Tip Sheet (part of Reaching Rural People)	12	24	5,184
Total	270	834	164,380

4-H CLUB BULLETIN SERIES

8. (Reprinted) 4-H bread. Ina Rowe and State 4-H Club Staff, Agricultural Extension, 24 pages, 3,500.
16. (Reprinted) Our goal is health. Agricultural Extension, 4 pages, 10,000.
26. (Revised) Forestry in 4-H. Marvin E. Smith, Agricultural Extension, 40 pages, 10,000.

31. (Reprinted) 4-H clothing project. Athelene Scheid, Gwendolyn M. Bacheller, and Elsie K. Williams, Agricultural Extension and Iowa State College. 40 pages, 10,000.

36. (Reprinted) 4-H homemaking assistance. Evelyn D. Harne, Agricultural Extension, 24 pages, 10,000.

Scientific Journal Series Papers

AGRICULTURAL ENGINEERING

2990. Drying tests with washed late-crop potatoes in the Red River Valley, 1950 and 1951. J. Strait, J. M. Lutz, G. B. Ramsey, and A. H. Graves. *American Potato Journal* 30:179-184. August, 1953.

3261. Field tests of broadcast sprayer nozzles. J. Strait and L. A. Liljedahl. *Research Report of North Central Weed Control Conference*, p. 154, December, 1954.

3262. Comparison of some mechanical and chemical weed control methods of corn. J. Strait and L. A. Liljedahl. *Research Report of North Central Weed Control Conference*, p. 155. December, 1954.

3263. Laboratory tests of broadcast sprayer nozzles. J. Strait and L. A. Liljedahl. *Research Report of North Central Weed Control Conference*, p. 155. December, 1954.

3288. Some laboratory and field tests of broadcast nozzles. J. Strait and L. A. Liljedahl. *Proceedings of Eleventh Annual North Central Weed Control Conference*, pp. 65-70. 1954.

AGRONOMY AND PLANT GENETICS

3007. The use of heritability ratios and correlation coefficients for measuring combining ability with smooth bromegrass, *Bromus inermis* Leyss. H. L. Thomas and M. F. Kernkamp. *Agronomy Journal* 46:553-556. 1954.

3113. Companion crops for weed control in soybeans. R. G. Robinson and R. S. Dunham. *Agronomy Journal* 46:278-281. 1954.

3154. Inter- and intra-annual relationships of some agronomic and malting quality characters of barley. C. H. Hsi and J. W. Lambert. *Agronomy Journal* 46:470-474. 1954.

3229. Inheritance of seedling reaction to races 7 and 8 of *Puccinia graminis avenae* Eriks. and Henn. at high temperature in three oat crosses. F. K. S. Koo, M. B. Moore, W. M. Myers, and B. J. Roberts. *Agronomy Journal* 47:122-124. 1955.

3273. The period of toxicity of IPC and CIPC when applied to the soil at various times of the year. A. F. Wiese and R. S. Dunham. *Research Report Eleventh Annual North Central Weed Control Conference*, p. 46. 1954.

3286. Influence of rates and time of application and tillage practices on residual effects of CMU. Lowell Jordan and R. S. Dunham. *Proceedings Eleventh Annual Meeting North Central Weed Control Conference*, pp. 14-15. 1954.

3092. Chromosomal interchanges in barley. C. R. Burnham, F. H. White, and R. Livers. *Cytologia* 19:191-202. 1954.

3138. Performance of birdsfoot trefoil alone and in competition with other species in pastures. K. S. Yawalkar and A. R. Schmid. *Agronomy Journal* 46:407-411. 1954.

3210. Winter hardiness of birdsfoot trefoil strains and varieties. K. O. Rachie and A. R. Schmid. *Agronomy Journal* 47:155-157. 1955.

3247. Giant foxtail control in Marine flax. R. G. Robinson and R. S. Dunham. *Research Report Eleventh Annual North Central Weed Control Conference*, p. 68. 1954.

3272. The effectiveness of CIPC and IPC when applied to crops and wild oats at different stages of growth. A. F. Wiese and R. S. Dunham. *Research Report Eleventh Annual North Central Weed Control Conference*, pp. 46-47. 1954.

3285. 2,4-D or MCP for weed control in flax, oats, and legumes. R. S. Dunham. *Proceedings Eleventh Annual Meeting North Central Weed Control Conference*, pp. 119-120. 1954.

ANIMAL HUSBANDRY

2885. Selection for factors of performance in the swine herds of the Hormel Foundation. R. A. Damon, Jr., and Laurence M. Winters. *Journal of Animal Science*. Vol. 14, No. 1, February, pp. 836-847. 1955.

2973. The effects of genetic diversity and performance of inbred lines per se on hybrid vigor in swine. D. C. England, L. M. Winters. *Journal of Animal Science*. Vol. 12, No. 4, pp. 94-104. November, 1953.

3205. The value of urea in a low protein ration for weaning pigs. L. E. Hanson and E. F. Ferrin. *Journal of Animal Science*. Vol. 14, No. 1, pp. 43-48. February, 1955.

3221. Growth and carcass characteristics of pigs fed antibiotics for part or all of the growing-fattening period. *Journal of Animal Science*. Vol. 14, No. 1, pp. 30-43. February, 1955.

3269. The use of arsanilic acid in the production of market pigs. L. E. Hanson, L. E. Carpenter, W. J. Aunan, and E. F. Ferrin. *Journal of Animal Science*. Vol. 14, No. 2, pp. 513-524. May, 1955.

AGRICULTURAL BIOCHEMISTRY

2842. Studies on the chemistry of the living bark of the black locust in relation to its frost hardiness. V. Seasonal transformations and variations in the carbohydrates: Starch-sucrose interconversions. D. Siminovitch, C. M. Wilson, and D. R. Briggs. *Plant Physiology* 28:383-400. July, 1953.

2849. Cellulose sheets as chromatographic supports. L. S. Cuendet, R. Montgomery, and F. Smith. *Journal of the American Chemical Society* 75:2764. June, 1953.

2873. A new procedure for correlating the structure of glycosides. F. Smith. *Nature* 171:474. March, 1953.

2879. Amperometric method for determining the sorption of iodine by starch. B. L. Larson, K. A. Gilles, and Robert Jenness. *Analytical Chemistry* 25:802-804. May, 1953.

2884. Studies on the chemistry of the living bark of the black locust tree in relation to frost hardiness. VI. Amylase and phosphorylase systems of the bark tissues. M. H. Ewart, D. Siminovitch, and D. R. Briggs. *Plant Physiology* 28:629-644. October, 1953.

2898. Detection of glycosides and other carbohydrate compounds on paper chromatograms. J. A. Cifonelli and Fred Smith. *Analytical Chemistry* 26:1132-1134. July, 1954.

2925. The activation of K⁺ and occurrence of pyruvic phosphoferase in different species. P. D. Boyer. *Journal of Cellular and Comparative Physiology* 42:71-78. August, 1953.

2931. Titration of calcium and magnesium in milk and milk fractions with ethylenediamine tetraacetate. Robert Jenness. *Analytical Chemistry* 25:966-968. June, 1953.

2956. Further studies of the heat-labile loaf volume depressant of milk serum proteins. A. L. Gordon, Robert Jenness, and W. F. Geddes. *Cereal Chemistry* 30:213-221. May, 1953.

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3195. An air blast method for rapid inoculation of wheat and barley with loose smut. (Abstract) M. B. Moore and D. E. Munnecke. *Phytopathology* 44:499. 1954.
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3219. Grain storage studies. XVIII. Mold invasion of wheats stored for sixteen months at moisture contents below 15 per cent. C. M. Christensen. *Cereal Chemistry* 32:107-116. 1955.
3223. Antagonistic action of *Helminthosporium sativum* and *Gibberella zeae* to infection by *Tilletia* spp. causing bunt of wheat. H. W. Schroeder. *Phytopathology* 45:288. 1955.
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3284. Evidence of races of *Cronartium ribicola* on *Ribes*. R. L. Anderson and D. W. French. *Forest Science* 1:38-39. 1955.
3338. Incidence of curly top of sugar beets in Minnesota and Iowa in 1954. C. L. Schneider. *Plant Disease Reporter* 39:453-454. 1955.

POULTRY HUSBANDRY

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2941. Some protein changes in stored frozen poultry. M. H. Swanson and H. J. Sloan. *Poultry Science* 32:643-649. July, 1953.
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3143. Crossing strains and breeds of turkeys. P. A. Kondra and R. N. Shoffner. *Poultry Science* 33:1065. September, 1954.
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3147. Utilizing carbon dioxide and moisture vapor proof packaging in the preservation of shell egg quality. M. H. Swanson and N. V. Helbacka. *Poultry Science* 33:1084. September, 1954.
3148. Growth promoting properties of dehydrated fish solubles in relation to time of rearing young stock. E. L. Johnson. *Poultry Science* 33:1063. September, 1954.
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VETERINARY MEDICINE

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2943. Isolation units for growing baby pigs without colostrum. G. A. Young and R. Underdahl. *American Journal of Veterinary Research* 14:571-574. October, 1953.

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A. F. Weber, R. L. Kitchell, and J. H. Sautter. *American Journal of Veterinary Research* 16:255-263. April, 1955.

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Miscellaneous Journal Series Papers

AGRICULTURAL ECONOMICS

864. Agricultural Economics in the decade ahead. W. W. Cochrane. *Journal of Farm Economics* 36:817-828. December, 1954.

AGRONOMY AND PLANT GENETICS

801. Wild oats. A. F. Wiese. *Abstract of Weed and Seed Inspectors' Short Course*, pp. 38-40. January, 1953.

802. Complete vegetation control. R. G. Robinson. *Abstract of Weed and Seed Inspectors' Short Course*, pp. 33-34. January, 1953.

828. V. Weeds. R. S. Dunham. *Advances in Agronomy* 6:168-174. 1954.

863. Still time to control weeds in 1954. R. G. Robinson. *Minnesota Seed Grower*, Vol. 27, No. 4, pp. 1, 2. 1954.

881. Weed control in corn. R. G. Robinson. *Abstract of Weed and Seed Inspectors' Short Course*, pp. 24-26. 1955.

AGRICULTURAL BIOCHEMISTRY

820. The investigator, the university, and research. P. D. Boyer. *Minnesota Chemist* 5:7. September-October, 1953.

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DAIRY HUSBANDRY

818. A new approach to mastitis therapy. I. A. Schipper. *Veterinary Medicine* 48:401-404. October, 1953.

ENTOMOLOGY AND ECONOMIC ZOOLOGY

819. Native pollinators of alfalfa in Northern Minnesota. R. L. Fischer. *Minnesota Beekeeper* 6:8-9. July, 1953.
852. American foulbrood and chemical controls. T. A. Gochnauer. *Report of the State Apiarist—State of Iowa*, pp. 10-14. 1953.
853. Propolis. M. H. Haydak. *Report of the State Apiarist—Iowa State College*, pp. 74-86. 1953.
856. Baltimore postscripts. T. A. Gochnauer. *The Minnesota Beekeeper* 7:3-6. July, 1954.
861. Insects injurious to gladiolus. C. E. Mickel. *The Glad Fan*, Vol. 8, No. 2, pp. 35-36. July, 1954.
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872. Some milestones in the history of insect classification. C. E. Mickel. *Canadian Entomologist* 87:57-66. February, 1955.
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FORESTRY

866. The management of Itasca State Park forests to meet recreational objectives. H. L. Hansen and D. P. Duncan. *Proceedings, Society of American Foresters*, pp. 123-125. 1954.
879. Tolerance of evergreens to chemical sprays. H. L. Hansen. *Fourteenth Annual Weed and Seed Inspectors' Short Course Proceedings*, pp. 22-23. 1955.
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PLANT PATHOLOGY AND BOTANY

764. Root rots of cereals. J. J. Christensen. *United States Department of Agriculture Yearbook*, pp. 321-328. 1953.
803. The present status of the stem rust problem. E. C. Stakman, Helen Hart, and D. M. Stewart. *Report of the International Wheat Stem Rust Conference at Winnipeg, Canada, January 5-7, pp. 2-5. 1953.*
804. Biotypes within races of stem rust. E. C. Stakman, Helen Hart, R. Postigo, and S. Goto. *Report of the International Wheat Stem Rust Conference*, pp. 7-9. January, 1953.
805. The pathogenicity of races 11, 49, and 139 of *Puccinia graminis tritici* to Kenya wheat varieties and their derivatives. E. B. Hayden, D. H. Smith, and E. C. Stakman. *Report of the International Wheat Stem Rust Conference*, p. 13. January, 1953.
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807. Differences in pathogenicity between isolates of race 11 of *Puccinia graminis tritici*. D. H. Smith and E. B. Hayden. *Report of the International Wheat Stem Rust Conference*, pp. 13-14. January, 1953.
829. The present status of flax diseases other than rust. J. J. Christensen. *Advances in Agronomy* 6:161-166. 1954.
871. Adaptation of plant pathogen to host. J. J. Christensen and J. E. DeVay. *Annual Review of Plant Physiology* 6:367-392. 1955.
873. Complexities of the wheat stem rust situation. Helen Hart. *Cereal Chemistry* 13:1-14. 1955.
880. The occurrence and distribution of the X-disease virus of *Prunus* in Minnesota. P. R. Fridlund and T. H. King. *Plant Disease Reporter* 39:545-546. 1955.

SOILS

816. Anhydrous ammonia is equal of other N materials in Minnesota. A. C. Caldwell and H. E. Jones. *What's New in Crops and Soils*, Vol. 5, No. 9, p. 22. August-September, 1953.

VETERINARY MEDICINE

800. Physiological and pathological basis for interpretation of urinalysis. G. W. Mather. *Cornell Veterinarian* 43:410-420. July, 1953.

Summary of Publications

JULY 1953-JULY 1954

Kind of publication	Number issued	Number of pages	Number of copies
General series bulletins	5	136	44,000
Technical series bulletins	4	100	12,000
<i>Minnesota Farm and Home Science</i>	3	56	49,700
Report series	5	112	32,500
Extension service			
Bulletins	11	240	157,500
Pamphlets	22	10	55,000
Folders	25	230	357,500
YMW circulars	2	20	20,000
4-H bulletins	5	132	43,500
Newsletters	270	834	164,380
	332	1,870	936,080

Summary of Journal Series Papers

Department	Scientific Journal Series		Miscellaneous Journal Series	
	Number issued	Number of pages	Number issued	Number of pages
Agricultural Economics	0	0	1	11
Agricultural Engineering	0	0	5	13
Agronomy and Plant Genetics	12	34	5	13
Animal Husbandry	5	49	0	0
Agricultural Biochemistry	47	303	4	20
Dairy Husbandry	14	94	1	3
Entomology and Economic Zoology ..	22	186	12	59
Forestry	13	54	5	9
Home Economics	2	10	0	0
Horticulture	21	44	0	0
Plant Pathology and Botany	59	122	10	60
Poultry Husbandry	12	25	0	0
Soils	7	18	1	1
Veterinary Medicine	18	84	1	10
Total publications	277			
	232	1,023	45	199

NEW EXPERIMENT STATION PROJECTS

Agricultural Biochemistry

NC-25. Minn. 1. Factors affecting the utilization of feed by ruminants.

Agricultural Economics

FH2211-M8. Economics of grain marketing.

Agronomy and Plant Genetics

147. Varietal improvement in smooth brome and other forage grasses.

148. Varietal improvement in red clover, and other legumes.

149. Minor and new field crops.

FH2213-3. Cropping systems based on grassland crops.

Animal Husbandry

442. The digestibility of a flax by-product.

449. The value of lye (NaOH) in swine feeding.

FH2214-M1. Factors affecting market quality of meat animal carcasses.

FH2214-4. Diet as a factor in swine reproduction.

FH2214-5. Dietary requirements of pigs in dry lots.

1417. Value of hormones in sheep production.

1418. Improvement of roughage utilization by sheep.

1419. The causes of oil lamb carcasses and the effect of feeding animal fat to sheep.

Dairy Husbandry

224. Egg transplantation in the bovine and associated problems.

Entomology and Economic Zoology

176. Influence of food selection on availability of game fish to anglers.

FH2217-5. Studies on the attractiveness of alfalfa clones to pollinating insects.

FH2217-6. Fruit insect pests.

Forestry

FH2219-4. Studies on the improvement of Minnesota forest and shade trees.

Home Economics

FH2220-3. Criteria of serviceability for fabrics and garments.

Horticulture

FH2221-2. Growing and handling ornamentals.
FH2221-3. The establishment and maintenance of lawns in Minnesota.

Plant Pathology and Botany

NC-14 Minn 1. Stone fruit virus diseases and their control.
NC-22 Minn 1. Epidemiology of oak wilt.
NC-11 Minn 2. Breeding and evaluating the small seeded grasses and legumes for the North Central Region.

Poultry Husbandry

FH2223-4. Nutritive factors required for hatchability and progeny performance.
FH2223-5. The effect of diet composition on egg production.
FH2223-M1. Factors affecting quality loss of Minnesota eggs in market channels.

Soils

102-5. Soil fertility investigations. (5) Soil potassium.
121. Radioisotopic investigations on soils and crops.
NC-16 Minn 1. Factors influencing the release of potassium from genetically different Minnesota soils.
FH2225-2. The activity of the rhizosphere population in transformations of nitrogen within the room zone as related to the nutrition of plants.
FH2225-3. Microbiological production of organic growth substances within rhizosphere and effects on plant growth.
FH2225-4. The effect of the nature of soil structures on soil properties and plant growth.

2518B1. The effect of soil properties on the regeneration and growth of important tree species.

2519B1. Soil moisture investigations relating to internal drainage and supply of water for crop production.

Veterinary Science

125. Mastitis of dairy cattle.

126. A study of the carrier state and serology in swine Leptospirosis.

127. Metabolic diseases and disorders of swine.

SUMMARY OF PROJECTS

Department	Total	Active	Inactive	Closed	New
Agricultural Biochemistry	16	15	1	0	1
Agricultural Economics	26	26	0	1	1
Agricultural Engineering	12	12	0	2	0
Agronomy and Plant Genetics	22	22	0	4	4
Animal Husbandry	22	22	0	1	8
Dairy Husbandry	19	19	0	1	1
Entomology and Economic Zoology	34	34	0	0	3
Forestry	15	15	0	1	1
Home Economics	14	14	0	1	1
Horticulture	26	26	0	2	2
Plant Pathology and Botany	26	26	0	0	3
Poultry Husbandry	15	15	0	3	3
Soils	19	19	0	2	8
Veterinary Medicine	21	21	0	0	3
Rural Sociology	2	2	0	0	0
North Central Experiment Station	5	5	0	0	0
Northeast Experiment Station	3	2	1	0	0
Northwest Experiment Station	5	5	0	0	0
Southern Experiment Station	3	3	0	0	0
West Central Experiment Station ..	1	1	0	0	0
Total	306	304	2	18	39

FINANCIAL STATEMENT

Income 1954-55

Source of revenue	St. Paul Campus	Branch stations					Total
		Crookston	Morris	Grand Rapids	Duluth	Waseca	
Federal appropriations:							
Hatch Fund	\$ 15,000.00						\$ 15,000.00
Adams Fund	15,000.00						15,000.00
Purnell Fund	60,000.00						60,000.00
Bankhead-Jones section 5	68,128.03						68,128.03
Bankhead-Jones 9b1-2	208,801.71						208,801.71
Bankhead-Jones 9b3	47,000.00						47,000.00
State appropriations:							
General University support	976,405.52	\$68,801.64	\$73,027.01	\$45,461.94	\$49,010.03	\$41,616.19	\$1,254,322.33
Special appropriations	426,500.00						426,500.00
Endowments, fellowships, and similar grants							
.....	246,272.02						246,272.02
Fees, sales, and miscellaneous							
.....	567,838.22						567,838.22
Total	\$2,630,945.50	\$68,801.64	\$73,027.01	\$45,461.94	\$49,010.03	\$41,616.19	\$2,908,862.31

Expenditures 1954-55

Classification	St. Paul Campus	Branch stations					Total
		Crookston	Morris	Grand Rapids	Duluth	Waseca	
Services and labor	\$1,695,736.79	\$ 67,060.83	\$ 75,070.49	\$42,142.91	\$47,362.14	\$ 61,817.39	\$1,989,190.55
Travel expense	47,567.76	198.73	774.67	237.62	326.82	305.28	49,410.88
Transportation of things	6,199.48	3,090.92	158.64	401.54	91.72	117.04	10,059.34
Communication service	13,417.79	633.44	554.31	259.07	642.11	527.75	16,034.47
Rents and utility service	31,338.19	1,408.14	1,137.03	1,579.95	2,630.43	3,765.72	41,859.46
Printing and binding	13,407.91		136.03	130.19	604.90		14,279.03
Other contractual services	155,851.68	9,252.91	6,972.34	2,736.28	5,104.42	5,766.20	185,683.83
Supplies and materials	323,676.93	18,973.17	20,888.38	12,061.34	18,860.45	24,252.49	418,712.76
Equipment	148,108.15	3,446.04	3,988.93	1,946.31	1,110.06	3,863.00	162,462.49
Land and structures	18,959.43			758.14			19,717.57
Retirement	1,451.93						1,451.93
Total	\$2,455,716.04	\$104,064.18	\$109,680.82	\$62,253.35	\$76,733.05	\$100,414.87	\$2,908,862.31

EXPERIMENT STATION STAFF

The Board of Regents

THE HON. JAMES F. BELL, Minneapolis	- - - - -	1957
THE HON. DANIEL C. GAINNEY, Owatonna	- - - - -	1961
THE HON. RICHARD L. GRIGGS, Duluth	- - - - -	1957
THE HON. MARJORIE J. HOWARD, Excelsior	- - - - -	1959
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THE HON. LESTER A. MALKERSON, Minneapolis	- - - - -	1959
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THE HON. CHARLES W. MAYO, Rochester	- - - - -	1959
THE HON. A. J. OLSON, Renville	- - - - -	1961
THE HON. RAY J. QUINLIVAN, St. Cloud	- - - - -	1957
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 W. P. MARTIN, Ph.D., Head, Department of Soils
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 T. M. MCCALL, M.S., Superintendent, Northwest Experiment Station, Crookston

R. E. HODGSON, M.S., Superintendent, Southern Experiment Station, Waseca
 A. W. EDSON, M.S., Superintendent, West Central Experiment Station, Morris
 THORVALD SCHANTZ-HANSEN, Ph.D., Director, Forestry and Biological Station, Itasca Park
 H. B. SWANSON, M.S., Editor
 E. B. STANFORD, Ph.D., Librarian
 HARALD OSTVOLD, B.S., Agricultural Librarian

DEPARTMENT OF AGRICULTURAL BIOCHEMISTRY

W. F. GEDDES, Ph.D., Professor and Head

Colloids, Carbohydrates, and Proteins

D. R. BRIGGS, Ph.D., Professor
 FRED SMITH, Ph.D., D.Sc., Professor
 REX MONTGOMERY, Ph.D., Research Associate

Cereal Technology

L. S. CUENDET, Ph.D., Associate Professor

Nutrition, Dairy Chemistry, and Analytical Service

M. O. SCHULTZE, Ph.D., Professor
 P. D. BOYER, Ph.D., Professor
 ROBERT JENNESS, Ph.D., Professor
 I. E. LIENER, Ph.D., Associate Professor
 M. J. PALLANSCH, Ph.D., Research Fellow

DEPARTMENT OF AGRICULTURAL ECONOMICS

O. B. JESNESS, Ph.D., Professor and Head
 E. F. KOLLER, Ph.D., Professor
 G. A. POND, Ph.D., Professor
 W. W. COCHRANE, Ph.D., Professor
 A. A. DOWELL, Ph.D., Professor
 P. M. RAUP, Ph.D., Professor
 R. W. COX, Ph.D., Associate Professor
 S. A. ENGINE, Ph.D., Associate Professor
 TRUMAN R. NODLAND, Ph.D., Assistant Professor
 R. P. DAHL, Ph.D., Assistant Professor
 A. C. KNUDTSON, M.S., Instructor
 H. C. LAMPE, B.S., Instructor
 R. A. HINTON, M.S., Instructor

¹ Resigned June 30, 1955
² Resigned April 30, 1955
³ Appointed September 1, 1954
⁴ Appointed July 1, 1954

DEPARTMENT OF AGRICULTURAL ENGINEERING

A. J. SCHWANTES, M.S., Professor and Head

Farm Power and Machinery

JOHN STRAIT, M.S., Associate Professor
 R. V. KEPPEL, M.S., Instructor
 *J. R. BEEBE, M.S., Instructor
 J. G. DENT, Instructor
 V. M. MEYER, Instructor

Farm Structures

C. K. OTIS, M.S., Professor
 C. H. CHRISTOPHERSON, M.A., Associate Professor
 J. H. POMROY, M.S., Instructor

Agricultural Physics and Rural Electrification

ANDREW HUSTRULID, Ph.D., Professor
 A. M. FLIKKE, M.S., Assistant Professor
 H. A. CLOUD, M.S., Instructor

Soil and Water Conservation

P. W. MANSON, M.S., Professor
 E. R. ALLRED, M.S., Associate Professor
 C. L. LARSON, M.S., Assistant Professor

Detailed by the United States Department of Agriculture, Agricultural Research Service, Agricultural Engineering Research Branch, Farm Machinery Section, for Cooperative Work

L. A. LILJEDAHL, B.S., Assistant Agricultural Engineer

DEPARTMENT OF AGRONOMY AND PLANT GENETICS

W. M. MYERS, Ph.D., Professor and Head
 C. R. BURNHAM, Ph.D., Professor
 R. S. DUNHAM, M.S., Professor
 E. H. RINKE, Ph.D., Professor
 CARL BORGESON, M.S., Associate Professor
 J. W. LAMBERT, Ph.D., Associate Professor
 A. R. SCHMID, Ph.D., Associate Professor
 H. L. THOMAS, Ph.D., Associate Professor
 E. L. PINNELL, Ph.D., Associate Professor
 R. A. BRIGGS, Ph.D., Associate Professor
 L. J. ELLING, Ph.D., Assistant Professor

* On leave September 1, 1954, to August 31, 1956

R. G. ROBINSON, Ph.D., Assistant Professor
 K. J. HSU, Ph.D., Research Fellow
 K. S. KOO, Ph.D., Research Fellow

Detailed by the United States Department of Agriculture, Agricultural Research Service, Cereal Crops Section, for Cooperative Work

E. R. AUSEMUS, Ph.D., Agronomist
 J. O. CULBERTSON, Ph.D., Agronomist
 R. S. CALDECOTT, Ph.D., Geneticist
 B. H. BEARD, Ph.D., Research Agronomist
 V. E. COMSTOCK, M.S., Research Agronomist
 J. C. SENTZ, Ph.D., Research Agronomist
 D. W. SUNDERMAN, M.S., Research Agronomist

DEPARTMENT OF ANIMAL HUSBANDRY

E. F. FERRIN, M.Agr., Professor and Head
 A. L. HARVEY, Ph.D., Professor
 L. E. HANSON, Ph.D., Professor
 L. M. WINTERS, Ph.D., Professor
 P. A. ANDERSON, B.S., Associate Professor
 J. N. CUMMINGS, Ph.D., Associate Professor
 W. J. AUNAN, Ph.D., Assistant Professor
 R. M. JORDAN, Ph.D., Assistant Professor
 W. E. REMPEL, Ph.D., Assistant Professor

DEPARTMENT OF DAIRY HUSBANDRY

J. B. FITCH, M.S., Professor and Head

Dairy Production

T. W. GULLICKSON, Ph.D., Professor
 *W. E. PETERSEN, Ph.D., Professor
 N. D. BAYLEY, Ph.D., Associate Professor
 †C. F. FOREMAN, Ph.D., Assistant Professor
 ‡H. W. THOELE, M.S., Research Fellow
 §P. J. DZIUK, Ph.D., Research Fellow
 ¶E. F. GRAHAM, Ph.D., Research Fellow

Dairy Industry

W. B. COMBS, M.A., Professor
 S. T. COULTER, Ph.D., Professor

* On leave March 28 to June 11, 1955

† Resigned January 15, 1955

‡ Resigned November 30, 1954

§ Appointed January 1, 1955

E. L. THOMAS, Ph.D., Assistant Professor
 H. A. MORRIS, Ph.D., Assistant Professor
¹⁰A. W. RUDNICK, JR., Ph.D., Instructor
¹¹V. H. TOWNLEY, Ph.D., Research Associate
¹²L. A. RICHARDSON, M.S., Instructor

Dairy Bacteriology

H. MACY, Ph.D., Professor
 J. J. JEZESKI, Ph.D., Associate Professor
 J. C. OLSON, JR., Ph.D., Associate Professor

DEPARTMENT OF ENTOMOLOGY AND ECONOMIC ZOOLOGY

C. E. MICKEL, Ph.D., Professor and Head
 A. A. GRANOVSKY, Ph.D., Professor
 A. C. HODSON, Ph.D., Professor
 F. G. HOLDAWAY, Ph.D., Professor
 W. H. MARSHALL, Ph.D., Professor
 A. G. RICHARDS, Ph.D., Professor
 M. H. HAYDAK, Ph.D., Associate Professor
 L. L. SMITH, JR., Ph.D., Associate Professor
 L. K. CUTKOMP, Ph.D., Associate Professor
 T. L. AAMODT, B.S., Assistant Professor
 JAMES R. BEER, Ph.D., Assistant Professor
 T. A. GOCHNAUER, Ph.D., Research Associate
 R. L. BUTLER, M.S., Research Associate
 A. G. PETERSON, Ph.D., Assistant Professor
 A. R. BARR, Ph.D., Instructor
 E. F. COOK, Ph.D., Assistant Professor
 H. C. CHIANG, Ph.D., Research Associate
 T. B. CLARK, M.S., Research Fellow
 B. A. HAWS, M.S., Research Fellow
 K. W. TUCKER, B.S., Research Fellow

SCHOOL OF FORESTRY

F. H. KAUFERT, Ph.D., Professor, Director
 THORVALD SCHANTZ-HANSEN, Ph.D., Professor
¹³A. E. SCHNEIDER, Ph.D., Professor
 L. W. REESE, Ph.D., Professor
 R. M. BROWN, M.F., Professor
 H. L. HANSEN, Ph.D., Associate Professor
 R. L. HOSSFELD, Ph.D., Associate Professor
 D. P. DUNCAN, Ph.D., Associate Professor
¹⁴S. S. PAULEY, Ph.D., Associate Professor

¹⁰ Resigned January 31, 1955

¹¹ Deceased January 1, 1955

¹² Appointed March 1, 1955

¹³ On leave effective September 5, 1954

¹⁴ Appointed April 1, 1955

R. I. BEAZLEY, Ph.D., Assistant Professor
 O. F. HALL, Ph.D., Assistant Professor
 J. R. NEETZEL, M.F., Research Associate
 E. T. SULLIVAN, Ph.D., Assistant Professor
 B. A. BROWN, M.F., Instructor
 M. P. MEYER, M.F., Instructor
 W. B. WALLIN, M.S., Instructor

SCHOOL OF HOME ECONOMICS

LOUISE A. STEDMAN, Ph.D., Professor and Director
¹⁵ALICE BIESTER, A.M., Professor
 JANE M. LEICHSENRING, Ph.D., Professor
 ISABEL NOBLE, Ph.D., Professor
¹⁶ETHEL PHELPS, M.S., Professor
 DOROTHY F. SIMMONS, M.S., Professor
 HELEN L. PILCHER, Ph.D., Assistant Professor
¹⁷MARY ANN MORRIS, Ph.D., Assistant Professor

DEPARTMENT OF HORTICULTURE

L. C. SNYDER, Ph.D., Professor and Head; Superintendent, Fruit Breeding Station
 F. A. KRANTZ, Ph.D., Professor
 T. M. CURRENCE, Ph.D., Professor
¹⁸W. G. BRIERLEY, Ph.D., Professor
 A. N. WILCOX, Ph.D., Professor
 A. E. HUTCHINS, Ph.D., Associate Professor
 R. E. NYLUND, Ph.D., Associate Professor
 J. D. WINTER, M.S., Associate Professor
 T. S. WEIR, M.S., Associate Professor and Assistant Superintendent of Fruit Breeding Station
 R. A. PHILLIPS, M.S., Assistant Professor
¹⁹A. A. PIRINGER, Ph.D., Assistant Professor
 R. E. WIDMER, M.S., Instructor
²⁰R. J. STADTHERR, M.S., Research Fellow
²¹S. R. TRANTANELLA, B.S., Instructor

Detailed by the United States Department of Agriculture,
 Bureau of Plant Industry, Soils and Agricultural
 Engineering, for Cooperative Work

TOM K. TOYAMA, Special Agent
 FLORIAN I. LAUER, Special Agent

¹⁵ Retired June 15, 1955

¹⁶ Retired June 15, 1955

¹⁷ Appointed September 16, 1954

¹⁸ Retired June 30, 1954

¹⁹ Appointed August 16, 1954

²⁰ Appointed October 1, 1954

²¹ Appointed July 1, 1954

DEPARTMENT OF PLANT PATHOLOGY AND BOTANY

J. J. CHRISTENSEN, Ph.D., Professor and Head
²²C. J. EIDE, Ph.D., Professor
 HELEN HART, Ph.D., Professor
 C. M. CHRISTENSEN, Ph.D., Professor
 M. F. KERNKAMP, Ph.D., Associate Professor
 T. H. KING, Ph.D., Associate Professor
 T. KOMMEDAHL, Ph.D., Assistant Professor
 R. H. LANDON, Ph.D., Assistant Professor
 LOUISE T. DOSDALL, Ph.D., Assistant Professor
 D. W. FRENCH, Ph.D., Assistant Professor
 J. E. DeVAY, Ph.D., Assistant Professor
 M. B. MOORE, M.S., Instructor
 R. N. CAMPBELL, M.S., Instructor
²³H. G. HEGGENESS, M.S., Instructor
²⁴J. B. ROWELL, Ph.D., Research Associate
²⁵I. A. WATSON, Ph.D., Research Associate
 E. E. BUTLER, Ph.D., Research Fellow
²⁶F. I. FROSHEISER, Ph.D., Research Fellow
²⁷A. J. LINCK, Ph.D., Research Fellow
²⁸R. R. NELSON, Ph.D., Research Fellow

Detailed by the United States Department of Agriculture,
 Agricultural Research Service, Field Crops Research
 Branch, for Cooperative Work
 Cereal Crops

²⁹M. N. LEVINE, Ph.D., Plant Pathologist
 E. B. HAYDEN, M.S., Agent, Pathologist
 B. J. ROBERTS, M.S., Agent, Pathologist

Sugar Crops

C. L. SCHNEIDER, M.S., Plant Pathologist

Agricultural Research Service, Plant Pest Control Branch

R. U. COTTER, Ph.D., Pathologist
 T. H. STEWART, B.S., State Leader of Barberry Eradication
 D. M. STEWART, Ph.D., Pathologist
³⁰E. C. STAKMAN, Ph.D., D.Sc., Agent

²² Leave of absence June 15, 1955, to September 15, 1955

²³ Resigned June 30, 1955

²⁴ Resigned March 10, 1955

²⁵ Appointed May 3, 1955

²⁶ Appointed October 1, 1954

²⁷ Appointed April 1, 1955

²⁸ Resigned March 31, 1955

²⁹ Retired June 30, 1955

³⁰ Retired May 31, 1955

Detailed by the State Department of Agriculture,
 Dairy and Food, for Cooperative Work

A. G. TOLAAS, M.S., in Charge Office of Seed Potato Certification
 J. L. LARSON, Seed Analyst in Charge of Seed Germination
 H. G. REGNIER, Chief Inspector, Office of Seed Potato Certification

DEPARTMENT OF POULTRY HUSBANDRY

E. L. JOHNSON, Ph.D., Professor and Head
 H. J. SLOAN, Ph.D., Professor
 T. H. CANFIELD, M.S., Associate Professor
 R. N. SHOFFNER, Ph.D., Associate Professor
 M. H. SWANSON, Ph.D., Assistant Professor
³¹P. E. WAIBEL, Ph.D., Research Associate

DEPARTMENT OF SOILS

³²C. O. ROST, Ph.D., Professor
³³W. P. MARTIN, Ph.D., Professor and Head
 P. M. BURSON, M.S., Professor
 P. R. McMILLER, M.S., Professor
 A. C. CALDWELL, Ph.D., Associate Professor
 J. M. MACGREGOR, Ph.D., Associate Professor
³⁴E. L. SCHMIDT, Ph.D., Associate Professor
³⁵G. R. BLAKE, Ph.D., Research Associate
 H. F. ARNEMAN, Ph.D., Assistant Professor
³⁶JOHN GRAVA, Ph.D., Research Fellow
 ROUSE S. FARNHAM, Ph.D., Research Fellow

Soil Conservation Service

A. H. PASCHALL, M.S., Senior Soil Scientist and Correlator
 ALEX ROBERTSON, B.S., Soil Scientist and Collaborator

DEPARTMENT OF VETERINARY SCIENCE

³⁷W. T. S. THORP, D.V.M., M.S., Assistant Dean, Director of the School of
 Veterinary Medicine, and Professor
 R. L. KITCHELL, D.V.M., Ph.D., Professor
 A. F. WEBER, D.V.M., Ph.D., Associate Professor
 J. T. BELL, D.V.M., Instructor
 M. W. STROMBERG, D.V.M., Instructor
 B. S. POMEROY, D.V.M., Ph.D., Professor

³¹ Appointed September 20, 1954

³² Retired June 30, 1954

³³ Appointed July 1, 1954

³⁴ Appointed September 16, 1954

³⁵ Appointed February 1, 1955

³⁶ Appointed November 16, 1954

³⁷ Appointed July 1, 1954

M. H. ROEPKE, Ph.D., Professor
 R. K. LINDORFER, M.S., Instructor
³⁸J. M. SIEBURTH, M.S., Research Fellow
 J. H. SAUTTER, D.V.M., Ph.D., Professor
 H. C. H. KERNKAMP, D.V.M., M.S., Professor
 C. E. REHFELD, D.V.M., Instructor
³⁹E. D. BESCH, D.V.M., Instructor
⁴⁰F. E. HILTON, D.V.M., Instructor
⁴¹D. R. KNAUFF, D.V.M., Instructor
 J. J. CLARK, D.V.M., Research Fellow
 A. F. SELLERS, D.V.M., Ph.D., Professor
⁴²H. E. DZIUK, D.V.M., Instructor
 A. L. GOOD, D.V.M., M.S., Instructor
 C. M. STOWE, D.V.M., Instructor
 P. B. HAMMOND, D.V.M., Instructor
 E. N. BERGMAN, D.V.M., Instructor
 H. H. HOYT, D.V.M., Ph.D., Professor
 J. N. CAMPBELL, D.V.S., Professor
 G. W. MATHER, D.V.M., Ph.D., Professor
 D. K. SORENSON, D.V.M., Ph.D., Assistant Professor
 R. A. MERRILL, D.V.M., Associate Professor
 D. G. LOW, D.V.M., Instructor
 FRANK SAUER, D.V.M., Instructor
⁴³W. F. CATES, D.V.M., Instructor
 J. P. ARNOLD, D.V.M., Instructor
 F. A. SPURRELL, D.V.M., Instructor
 D. H. CLIFFORD, D.V.M., Instructor
 E. A. USENIK, D.V.M., Instructor
 RAIMUNDS ZEMJANIS, D.V.M., Instructor
 L. L. LARSON, D.V.M., Instructor
 REUEL FENSTERMACHER, D.V.M., Professor
 CHARLES GALE, D.V.M., Instructor

RURAL SOCIOLOGY

LOWRY NELSON, Ph.D., Professor
 ROY G. FRANCIS, Ph.D., Assistant Professor
 GEORGE A. DONOHUE, M.S., Instructor

INFORMATION SERVICE

HAROLD B. SWANSON, M.S., Associate Professor and Editor
 RAYMOND S. WOLF, B.S., Assistant Professor and Extension Information Specialist (radio)

³⁸ Resigned March 31, 1955
³⁹ Appointed September 1, 1954
⁴⁰ Resigned August 31, 1954
⁴¹ Appointed July 1, 1954
⁴² Resigned January 15, 1955
⁴³ Appointed July 1, 1954

GERALD R. MCKAY, M.S., Assistant Professor and Extension Specialist in Visual Education
 JOSEPHINE B. NELSON, M.A., Instructor and Extension Assistant Editor
 HARRY R. JOHNSON, B.A., Instructor and Extension Information Specialist
 GWEN H. HAWS, B.S., Agricultural Bulletins Editor
 JEAN M. METCALF, B.A., Editorial Assistant

AGRICULTURAL EXPERIMENT STATION—ROSEMOUNT

A. C. HEINE, B.S., Associate Professor, Superintendent
 R. M. DENNISTOUN, M.S., Instructor, Assistant Superintendent

NORTH CENTRAL EXPERIMENT STATION

C. L. COLE, M.S., Associate Professor, Superintendent
 R. B. AAKRE, B.S., Assistant Professor
 C. H. GRIFFITH, M.Ph., Assistant Professor
 N. H. GRIMSBO, B.S., Instructor
 L. M. LAMOIS, M.F., Instructor
 A. B. SALMELA, M.S., Instructor

NORTHEAST EXPERIMENT STATION

RALPH S. GRANT, M.S., Assistant Professor, Superintendent
 WALLACE W. NELSON, B.S., Instructor, Assistant Superintendent

NORTHWEST EXPERIMENT STATION

T. M. MCCALL, M.S., Professor and Superintendent
 O. C. SOINE, Ph.D., Associate Professor
 H. D. FAUSCH, Ph.D., Associate Professor
 B. C. BERESFORD, M.S., Assistant Professor
 H. W. SODERBURG, M.S., Assistant Professor
 E. C. MILLER, M.S., Assistant Professor
 A. M. PILKEY, Instructor
⁴⁴R. M. STOLEN, M.S., Instructor

SOUTHERN EXPERIMENT STATION

R. E. HODGSON, M.S., Professor and Superintendent
 K. P. MILLER, M.S., Assistant Professor
 JOHN THOMPSON, M.S., Instructor

WEST CENTRAL EXPERIMENT STATION

A. W. EDSON, M.S., Professor and Superintendent
 R. O. BRIDGFORD, M.S., Associate Professor

⁴⁴ Resigned February 28, 1955