

SIXTY-THIRD ANNUAL REPORT

Agricultural Experiment Station
University of Minnesota

JULY 1, 1955 TO JUNE 30, 1956



UNIVERSITY OF MINNESOTA

ST. PAUL CAMPUS

LETTERS OF TRANSMITTAL

University of Minnesota, Minneapolis, Minn.

July 1, 1956

*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, 1956.

Respectfully transmitted,

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

July 1, 1956

*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, 1956.

Respectfully transmitted,

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

July 1, 1956

*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, 1956.

Respectfully submitted,

H. J. SLOAN, *Director*

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SIXTY-THIRD ANNUAL REPORT
JULY 1, 1955 TO JUNE 30, 1956

H. J. Sloan, Director
M. F. Kernkamp, Assistant Director

FOREWORD

WHY DO WE NEED TO CONTINUE RESEARCH and why is it necessary to expand research? These questions probably could be answered in many ways, but it is apparent that new developments breed more developments, one thing leads to another, and the more we know about something the more we want and need to know.

A philosopher once said that knowledge expands the unknown. This is literally true because as we learn more facts, we find that there are many more things that we do not know. It is human nature to investigate and search the unknown. Some people can enjoy the luxury of searching the unknown just for the sheer pleasure of finding out something new or searching for the truth. However, the Agricultural Experiment Station usually has more practical reasons for continuing and expanding research. New discoveries often make it mandatory to do more investigating so the results of those new discoveries can be used in a practical manner by our citizens.

The success of the farmer or his failure has drastic effects on our economic and sociologic welfare, and thus demands are placed on the Experiment Station for additional research in order to make farm production more stable, profitable, and pleasant. A few examples of how the acquisition of knowledge expands the unknown and how the demands of the public make it necessary for research to continue and to expand may help to emphasize these needs.

In the early days of crop improvement, we learned how to develop new varieties. These varieties were distributed to farmers and grown on large acreages. Gradually they began to "run out," as the saying went at the time. We did not know why these varieties "ran out." Research, therefore, was needed to find out why.

Through intensive research it was found that the organisms that cause diseases of plants are capable of changing and attacking new varieties of crop plants, thus, much of the "running out" of these crops was no fault of the crop itself or the new variety, but it was because of the development of a new and more virulent form of the disease causing organism. This bit of knowledge led to still further questions. For example, how do the disease organisms change? Further research demonstrated that the organisms that cause the diseases of plants change by the same laws of inheritance that operate in animals, humans, or the very crops that they attack.

Not all of the answers are known today. For example, the questions as to what extent can pathogens change, to what extent can virulence of a pathogen be increased, to what extent can resistance of a crop be increased, and what are the best methods of determining these answers are still important today.

Only in recent years was the discovery of antibiotics made by Dr. Fleming in England. This discovery immediately raised many questions as to the use of antibiotics in the control of human diseases, animal diseases, and plant diseases. Shortly after antibiotics were used in controlling human diseases, it became apparent that certain strains of the organisms that cause diseases became resistant to the antibiotics and, therefore, the antibiotics were not effective in controlling the diseases.

With the recent developments of new and more specific insecticides, it was soon discovered that certain strains of insects developed resistance to the insecticides. Now one of the important questions is whether or not weeds will develop resistance to certain forms of chemicals that are used for their control. Only further investigation and research will bring us answers to these questions.

With today's highly technologic developments and labor saving devices, mechanization has become common place in farming operations. Mechanization has created literally thousands of problems. One of the most important is the uniformity in the ripening or maturing of crops. When a man goes through a field he can pick out the ripe fruit from the immature fruit, but a mechanical harvester cannot.

The harvesting and processing of sweet corn is one of the best examples to illustrate this problem. When sweet corn was harvested by hand, a man could go down the row and pick out the marketable ears, leave those that were not sufficiently mature,

and come back later and pick them as they developed. Today, all of the ears must be ripe at one time because the mechanical picker has no way of knowing which is ripe and which is not.

The corn is then transported to the cannery. The kernels are cut from the cob by mechanical means. Here again uniformity is essential because if a small ear follows a large ear, the chances are that the kernels will not be removed from the cob. They must be uniform in size in order to get uniform removal of the kernels from the cob. Furthermore, whole ears are canned and the space in the can must be utilized to greatest advantage. Therefore, it is necessary again to have ears of uniform size so that two, three, or four ears can be put into one can. This problem raises questions as: can this be accomplished by breeding; what effect does fertility have on maturity and ear size; will proper application of chemicals help. The answers to these questions were not needed until mechanical processing became common.

Combine harvesting of grain and picker-sheller methods of harvesting corn also demand uniformity in the maturity of those crops. They must ripen in the field and all of the field must ripen at one time because the grain must cure on the stem and not in the shock or the stacks as they used to. Machine harvesting demands crops that will not lodge. It demands corn that will not drop its ears on the ground. A man picking corn can stoop down and pick up the ears off of the ground, but the machine cannot. Again, these qualities were not required until mechanical harvesting was introduced.

Today marketing demands and the desires and demands of the housewife are much more critical than they were in years gone by. Our fruits and vegetables are packaged in plastic bags and other containers so that the housewife can actually see what she is buying before she takes it home. She demands uniformity in shape and size, an attractive color, and an attractive package. Products with blemishes do not sell well. Above all, the product must be palatable and the public today knows that palatability of fruits, vegetables, and meats can be improved or changed through research and investigation. All of these qualities and characteristics create new problems for the grower, the processor, and the retailer, and all of the people concerned demand research to provide the quality they want in their products.

At one time, varieties of fruits and vegetables were chosen for their qualities as raw food or canned food. Today, much of the fruit and vegetable crop is preserved by freezing. The public de-

mands convenience and quality. The latter means palatability and appearance. It has been known for years that some varieties of apples for example make better pies or sauce than others. Some are better eaten raw than others. The question is now, how will this variety freeze? Are some varieties better than others for freezing? Can we develop new varieties that are better for freezing than the ones we have today?

This is a problem in itself, but the very processes of packaging and freezing must be developed and improved. Our housewives and our food processors have had years of experience in canning fruits and vegetables, but they have had very few years of experience in freezing fruits and vegetables. New and better methods are always in demand. If we carry this one step further, questions arise regarding the effect of freezing, thawing, and cooking on the nutritive value of the foods that were preserved by freezing. Freezing quality was not important until frozen foods became popular. Here again, relatively little is known and much is to be learned through research.

Only a few examples are presented here to illustrate the question why research must be continued and why research must expand. Many other examples could be given, but all examples would illustrate that man wants to investigate the unknown, he wants to improve his life, he wants more luxury, more comforts, more security, and stability in his business, and he wants it to be easier.

Many of the questions raised in this discussion did not exist a few years ago, and thus did not need investigating. However, as methods, tastes, economic needs, and customs change new problems arise. This will undoubtedly be a continuing process. Therefore, research must and will continue as long as man himself wants to progress and advance.

CHANGES IN STAFF

Appointments

D. M. Barnes, D.V.M., instructor, School of Veterinary Medicine, July 1, 1955.

Gladys I. Bellinger, Ph.D., associate professor, School of Home Economics, September 16, 1954.

H. L. Bissonnette, B.S., agent, plant pathologist, Department of Plant Pathology and Botany, January 16, 1956.

C. W. Boothroyd, Ph.D., assistant professor, Department of Plant Pathology and Botany, February 16, 1956.

Earl K. Brigham, M.A., Instructor and Agricultural Bulletin Editor, Information Service, November 10, 1955.

M. K. Christiansen, B.S., instructor, Department of Agricultural Economics, July 1, 1955.

W. M. Dickson, D.V.M., instructor, School of Veterinary Medicine, July 1, 1955.

L. J. Hanson, D.V.M., instructor, School of Veterinary Medicine, November 1, 1955.

F. D. Irving, M.F., instructor, School of Forestry, August 1, 1955.

D. W. Johnson, D.V.M., instructor, School of Veterinary Medicine, November 1, 1955.

L. E. Juers, M.S., research fellow, Department of Agricultural Economics, July 1, 1955.

M. F. Kernkamp, Ph.D., Assistant Director, Agricultural Experiment Station, April 1, 1956.

S. Kirkwood, Ph.D., associate professor, Department of Agricultural Biochemistry, July 1, 1955.

R. J. Klug, research fellow, Department of Plant Pathology and Botany, July 1, 1955.

K. I. Loken, D.V.M., research fellow, School of Veterinary Medicine, September 1, 1955.

T. H. Nicolson, Ph.D., research fellow, Department of Plant Pathology and Botany, October 10, 1955.

V. Perman, D.V.M., instructor, School of Veterinary Medicine, July 1, 1955.

R. D. Price, M.A., instructor, Department of Entomology and Economic Zoology, September, 1955.

G. H. Pyne, M.S., instructor, Department of Dairy Husbandry, August 29, 1955.

D. Reimer, M.S., instructor, Northwest Experiment Station, August 16, 1955.

B. L. Renfro, M.S., research fellow, Department of Plant Pathology and Botany, January 1, 1956.

R. H. Rust, Ph.D., assistant professor, Department of Soils, March 16, 1956.

L. A. Snyder, Ph.D., assistant professor, Department of Agronomy and Plant Genetics, November 1, 1955.

E. W. Sprague, Ph.D., geneticist, Department of Agronomy and Plant Genetics, April 1, 1956.

C. M. Stine, M.S., research fellow, Department of Dairy Husbandry, July 1, 1955.

J. T. Tumlin, D.V.M., instructor, School of Veterinary Medicine, September 1, 1955.

J. B. Williams, Ph.D., assistant professor, Department of Dairy Husbandry, July 1, 1955.

D. A. Willigan, D.V.M., instructor, School of Veterinary Medicine, August 1, 1955.

J. M. Wetmore, A.M., research fellow, Department of Agricultural Economics, July 1, 1955.

R. B. Zoller, B.S., instructor, Department of Agricultural Economics, September 1, 1955.

Promotions

J. P. Arnold, Ph.D., associate professor and head of the Division of Veterinary Surgery and Radiology, School of Veterinary Medicine, May 1, 1956.

G. R. Blake, Ph.D., associate professor, Department of Soils, July 1, 1955.

R. S. Farnham, Ph.D., research associate, Department of Soils, July 1, 1955.

G. A. Donohue, M.S., assistant professor, Department of Rural Sociology, July 1, 1955.

E. F. Graham, Ph.D., instructor, Department of Dairy Husbandry, January 1, 1956.

R. S. Grant, M.S., associate professor, Northeast Experiment Station, July 1, 1955.

P. B. Hammond, M.S., associate professor, School of Veterinary Medicine, August 18, 1955.

R. K. Lindorfer, M.S., assistant professor, School of Veterinary Medicine, July 1, 1955.

H. A. Morris, Ph.D., associate professor, Department of Dairy Husbandry, July 1, 1955.

A. M. Pilkey, assistant professor, Northwest Experiment Station, July 1, 1955.

W. E. Rempel, Ph.D., associate professor, Department of Animal Husbandry, July 1, 1955.

R. N. Shoffner, Ph.D., professor, Department of Poultry Husbandry, July 1, 1955.

L. A. Snyder, Ph.D., assistant professor, Department of Agronomy and Plant Genetics, November 1, 1955.

L. A. Snyder, Ph.D., assistant professor, Department of Agronomy and Plant Genetics, November 1, 1955.

Francis A. Spurrell, Ph.D., associate professor, School of Veterinary Medicine, January 1, 1956.

D. K. Sorenson, D.V.M., associate professor, School of Veterinary Medicine, July 1, 1955.

C. M. Stowe, Ph.D., associate professor, School of Veterinary Medicine, July 1, 1955.

E. L. Thomas, Ph.D., associate professor, Department of Dairy Husbandry, July 1, 1955.

P. E. Waibel, Ph.D., assistant professor, Department of Poultry Husbandry, July 1, 1955.

T. G. White, Ph.D., research fellow, School of Veterinary Medicine, November 16, 1955.

R. E. Widmer, Ph.D., assistant professor, Department of Horticulture, October 1, 1955.

K. E. Winsness, M.F., instructor, School of Forestry, July 1, 1956.

Resignations

A. R. Barr, Ph.D., instructor, Department of Entomology and Economic Zoology, to accept position as instructor at the University of Kansas, September 15, 1955.

N. D. Bayley, Ph.D., professor, Department of Dairy Husbandry, to accept a USDA position at Beltsville, Maryland, July 31, 1955.

E. E. Butler, Ph.D., instructor, Department of Plant Pathology and Botany, to accept position as assistant professor, University of California, October, 1955.

W. F. Cates, instructor, School of Veterinary Medicine, to enter into private practice in Emery, South Dakota, August 31, 1955.

H. A. Cloud, M.S., instructor, Department of Agricultural Engineering, to accept position of research engineer with Minneapolis Honeywell Regulator Company, June 30, 1956.

L. S. Cuendet, Ph.D., associate professor, Department of Agricultural Biochemistry, to accept position in Switzerland, July 31, 1955.

P. J. Dziuk, Ph.D., research fellow, Department of Dairy Husbandry, to accept position at the University of Illinois, September 28, 1955.

F. I. Frosheiser, Ph.D., research fellow, Department of Plant Pathology and Botany, to accept position as a plant pathologist, USDA, St. Paul, Minnesota, October 7, 1955.

Harley Hanke, B.S., instructor, West Central Experiment Station, to attend the University of Minnesota for Master's Degree, October 15, 1955.

G. H. Haws, B.S., agricultural bulletins editor, Information Service, to become a homemaker at 1815 Tatum Street, St. Paul, September 17, 1955.

E. B. Hayden, M.S., plant pathologist, Department of Plant Pathology and Botany, Cereal Crops Division, to accept position in the Rust Prevention Association, Minneapolis, Minnesota, December 30, 1955.

R. A. Hinton, M.S., instructor, Department of Agricultural Economics, to become research associate in the University of Illinois, August 31, 1955.

H. K. Hsu, Ph.D., research fellow, Department of Agronomy and Plant Genetics, to return to China, no position, June 30, 1956.

Gertrude S. Joachim, research fellow, Department of Agronomy and Plant Genetics, to take a position with the Remington Rand Univac Company, St. Paul, Minnesota, January 31, 1956.

Harry R. Johnson, M.S., instructor and extension information specialist, Information Service, to seek commercial employment, June 30, 1956.

M. F. Kernkamp, Ph.D., associate professor, Department of Plant Pathology and Botany, to become assistant director, Minnesota Agricultural Experiment Station, March 31, 1956.

Lloyd Lamois, M.F., instructor, North Central School and Experiment Station, to accept position with Lake States Forest Service, St. Paul, Minnesota, August 12, 1955.

H. C. Lampe, B.S., instructor, Department of Agricultural Economics, to accept position of assistant professor in the University of Connecticut, December 23, 1955.

Jean M. Metcalf, B.A., editorial assistant, Information Service, automobile accident, July 22, 1955.

Rex Montgomery, Ph.D., research associate, Department of Agricultural Biochemistry, to accept position at the University of Iowa, November 30, 1955.

Mary Ann Morris, Ph.D., assistant professor, School of Home Economics, to accept position in the University of California, Berkeley, California, June 15, 1956.

Carl E. Rehfeld, Ph.D., instructor, School of Veterinary Medicine, to accept a position in the Radiobiology Laboratory, University of Utah, September 15, 1955.

C. L. Schneider, Ph.D., plant pathologist, Department of Plant Pathology and Botany, to accept position with Sugar Beet Section of USDA, in Beltsville, Maryland, February 9, 1956.

R. M. Stolen, M.S., instructor, Northwest Experiment Station, to accept position with Land O'Lakes Creamery, March 18, 1955.

I. A. Watson, Ph.D., research associate, Department of Plant Pathology and Botany, to accept position with the University of Sydney, N.S.W., Australia, May 2, 1956.

Retirements

R. O. Bridgeford, M.S., associate professor, West Central Experiment Station, June 30, 1956.

J. G. Dent, instructor, Department of Agricultural Engineering, June 16, 1956.

E. F. Ferrin, M.Agr., professor and head, Department of Animal Husbandry, June 30, 1956.

J. B. Fitch, M.S., professor and head, Department of Dairy Husbandry, June 30, 1956.

A. A. Granovsky, Ph.D., professor, Department of Entomology and Economic Zoology, June 30, 1956.

T. W. Gullickson, Ph.D., professor, Department of Dairy Husbandry, June 30, 1956.

T. M. McCall, M.S., professor and superintendent, Northwest Experiment Station, June 30, 1956.

Leaves of Absence

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

E. N. Bergman, D.V.M., instructor, School of Veterinary Medicine, returned from active army duty on October 1, 1955.

P. M. Burson, M.S., professor, Department of Soils, special assignment to Seoul National University of Korea, June 1, 1956.

C. J. Eide, Ph.D., professor, Department of Plant Pathology and Botany, on leave to tour in South and Central America for the Rockefeller Foundation, June 16, 1955, to September 15, 1955.

J. W. Lambert, Ph.D., associate professor, Department of Agronomy and Plant Genetics, on faculty short term leave to northern Europe, April 16, 1956.

P. W. Manson, M.S., professor, Department of Agricultural Engineering, on leave to accept assignment in Seoul, University of Korea.

W. E. Petersen, Ph.D., professor, Department of Dairy Husbandry, on leave because of illness, February 20, to April 1, 1956.

A. E. Schneider, Ph.D., professor, School of Forestry, on leave to head University Korean project, September 5, 1954, to (Indefinite).

J. D. Winter, M.S., associate professor, Department of Horticulture, single quarter leave of absence for study of food processing in Europe, April 1, 1956, to July 1, 1956.

Deaths

P. R. McMiller, M.S., professor emeritus, Department of Soils, February 27, 1956.

P. S. Jordan, B.S., associate professor, West Central Experiment Station, March 9, 1956.

PUBLICATIONS

Agricultural Experiment Station

GENERAL BULLETIN SERIES

432. Trends in Rural-Urban Distribution of Hospital Facilities and Physicians in Minnesota. Lowry Nelson and Roy G. Francis, 20 pages, 5,000.

433. Quantity Discount Pricing of Fluid Milk. John D. Helmsberger and E. Fred Koller, 32 pages, 6,000.

434. (NC Reg. 71). Quackgrass Control. R. S. Dunham, 12 pages, 22,500.

435. Costs of Drying Milk in Specialized Drying Plants. Linley E. Juers and E. Fred Koller, 32 pages, 5,000.

TECHNICAL BULLETIN SERIES

217. Groundwater Fluctuations in Certain Open and Forested Bogs of Northern Minnesota. Philip W. Manson and Dalton G. Miller, 28 pages, 3,000.

218. The Nearctic Chaborinae (Diptera: Culicidae). Edwin F. Cook, 102 pages, 3,000.

219. Farm Accounts as a Source of Data for Farm Management Research. George A. Pond, 24 pages, 5,000.

MINNESOTA FARM AND HOME SCIENCE

Volume XIII, Number 1, 20 pages, 16,500.

Volume XIII, Number 2, 20 pages, 16,500.

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

REPORT SERIES

Sixty-Second Annual Report of the Minnesota Agricultural Experiment Station. July 1, 1954, to June 30, 1955, 52 pages, 2,500.

Miscellaneous Report 20. (Revised). Maturity Ratings for Corn Hybrids in Minnesota, 1956-57. E. H. Rinke, Gertrude Joachim, and N. C. Olmein, 16 pages, 2,000.

Miscellaneous Report 26. Mesabi and Wanda: New Chrysanthemums. Horticulture Department, 2 pages, 5,000.

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

Agricultural Extension Service

BULLETIN SERIES

134. (Revised) Soybeans for Minnesota. E. H. Jensen, J. W. Lambert, A. C. Caldwell, and M. F. Kernkamp, 24 pages, 25,000.

141. (Revised) Sheep on Minnesota Farms. W. E. Morris and P. A. Anderson, 20 pages, 7,500.

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

244. (Revised) Freezing Foods for Home Use. J. D. Winter, Andrew Hustrulid, Shirley Trantanella, Woodrow J. Aunan, and Milo H. Swanson, 48 pages, 25,000.

258. (Revised) Evergreens. L. C. Snyder, Clyde M. Christensen, A. C. Hodson, Marvin E. Smith, Richard J. Stadtherr, and David French, 28 pages, 10,000.

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

274. (Revised) Care of House Plants. Richard E. Widmer and Leon C. Snyder, 32 pages, 15,000.

277. (Revised) Guide to Fertilizer Use in Minnesota. Soils Staff, 36 pages, 25,000.

279. Pictures—Selecting, Framing, and Hanging. Myra Zabel, 20 pages, 20,000.

280. Letting Color Work for You. Myra Zabel, 16 pages, 15,000.

281. Dairy Foods. Ina B. Rowe, 20 pages, 50,000.

PAMPHLET SERIES

83. (Revised) Farm Building Plans. 12 pages, 5,000.

134. (Revised) Custom Rates for Farm Operation. H. J. Aune, T. R. Nodland, 6 pages, 5,000.

175. (Revised) Getting Your Money's Worth. Lucile Holaday, 6 pages, 5,000.

193. Guiding Your Child. Louise Danielson, 6 pages, 5,000.

194. Crop Production Guide for Minnesota. R. A. Briggs, E. H. Jensen, H. E. Jones, and C. A. Simpkins, 5,000, wall chart.

FOLDERS

22. (Revised) Varieties of Farm Crops, 1956. 24 pages, 20,000.

120. (Revised) Making Lard at Home. P. A. Anderson, 4 pages, 10,000.

153. (Revised) Longer-Lasting Fence Posts with Penta. Marvin E. Smith, 4 pages, 10,000.

154. (Revised) Vegetable Varieties in Minnesota. O. C. Turnquist, 10 pages, 12,500.

182. (Revised) Forage Mixtures. A. R. Schmid, H. E. Jones, R. A. Briggs, and R. E. Bennett, 8 pages, 10,000.

191. (Revised) Cultural and Chemical Weed Control in Minnesota, 1956. R. S. Dunham, H. L. Hansen, R. E. Nylund, and E. H. Jensen, 36 pages, 20,000.

191T. Weed Control in Minnesota, 1956 (A Summary). 8 pages, 15,000.

195. Swine Management from Weaning to Market. H. G. Zavoral, 8 pages, 15,000.

196. Know the Processed Foods You Buy. Eleanor Loomis, 8 pages, 10,000.

197. Know the Best Buys in Fruits and Vegetables. Eleanor Loomis, 6 pages, 15,000.

Special Folder. The Minnesota Extension Home Program. State Staff, 6 pages, 30,000.

YOUNG FARMER AND HOMEMAKER CIRCULARS

3. Starting in Livestock Production. W. E. Morris, 10 pages, 10,000.
4. Starting in Dairy Farming. Ralph W. Wayne, 10 pages, 10,000.

4-H CLUB BULLETIN SERIES

37. 4-H Farm and Home Electrification Project. A. M. Flikke, and D. W. Bates, 24 pages, 7,500.

NEWSLETTERS

Name of Publication	Issues	Pages	Circulation
Buy Best Buys	12	36	5,784
Club Leader Letter	4	30	18,676
Dairy Herd Improvement Monthly Letter	12	48	4,500
Dairy Herd Improvement Association Summary	1	63	4,200
Farm Business Notes	12	48	38,250
Forestry Notes	10	20	8,000
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	2,370
Our Land	52	52	20,904
Radio Shorts	52	156	5,252
Reaching Rural People	12	48	2,892
Rural Youth News	6	38	12,900
Visual Aids Tip Sheet (part of Reaching Rural People)	12	24	5,184
Total	267	875	148,426

Scientific Journal Series Papers

AGRICULTURAL BIOCHEMISTRY

3107. The preparation and proof of structure of 1, 4-bis-O-p-nitrobensoylerythritol. F. Smith and J. W. Van Cleve. *Journal of the American Chemical Society* 77:3659-3660. July, 1955.
3204. The constitution of the hemicellulose of the straw of flax (*Linum Usitatissimum* Sp.). I. Identification of 2-O-(4-O-methyl-D-glucuronosyl)-D-xylose. J. D. Geerdes and F. Smith. *Journal of the American Chemical Society* 77:3569-3572. July, 1955.
3230. Detection of amino on paper chromatograms. J. A.

Cifonelli and F. Smith. *Analytical Chemistry* 27:1501-1502. September, 1955.

3232. Nonspecific effect of soybean hemagglutinin on tumor growth. Irvin E. Liener and T. A. Seto. *Cancer Research* 15:407-409. July, 1955.

3243. The mechanism of enzymic phosphate transfer reactions. W. H. Harrison, P. D. Boyer, and A. B. Falcone. *Journal of Biological Chemistry* 215:303-317. July, 1955.

3275. Utilization of native and denatured proteins by *Tetrahymena pyriformis*. W. T. Viswanatha and Irvin E. Liener. *Archives of Biochemistry and Biophysics* 56:222-229. May, 1955.

3289. Nature of a hemicellulose extracted from cellulose with water. G. W. Huffman, P. A. Rebers, D. R. Spriestersbach, and F. Smith. *Nature* 175:990-992. June, 1955.

3290. Reduction of the products of periodate oxidation of carbohydrates. I. Hydrogenation with Raney nickel of the dialdehydes from the methyl glycopyranosides. F. Smith and J. W. Van Cleve. *Journal of the American Chemical Society* 77:3091-3096. June, 1955.

3294. A note on the synthesis of glycosides. F. Smith and J. W. Van Cleve. *Journal of the American Chemical Society* 77:3159. June, 1955.

3296. Turbidimetric method for the determination of yeast manan and glycogen. J. A. Cifonelli and F. Smith. *Analytical Chemistry* 27:1639-1641. October, 1955.

3302. The polysaccharide associated with yeast invertase. J. A. Cifonelli and F. Smith. *Journal of the American Chemical Society* 77:5682-5684. November, 1955.

3303. The carbohydrates of the Gramineae. VII. The constitution of a water-soluble hemicellulose of the endosperm of wheat (*Triticum vulgare*). R. Montgomery and F. Smith. *Journal of the American Chemical Society* 77:3325-3328.

3310. Colorimetric submicromethod for determination of ammonia. P. G. Scheurer and F. Smith. *Analytical Chemistry* 27:1616-1618. October, 1955.

3311. The constitution of the hemicellulose of the straw of flax (*Linum Usitatissimum* Sp.). II. Hydrolysis of the methylated hemicellulose. J. D. Geerdes and F. Smith. *Journal of the American Chemical Society* 77:3572-3576. July, 1955.

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3316. Physiological studies of the vagal nerve supply to the bovine stomach. I. Comparison of responses in milk-fed and roughage-fed calves using a chronic intrathoracic electrode technic. H. E. Dziuk and A. F. Sellers. *American Journal of Veterinary Research* 16:411-417. July, 1955.

3318. Physiological studies of the vagal nerve supply to the bovine stomach. II. Studies of the eructation mechanism in adult cattle. H. E. Dziuk, A. F. Sellers. *American Journal of Veterinary Research* 16:499-504. October, 1955.

3329. An evaluation of influenza in midwestern swine. George A. Young, Norman R. Underdahl. *American Journal of Veterinary Research* 16:545-622. October, 1955.

3334. Studies on egg transmission of the agent of infectious sinusitis of turkeys. C. F. Mataney, B. S. Pomeroy, O. H. Osborn. *Proceedings Book of the American Veterinary Medical Association 92nd Annual Meeting*. pp. 310-314. 1955.

3335. Primary megacolon (Hirschsprung's disease) in swine. H. C. H. Kernkamp and H. H. Kanning. *North American Veterinarian* 36:642-643. August, 1955. *Abstract in Southwestern Veterinarian* 9:78. 1955.

3352. Demonstration of Demodex Equi, Railliet, 1895, from a horse in Minnesota. Everett D. Besch and Henry Griffiths. *Journal of the American Veterinary Medical Association* 128:82-83. January 15, 1956.

3364. Post parturient albuminuria and "Downer cow" syndrome. A. F. Sellers, W. R. Pritchard, A. F. Weber, and J. H. Sautter. *Proceedings Book of the American Veterinary Medical Association 92nd Annual Meeting*. pp. 35-37. 1955.

3366. Neurological factors in sexual behavior in domestic animals. R. L. Kitchell, B. Campbell, T. A. Quilliam, and L. L. Larson. *Proceedings Book of the American Veterinary Medical Association 92nd Annual Meeting*. pp. 177-189. 1955.

3375. Bluecomb disease of turkeys. III. Preliminary studies on etiology. John M. Sieburth and B. S. Pomeroy. *Proceedings Book of the American Veterinary Medical Association 92nd Annual Meeting*. pp. 301-306. 1955.

3376. Experimental transmission of a catarrhal enteritis of chicks similar to bluecomb disease. John M. Sieburth and B. S.

Pomeroy. *American Journal of Veterinary Research* 17:24-27. January, 1956.

3500. Cystotomy in a shetland mare. E. A. Usenik, L. L. Larson, and F. Sauer. *Journal of the American Veterinary Medical Association* 128:453. May, 1956.

Miscellaneous Journal Series Papers

AGRICULTURAL BIOCHEMISTRY

870. Chemistry of dry milk products during processing and storage. R. Jenness and S. T. Coulter. *Symposium of Dry Milk Products, Quartermaster Food and Container Institute* pp. 17-43. July, 1955.

AGRICULTURAL ECONOMICS

900. Conceptualizing the supply relation in agriculture. W. W. Cochrane. *Journal of Farm Economics* 37:1101-76. December, 1955.

AGRICULTURAL ENGINEERING

892. Planning pump drainage outlets. C. L. Larson and E. R. Allred. *The Journal of the American Society of Agricultural Engineers* 37:38-40. January, 1956.

916. The junctions of equal-sized drainage tile. F. W. Blaisdell and P. W. Manson. *Paris Meeting of the International Society of Soil Science*. 1956.

AGRONOMY AND PLANT GENETICS

878. Wheat in North America. E. R. Ausemus. *Handbuch der Pflanzenzuchtung* Chapter 2, pp. 1-27. Berlin: Parey-Verlag. 1956.

ANIMAL HUSBANDRY

886. Studies of factors responsible for internal hemorrhages in hams. R. L. Kitchell, W. J. Aunan, D. P. Mossberg, and P. A. Anderson. *Proceedings of the Seventh Research Conference* (Sponsored by the Council on Research, American Meat Institute at the University of Chicago) March, 1955.

DAIRY HUSBANDRY

897. Evaporation of water from milk by spray drying. S. T. Coulter. *Journal of Dairy Science* 38:1180-84. October, 1955.

ENTOMOLOGY AND ECONOMIC ZOOLOGY

876. Recent trends in insecticide research. Laurence K. Cutkomp. *Transactions of the American Association of Cereal Chemists* 13: 83-107. 1955.
883. Recent advances in the control and diagnosis of American foulbrood disease. Thomas A. Gochnauer. *Iowa Report of the State Apiarist for 1954* pp. 34-36. December, 1954.
888. Division of labor in the honeybee colony. Mykola H. Haydak. *Iowa Report of the State Apiarist for 1954* pp. 108-121. 1955.
898. Beekeeping in Minnesota. Mykola H. Haydak and C. D. Floyd. *Gleanings in Bee Culture* 83: 464-465, 508. 1955.
903. A marsh bird study—spring 1955. James R. Beer and J. M. Gates. *Flicker* pp. 16-21. March, 1956.
904. Zoogeographic relationships of Minnesota's mammals. James R. Beer. *Flicker* 27: 4: 160-163. Fall, 1955.
905. Wallowing in the witch's brew. Thomas A. Gochnauer. *American Bee Journal* 95: 436-9. 1955.
906. European foulbrood distribution in Minnesota. Thomas A. Gochnauer and C. D. Floyd. *Gleanings in Bee Culture* 84: 156-8. 1956.
907. Increasing crop resources through Entomology research. F. G. Holdaway. *Published in Governor's Confidential Report* pp. 33-38. June, 1956.
911. Spider mites or red spiders. Laurence K. Cutkomp. *Minnesota State Florists' Bulletin* pp. 4-5. February, 1956.
912. The recognition and control of scale insects. A. C. Hodson. *Minnesota Horticulturist* 84: 7, 14. January, 1956.
920. Bee stings. Mykola H. Haydak. *American Bee Journal* 96: 200-201. 1956.

HOME ECONOMICS

894. A modern textile development—Blended suitings. Mary Ann Morris, Ethel L. Phelps, and Lillian O. Lund. *South Dakota Farm and Home Research* 7 (1): 10-13, 21. 1955.

PLANT PATHOLOGY AND BOTANY

882. Fungus infection of plants. C. J. Eide. *Annual Review of Microbiology* 9: 297-318. 1955.

884. A useful technique for the field inoculation of wheat plants with stem rust. D. H. Smith and E. B. Hayden. *Wheat Newsletter* 1: 22-23. 1954.

896. Deterioration of stored grains by molds. C. M. Christensen. *Wallerstein Laboratories Communications* Vol. 19, No. 24. pp. 31-48. 1956.

SOILS

901. Can you fertilize this fall for next year's corn? J. M. MacGregor. *Plant Food Review* Vol. No. 2, pp. 4-5. 1955.

910. Fertilizer placement for corn in Minnesota. John M. MacGregor and Virgil H. Johnson. *Better Crops with Plant Food* Vol. XL, No. 5, pp. 13-18, 44-45. May, 1956.

913. Soil moisture and balanced fertility factors in corn production. John M. MacGregor. *Minnesota Farm and Home Science* Vol. XIII, No. 2, pp. 7, 8, 20. February, 1956.

914. Cultivate?—It looks better! George R. Blake. *Crystalized Facts About Sugar Beets* Vol. X, No. 1. 1956.

918. Flax is not "hard on the land." John M. MacGregor. *Proceedings of the Canadian Barley and Oil Seeds Conference*. 1956.

925. Studies on phosphate fertilizers in Minnesota. A. C. Caldwell. *Soil Series* No. 44.

VETERINARY MEDICINE

886. Studies of factors responsible for internal hemorrhages in hams. R. L. Kitchell, W. J. Aunan, D. P. Mossberg, P. A. Anderson. *Proceedings of the Seventh Research Conference of the American Meat Institute* pp. 11-20. 1955.

889. A case report on a surgical approach to glaucoma. Robert M. Schwartzman. *Journal of the American Veterinary Medical Association* 128: 18-20. January, 1956.

895. Recent trends in the treatment of Demodectic Acariasis in the canine. Donald H. Clifford. *Southwestern Veterinarian* Texas A and M College, College Station, Texas, 9: 45-48. 1955.

899. Bovine malignant catarrh. Harvey H. Hoyt. *The Official Report of the United States Livestock Sanitary Association* pp. 100-104. 1955.

902. Parakeratosis in swine. H. C. H. Kernkamp, H. H. Hoyt, D. K. Sorenson, J. H. Sautter. *Proceedings Book of the American Veterinary Medical Association 92nd Annual Meeting* pp. 77-81. 1955.

Summary of Publications

JULY 1955-JULY 1956

Kind of publication	Number issued	Number of pages	Number of copies
General series bulletins	4	96	38,500
Technical series bulletins	3	154	11,000
<i>Minnesota Farm and Home Science</i>	3	60	49,500
Report series	4	78	14,500
Extension service			
Bulletins	11	288	210,000
Pamphlets	5	30	70,000
Folders	11	122	167,500
YMW circulars	2	20	20,000
4-H bulletins	1	24	7,500
Newsletters	267	875	153,626
	311	1,747	742,126

Summary of Journal Series Papers

Department	Scientific Journal Series		Miscellaneous Journal Series	
	Number issued	Number of pages	Number issued	Number of pages
Agricultural Biochemistry	32	226	1	26
Agricultural Economics	0	0	1	66
Agricultural Engineering	3	9	2	3
Agronomy and Plant Genetics	17	50	1	27
Animal Husbandry	7	55	1	8
Dairy Husbandry	3	30	1	4
Entomology and Economic Zoology	20	237	12	65
Forestry	15	107	0	0
Home Economics	6	30	1	8
Horticulture	14	41	0	0
Plant Pathology and Botany	30	165	3	39
Poultry Husbandry	9	23	0	0
Soils	2	8	6	13
Veterinary Medicine	12	128	5	22
Rural Sociology	2	15	0	0
	172	1,124	34	281
Total publications	206			

NEW EXPERIMENT STATION PROJECTS

Agricultural Biochemistry

- 1516B1. Isolation and characterization of plant hemoglutins.
 1517BM1. Storage of grain in various atmospheres in sealed bins.
 1518R3. Factors affecting the utilization of feed by ruminants.

Agricultural Economics

- 1126BM1. Analysis of the efficiency of milk distribution in Minnesota markets.
 1127R3. An economic analysis of demand expansion policies and programs for food in the United States.
 1128R3. Information and techniques for farm planning.

Agricultural Engineering

- 1211B1. Drainage of agricultural land by pumping.
 1212. Determination of the amount and rate of water movement in plants through the use of radio-active isotopes.

Agronomy and Plant Genetics

- 1322B1. Soybean genetics.
 1323. A cytogenetic study of the nature of changes induced by radiations with particular reference to induced resistance to Race 15B of stem rust in Lee wheat.

Animal Husbandry

- 1420B1. A study of the interaction of genetics and environment in swine.
 1421. The effect of diet on the production of market cattle.
 1422. Management and nutrition of suckling lambs.

Dairy Husbandry

- 1619B1. Factors influencing the melting properties and flavor retention of hard cheese when heat treated.

Entomology and Economic Zoology

1729. Investigation of year class formation in game fish.
 1730BM1. Association of molds and insects in stored grain.
 1731B1. A study of the ecology and control of the pest mosquitoes of Northern Minnesota.
 1732B1. Forest wildlife relations.
 1733B1. Biology and importance of the sugar beet root maggot (*Ketanops myopaeformis* Roder) in Minnesota.
 1734R3. Migration of Potato Leafhopper and its courses.

Forestry

- 1914B1. Studies of Southeastern Minnesota forest plantations.
 1915B1. Management of Southeastern Minnesota hardwoods.
 1916R3. The container industry as a market for hardwoods.
 2901R3. Planning and coordination of research under regional project NCM-17. The marketing of farm woodland products in the north central region.

Home Economics

- 2014B1. Certain aspects of personality.
 2015B1. Energy metabolism of older population groups.
 2016. A comparison of rural and urban (home economics) students in regard to parental guidance, affection, and leadership development.

Horticulture

2122. Fruit variety studies.
 2123. Orchard and small fruit management studies.
 2124B1. Physiological studies of fruit crops as related to growth and development.
 2125B1. Studies on the culture of vegetables for processing.
 2126B1. Breeding disease resistant vegetables.
 2127B1. Radiation as a tool in horticultural crop breeding.

Plant Pathology and Botany

- 2226B1. Physiology of plant pathogens and host parasite relationships.

- 2227B1. Movement of natural compounds and agricultural chemicals in plants: Its direction, modification, and mechanism.

Poultry Husbandry

- 2314BM1. A study of moisture levels in processed poultry.
 2315B1. Development of an *in vitro* method for determining the nutritive efficiency of poultry rations.

Soils

2520. Soil and physiological factors in plant chlorosis.

Veterinary Medicine

- 2622R3. Endema disease ("entero-toxemia") in pigs.
 2623. Ornithosis (*Psittacosis*) of poultry.
 2624R3. Bloat producing mechanisms in ruminants.
 2625. *In vivo* studies of rates of production and utilization of ketone bodies.
 2626. Investigation in the therapy of bovine lead poisoning.
 2627. Studies of factors responsible for producing bruises in hams.

Northwest Experiment Station

4206. Feeding beef cattle.

North Central Experiment Station

4405. Development of uses for surplus and waste aspen and hardwoods.

Southern Experiment Station

5204. Studies on normal antigens and antibodies in swine.

SUMMARY OF PROJECTS

Department	Total	Active	Inactive	Closed	New
Agricultural Biochemistry	18	17	1	0	2
Agricultural Economics	27	27	0	1	3
Agricultural Engineering	13	13	0	0	2
Agronomy and Plant Genetics	22	22	0	0	2
Dairy Husbandry	19	19	0	0	1
Animal Husbandry	16	16	0	5	3
Entomology and Economic Zoology	30	30	0	5	6
Forestry	16	16	0	1	4
Home Economics	15	15	0	1	3
Horticulture	23	23	0	4	6
Plant Pathology and Botany	26	26	0	0	2
Poultry Husbandry	15	15	0	0	2
Soils	17	17	0	3	1
Veterinary Medicine	27	27	0	0	6
Rural Sociology	2	2	0	0	0
North Central Experiment Station	6	6	0	0	1
Northeast Experiment Station	3	3	0	0	0
Northwest Experiment Station	6	6	0	0	1
Southern Experiment Station	4	4	0	0	1
West Central Experiment Station	1	1	0	0	0
Total	306	305	1	20	46

FINANCIAL STATEMENT

Income 1955-56

Source of revenue	St. Paul Campus	Branch stations				Total
		Crookston	Morris	Grand Rapids	Duluth	
Federal appropriations:						
Hatch Fund	\$ 463,160.11					\$ 463,160.11
Regional Research Fund	99,390.00					99,390.00
State appropriations:						
General University support	886,047.78	\$69,518.85	\$70,183.54	\$44,824.08	\$49,536.73	1,170,049.21
Special appropriations	452,500.00					452,500.00
Endowments, fellowships, and similar grants	338,351.43					338,351.43
Fees, sales, and miscellaneous	583,925.57					583,925.57
Total	\$2,823,374.89	\$69,518.85	\$70,183.54	\$44,824.08	\$49,536.73	\$3,107,376.32

EXPERIMENT STATION STAFF

The Board of Regents

THE HON. JAMES F. BELL, Minneapolis	-	-	-	-	-	1957
THE HON. DANIEL C. GAINAY, Owatonna	-	-	-	-	-	1961
THE HON. RICHARD L. GRIGGS, Duluth	-	-	-	-	-	1957
THE HON. MARJORIE J. HOWARD, Excelsior	-	-	-	-	-	1959
THE HON. GEORGE W. LAWSON, St. Paul	-	-	-	-	-	1957
THE HON. LESTER A. MALKERSON, Minneapolis	-	-	-	-	-	1959
THE HON. KARL G. NEUMEIER, Stillwater	-	-	-	-	-	1959
THE HON. CHARLES W. MAYO, Rochester	-	-	-	-	-	1959
THE HON. A. J. OLSON, Renville	-	-	-	-	-	1961
THE HON. RAY J. QUINLIVAN, St. Cloud	-	-	-	-	-	1957
THE HON. HERMAN F. SKYBERG, Fisher	-	-	-	-	-	1961
THE HON. E. B. COSGROVE, Le Sueur	-	-	-	-	-	1961

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- T. H. FENSKE, D.Sc., Assistant Dean, Institute of Agriculture
- H. J. SLOAN, Ph.D., Director
- M. F. KERNKAMP, Ph.D., Assistant Director
- W. T. MIDDLEBROOK, A.B., M.C.S., Treasurer
- W. F. GEDDES, Ph.D., Head, Department of Agricultural Biochemistry
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- C. E. MICKEL, Ph.D., Head, Department of Entomology and Economic Zoology
- F. H. KAUFERT, Ph.D., Director, School of Forestry
- LOUISE A. STEDMAN, Ph.D., Director, School of Home Economics
- L. C. SNYDER, Ph.D., Head, Department of Horticulture; Superintendent, Fruit Breeding Farm, Excelsior
- J. J. CHRISTENSEN, Ph.D., Head, Department of Plant Pathology and Botany
- E. L. JOHNSON, Ph.D., Head, Department of Poultry Husbandry
- W. P. MARTIN, Ph.D., Head, Department of Soils
- W. T. S. THORP, D.V.M., M.S., Assistant Dean, School of Veterinary Medicine
- A. C. HEINE, B.S., Superintendent, Agricultural Experiment Station, Rosemount
- C. L. COLE, M.S., Superintendent, North Central Experiment Station, Grand Rapids

Expenditures 1955-56

Classification	St. Paul Campus	Branch stations					Total
		Crookston	Morris	Grand Rapids	Duluth	Waseca	
Services and labor	\$1,833,354.30	\$ 72,240.82	\$ 76,522.72	\$42,258.29	\$51,089.10	\$64,255.82	\$2,139,721.05
Travel expense	55,812.79	247.72	607.15	239.72	232.93	277.48	57,444.79
Transportation of things	6,158.01	682.32	229.50	192.32	137.04	202.80	7,601.99
Communication service	14,244.28	659.91	509.63	258.42	646.82	504.87	16,823.93
Rents and utility service	33,355.86	1,612.44	1,200.38	2,029.24	3,465.45	4,817.90	46,481.27
Printing and binding	14,214.37	.....	131.49	153.82	.....	.....	14,499.68
Other contractual services	182,319.63	5,357.25	3,330.47	3,575.83	5,042.53	7,401.57	207,027.28
Supplies and materials	347,678.03	15,430.83	16,438.93	11,288.72	18,188.11	14,300.39	423,325.01
Equipment	164,644.10	4,620.17	5,199.80	2,239.47	1,706.62	6,256.69	184,666.85
Land and structures	8,033.04	.....	.....	.....	.....	.....	8,033.04
Retirement	1,751.43	.....	.....	.....	.....	.....	1,751.43
Total	\$2,661,565.84	\$100,878.46	\$104,170.07	\$62,235.83	\$80,508.60	\$98,017.52	\$3,107,376.32

R. S. GRANT, M.S., Superintendent, Northeast Experiment Station, Duluth
 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
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⁴L. E. JUERS, M.S., Research Fellow
⁵J. M. WETMORE, A.M., Research Fellow
⁶M. K. CHRISTIANSEN, B.S., Instructor
⁷R. A. HINTON, M.S., Instructor
 A. C. KNUDTSON, M.S., Instructor
⁸H. C. LAMPE, B.S., Instructor
⁹R. B. ZOLLER, B.S., Instructor

¹ Resigned July 31, 1955

² Appointed March 16, 1956

³ Resigned November 30, 1955

⁴ Appointed July 1, 1955

⁵ Appointed July 1, 1955

⁶ Appointed July 1, 1955

⁷ Resigned August 31, 1955

⁸ Resigned December 23, 1955

⁹ Appointed September 1, 1955

DEPARTMENT OF AGRICULTURAL ENGINEERING

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

Farm Power and Machinery

A. J. SCHWANTES, M.S., Professor
 JOHN STRAIT, M.S., Associate Professor
 R. V. REPEL, M.S., Instructor
¹⁰J. R. BEEBE, M.S., Instructor
¹¹J. G. DENT, M.S., Instructor
 V. M. MEYER, M.S., 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
¹²H. A. CLOUD, M.S., Instructor

Soil and Water Conservation

¹³P. 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

¹⁰ On leave September, 1954-August 31, 1956

¹¹ Retired, June 16, 1956

¹² Resigned, June 30, 1956

¹³ On leave September 3, 1955-February 3, 1956

CARL BORGESON, M.S., Associate Professor
¹⁴J. 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
¹⁵L. A. SNYDER, Ph.D., Assistant Professor
 R. G. ROBINSON, Ph.D., Assistant Professor
¹⁶K. J. HSU, Ph.D., Research Fellow
 K. S. KOO, Ph.D., Research Fellow
¹⁷A. F. TROYER, M.S., Research Fellow
¹⁸GERTRUDE S. JOACHIM, 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
¹⁹E. W. SPRAGUE, Ph.D., Geneticist

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 L. M. WINTERS, Ph.D., Professor
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 W. E. REMPEL, Ph.D., Associate Professor
 W. J. AUNAN, Ph.D., Assistant Professor
 R. M. JORDAN, Ph.D., Assistant Professor

DEPARTMENT OF DAIRY HUSBANDRY

²¹J. B. FITCH, M.S., Professor and Head

¹⁴ On leave April 16, 1956
¹⁵ Appointed November 1, 1956
¹⁶ Resigned June 30, 1956
¹⁷ Appointed April 1, 1956
¹⁸ Resigned January 31, 1956
¹⁹ Appointed April 1, 1955
²⁰ Retired June 30, 1956
²¹ Retired June 30, 1956

Dairy Production

²²T. W. GULLICKSON, Ph.D., Professor
²³W. E. PETERSEN, Ph.D., Professor
²⁴N. D. BAYLEY, Ph.D., Associate Professor
²⁵C. M. CLIFTON, Ph.D., Assistant Professor
²⁶J. B. WILLIAMS, Ph.D., Assistant Professor
 E. F. GRAHAM, Ph.D., Instructor
²⁷P. J. DZIUK, Ph.D., Research Fellow

Dairy Industry

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 S. T. COULTER, Ph.D., Professor
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 H. A. MORRIS, Ph.D., Associate Professor
 L. A. RICHARDSON, M.S., Instructor
²⁸C. M. STINE, M.S., Research Fellow
²⁹C. H. PYNE, M.S., Instructor

Dairy Bacteriology

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

DEPARTMENT OF ENTOMOLOGY AND ECONOMIC ZOOLOGY

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 A. C. HODSON, Ph.D., Professor
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 W. H. MARSHALL, Ph.D., Professor
 A. G. RICHARDS, Ph.D., 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
 E. F. COOK, Ph.D., Assistant Professor
 A. G. PETERSON, Ph.D., Assistant Professor
 H. C. CHIANG, Ph.D., Research Associate
 T. B. CLARK, M.S., Research Fellow
 B. A. HAWS, Ph.D., Research Fellow

²² Retired June 30, 1956
²³ On leave February 20-April 1, 1956
²⁴ Resigned July 31, 1955
²⁵ Appointed June 6, 1956
²⁶ Appointed July 1, 1955
²⁷ Resigned September 28, 1955
²⁸ Appointed July 1, 1955
²⁹ Appointed August 29, 1955
³⁰ Retired June 30, 1956

K. W. TUCKER, B.S., Research Fellow
²¹A. R. BARR, Ph.D., Instructor
²²ROGER D. PRICE, M.A., Instructor

SCHOOL OF FORESTRY

F. H. KAUFERT, Ph.D., Professor, Director
 THORVALD SCHANTZ-HANSEN, Ph.D., Professor
²³A. 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
 S. S. PAULEY, Ph.D., Associate Professor
 R. I. BEAZLEY, Ph.D., Assistant Professor
 O. F. HALL, Ph.D., Assistant Professor
 E. T. SULLIVAN, Ph.D., Assistant Professor
 J. R. NEETZEL, M.F., Research Associate
 B. A. BROWN, M.F., Instructor
 M. P. MEYER, M.F., Instructor
 W. B. WALLIN, M.S., Instructor
²⁴F. O. IRVING, M.F., Instructor

SCHOOL OF HOME ECONOMICS

LOUISE A. STEDMAN, Ph.D., Professor and Director
 JANE M. LEICHSENRING, Ph.D., Professor
 ISABEL NOBLE, Ph.D., Professor
 DOROTHY SIMMONS, M.S., Professor
²⁵GLADYS BELLINGER, Ph.D., Associate Professor
²⁶MARY 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
 A. N. WILCOX, Ph.D., Professor
 A. E. HUTCHINS, Ph.D., Associate Professor
 R. E. NYLUND, Ph.D., Associate Professor
²⁷J. D. WINTER, M.S., Associate Professor

²¹ Resigned September 15, 1955
²² Appointed September 16, 1955
²³ On leave effective September 25, 1954
²⁴ Appointed August 1, 1955
²⁵ Appointed September 16, 1954
²⁶ Resigned June 15, 1956
²⁷ On leave April 1, 1956-July 1, 1956

T. S. WEIR, M.S., Associate Professor and Assistant Superintendent of Fruit Breeding Station
 R. A. PHILLIPS, M.S., Assistant Professor
 A. A. PIRINGER, Ph.D., Assistant Professor
 R. E. WIDMER, Ph.D., Assistant Professor
 R. J. STADTHERR, M.S., Instructor
 S. R. TRANTANELLA, B.S., Instructor

DEPARTMENT OF PLANT PATHOLOGY AND BOTANY

J. J. CHRISTENSEN, Ph.D., Professor and Head
²⁸C. J. EIDE, Ph.D., Professor
 HELEN HART, Ph.D., Professor
 C. M. CHRISTENSEN, Ph.D., Professor
²⁹M. F. KERNKAMP, Ph.D., 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
³⁰C. W. BOOTHROYD, Ph.D., Assistant Professor
³¹I. A. WATSON, Ph.D., Research Associate
³²T. H. NICOLSON, Ph.D., Research Fellow
³³F. I. FROSHEISER, Ph.D., Research Fellow
³⁴B. L. RENFRO, M.S., Research Fellow
³⁵R. J. KLUG, M.S., Research Fellow
 A. J. LUNCK, Ph.D., Instructor
 M. B. MOORE, M.S., Instructor
³⁶E. E. BUTLER, Ph.D., Instructor
 R. N. CAMPBELL, M.S., Instructor

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

Cereal Crops

³⁷E. B. HAYDEN, M.S., Agent, Plant Pathologist
 B. J. ROBERTS, M.S., Agent, Plant Pathologist
³⁸J. B. ROWELL, Ph.D., Agent, Plant Pathologist

²⁸ Leave of absence June 15-September 15, 1955
²⁹ Resigned March 31, 1956
³⁰ Appointed February 16, 1956
³¹ Resigned May 2, 1956
³² Appointed October 10, 1955
³³ Resigned October 7, 1955
³⁴ Appointed January 1, 1956
³⁵ Appointed July 1, 1955
³⁶ Resigned October 1955
³⁷ Resigned December 30, 1955
³⁸ Appointed January 16, 1956

Sugar Crops

⁴⁰C. L. SCHNEIDER, Ph.D., Plant Pathologist
⁴¹H. L. BISSONNETTE, B.S., Agent, 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., D.Sc., Consultant
 E. C. STAKMAN, Ph.D., D.Sc., Consultant

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
 R. N. SHOFFNER, Ph.D., Professor
 T. H. CANFIELD, M.S., Associate Professor
 M. H. SWANSON, Ph.D., Assistant Professor
 P. E. WAIBEL, Ph.D., Assistant Professor

DEPARTMENT OF SOILS

W. P. MARTIN, Ph.D., Professor and Head
⁴²P. M. BURSON, M.S., Professor
 A. C. CALDWELL, Ph.D., Professor
 J. M. MACGREGOR, Ph.D., Associate Professor
 E. L. SCHMIDT, Ph.D., Associate Professor
 G. R. BLAKE, Ph.D., Associate Professor
 H. F. ARNEMAN, Ph.D., Assistant Professor
⁴³R. H. RUST, Ph.D., Assistant Professor
 ROUSE S. FARNHAM, Ph.D., Research Associate
 JOHN GRAVA, Ph.D., Research Fellow
⁴⁴P. R. McMILLER, M.S., Professor

Soil Conservation Service

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

⁴⁰ Resigned December 30, 1955
⁴¹ Appointed January 16, 1956
⁴² On leave June 1, 1956
⁴³ Appointed March 16, 1956
⁴⁴ Deceased February 27, 1956

SCHOOL OF VETERINARY MEDICINE

W. T. S. THORP, D.V.M., M.S., Assistant Dean, Director of the School of Veterinary Medicine, and Professor
 H. J. GRIFFITHS, D.V.M., Ph.D., Assistant Director and Professor
 R. L. KITCHELL, D.V.M., Ph.D., Professor
 A. F. WEBER, D.V.M., Ph.D., Professor
 B. S. POMROY, D.V.M., Ph.D., Professor
 M. H. ROEPKE, Ph.D., Professor
 J. H. SAUTER, D.V.M., Ph.D., Professor
 H. C. H. KERNKAMP, D.V.M., M.S., Professor
 A. F. SELLERS, D.V.M., Ph.D., Professor
 H. H. HOYT, D.V.M., Ph.D., Professor
 J. M. CAMPBELL, D.V.S., Professor
 G. W. MATHER, D.V.M., Ph.D., Professor
 REUEL FENSTERMACHER, D.V.M., Professor
 C. M. STOWE, D.V.M., Ph.D., Associate Professor
 P. B. HAMMOND, D.V.M., Ph.D., Associate Professor
 D. K. SORENSON, D.V.M., Ph.D., Associate Professor
 R. A. MERRILL, D.V.M., Associate Professor
 J. P. ARNOLD, D.V.M., Ph.D., Associate Professor
 F. A. SURRELL, D.V.M., Ph.D., Associate Professor
 R. K. LINDORFER, M.S., Assistant Professor
 J. J. CLARK, D.V.M., Research Fellow
⁴⁵KEITH I. LOKEN, B.S., D.V.M., Research Fellow
 J. T. BELL, D.V.S., Instructor
 M. W. STROMBERG, D.V.M., Instructor
⁴⁶C. E. REHFELD, D.V.M., Instructor
 E. D. BESCH, D.V.M., Instructor
 D. R. KNAUFF, D.V.M., Instructor
 A. L. GOOD, D.V.M., M.S., Instructor
⁴⁷E. N. BERGMAN, D.V.M., Instructor
 D. G. LOW, D.V.M., Instructor
 FRANK SAUER, D.V.M., Instructor
⁴⁸W. F. CATES, 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
 CHARLES GALE, D.V.M., Instructor
⁴⁹DONALD M. BARNES, D.V.M., Instructor
⁵⁰WILLIAM M. DICKSON, D.V.M., M.S., Instructor
⁵¹LYLE JAN HANSON, D.V.M., B.S., Instructor

⁴⁵ Appointed September 1, 1955
⁴⁶ Resigned September 15, 1955
⁴⁷ Leave of absence effective October 1, 1955
⁴⁸ Resigned August 1, 1955
⁴⁹ Appointed July 1, 1955
⁵⁰ Appointed July 1, 1955
⁵¹ Appointed November 1, 1955

- ⁶¹DONALD W. JOHNSON, D.V.M., B.S., Instructor
⁶²VICTOR PERMAN, D.V.M., B.S., Instructor
⁶³JACK T. TUMLIN, D.V.M., B.S.A., Instructor
⁶⁴DONALD A. WILLIGAN, B.S.A., D.V.M., M.S., Instructor

RURAL SOCIOLOGY

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

INFORMATION SERVICE

- HAROLD SWANSON, M.S., Associate Professor and Editor
 RAYMOND S. WOLF, B.S., Assistant Professor and Extension Information Specialist (radio)
 GERALD R. MCKAY, M.S., Associate Professor and Extension Specialist in Visual Education
 JOSEPHINE B. NELSON, M.A., Instructor and Extension Assistant Editor
⁶⁵HARRY R. JOHNSON, B.A., Instructor and Extension Information Specialist
⁶⁶GWEN H. HAWS, B.S., Agricultural Bulletin Editor
⁶⁷JEAN M. METCALF, B.A., Editorial Assistant
⁶⁸EARL K. BRIGHAM, M.A., Instructor and Agricultural Bulletin Editor
 MAXINE A. LARSON, 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, Ph.D., Associate Professor, Superintendent
 R. B. AAKRE, B.S., Assistant Agricultural Engineer
 C. H. GRIFFITH, M.Ph., Assistant Professor, Agronomy
 N. H. GRIMSBO, B.S., Instructor, Horticulture
 A. B. SALMELA, M.S., Instructor, Animal Husbandry
⁶⁹LOYD LAMOIS, M.F., Instructor, Forestry

⁶¹ Appointed November 1, 1955
⁶² Appointed October 16, 1955
⁶³ Appointed September 1, 1955
⁶⁴ Appointed August 1, 1955
⁶⁵ Resigned June 30, 1956
⁶⁶ Resigned September 17, 1955
⁶⁷ Resigned July 22, 1955
⁶⁸ Appointed November 10, 1955
⁶⁹ Resigned August 12, 1955

NORTHEAST EXPERIMENT STATION

- RALPH S. GRANT, M.S., Associate Professor, Superintendent
 WALLACE W. NELSON, Ph.D., Instructor, Assistant Superintendent

NORTHEAST EXPERIMENT STATION

- ⁷⁰T. 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, Assistant Professor
 DIEDRICH REIMER, M.S., Instructor
 R. 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
⁷¹R. O. BRIDGFORD, M.S., Associate Professor
⁷²P. S. JORDAN, B.S., Associate Professor
 H. G. CROOM, M.S., Assistant Professor
 L. K. LINDFOR, B.S., Assistant Professor
 ROBERT HANSON, M.S., Instructor
 W. H. GRAY, B.S., Instructor
 RALPH E. SMITH, B.S., Instructor
 HARLEY HANKE, B.S., Instructor
⁷³ROY THOMPSON, B.S., Instructor

⁷⁰ Retired June 30, 1956
⁷¹ Retired June 30, 1956
⁷² Deceased March 9, 1956
⁷³ Appointed July 1, 1956