

## NORTHEAST EXPERIMENT STATION

M. J. THOMPSON, M.S., Superintendent

## NORTHWEST EXPERIMENT STATION

T. M. McCALL, M.S., Superintendent  
 B. C. BERESFORD, M.S., Assistant Horticulturist  
 A. M. FOKER, Assistant Agricultural Engineer  
 O. M. KISER, M.S., Assistant Animal Husbandman  
 H. W. SODERBURG, M.A., Assistant Agricultural Engineer  
 O. C. SOINE, Ph.D., Assistant Agronomist  
<sup>53</sup>H. D. FAUSCH, B.S., Assistant in Animal Husbandry  
 A. M. PILKEY, Assistant in Poultry Husbandry

## SOUTHEAST EXPERIMENT STATION

R. E. HODGSON, M.S., Superintendent

## WEST CENTRAL EXPERIMENT STATION

A. W. EDSON, M.S., Superintendent  
 R. O. BRIDGFORD, M.S., Associate Agronomist  
 P. S. JORDAN, B.S., Associate Animal Husbandman  
 H. G. CROOM, B.S., Assistant Poultry Husbandman  
 A. C. HEINE, B.S., Assistant Agricultural Engineer and Assistant Superintendent  
<sup>54</sup>B. E. YOUNGQUIST, B.S., Assistant Agricultural Engineer

## PUBLICATIONS

HAROLD B. SWANSON, M.S., Editor  
<sup>55</sup>ROBERT G. RUPP, B.S., Instructor and Extension Information Specialist  
 LETTIE GUDMESTAD, B.A., Assistant to Editor, Agricultural Bulletins  
 JOSEPHINE B. NELSON, M.A., Informational Representative

<sup>53</sup> On leave May 1, 1949, to June 30, 1949

<sup>54</sup> On leave August 14, 1948, to June 30, 1949

<sup>55</sup> Appointed September 10, 1948

## FIFTY-SIXTH ANNUAL REPORT

# Agricultural Experiment Station University of Minnesota

JULY 1, 1948 TO JUNE 30, 1949



UNIVERSITY FARM, ST. PAUL

LETTERS OF TRANSMITTAL

University of Minnesota, Minneapolis, Minn.

July 1, 1949

To His Excellency, Luther W. Youngdahl,  
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, 1949.

Respectfully transmitted,

JAMES L. MORRILL,  
President of the Board of Regents

University of Minnesota, Minneapolis, Minn.

July 1, 1949

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, 1949.

Respectfully transmitted,

JAMES L. MORRILL,  
President of the University of Minnesota

University Farm, St. Paul, Minn.

July 1, 1949

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, 1949.

Respectfully submitted,

C. H. BAILEY, Director

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FIFTY-SIXTH ANNUAL REPORT  
AGRICULTURAL EXPERIMENT STATION  
UNIVERSITY OF MINNESOTA

JULY 1, 1948 TO JUNE 30, 1949

C. H. Bailey, Director  
H. Macy, Associate Director

FOREWORD

The changes which have taken place in Minnesota agriculture in the past decade have brought countless new problems to the producer, handler, processor, and distributor of farm products. Each in turn has placed a new responsibility on the research worker at the Agricultural Experiment Station. The problems may be biological, physical, sociological, or economic—often a combination of two or more. The scientist has been facing the perplexing questions and is making use of every new tool of science to find early and adequate answers.

The investigations at the Agricultural Experiment Station are never static. The programs of research are modified as circumstances may require. However, there are certain lines of investigation which are of long standing; and, of necessity, some of them will be continued into the distant future. For example, the development of new and superior varieties of plants and animals may be expected to require research for generations. As a new variety is introduced, a new hazard may appear suddenly so that the plant breeder, for instance, must be seeking constant improvement to meet the peril of new diseases or the demands of a changing market. Much progress is being made as evidenced by the fact that the Minnesota Station continues to introduce new varieties of plants and even breeds of livestock. Each year we find that the investigators have brought forth new methods and products for the control of plant and animal diseases and for the eradication of insect pests and noxious weeds. The researchers have uncovered new facts which lead to the more efficient nourishment of plants and animals with the result that higher production at lower costs and with less expenditure of labor has been obtained. Facts about the nutrition of our people are being accumulated and made known to the people of the State. We are developing new machinery to make farm operation more efficient. We are learning more about the cultivation and conservation of the soil, as well as the conservation of water and other natural

resources. The economist presents new facts about the business side of agriculture and is learning something about the marketing of farm products that will be beneficial to the producer, the consumer, and even the so-called "middleman," who represents a wide variety of organizations and agencies that serve the State. Progress has been made in uncovering information about the social structure of farm communities which will lead us toward a richer and fuller family life on our farms and in our rural communities. Fundamental studies are being pursued in many fields, including, for example, atomic energy.

There has been a healthy growth of cooperative research between the scientists in all departments of the University, in the State, in the Region, nationally and internationally. The talents of many people are being brought to bear on the solution of agricultural problems. The results of the numerous and diverse investigations in the Agricultural Experiment Station are being called to the attention of the people of the State through many agencies, by word of mouth, by radio, television, and a great variety of publications, both inside and outside the University. The scientific staff of the Agricultural Experiment Station is alert to the problems of the people and is making effective use of the funds provided by the State, the Federal Government, and many individuals, corporations, and other public-spirited groups for agricultural research.

## CHANGES IN STAFF

## Appointments

D. E. Bartlett, D.V.M., as instructor, Division of Veterinary Medicine, effective September 1, 1948.

James R. Beer, Ph.D., as assistant professor, Division of Entomology and Economic Zoology, effective March 1, 1949.

J. N. Campbell, D.V.S., B.S., as associate professor, Division of Veterinary Medicine, effective December 16, 1948.

H. C. Chiang, Ph.D., as research fellow, Division of Entomology and Economic Zoology, effective July 1, 1948.

J. M. Daly, M.S., as instructor, Division of Plant Pathology and Botany, effective July 1, 1948.

H. J. Griffiths, D.V.M., Ph.D., as associate professor, Division of Veterinary Medicine, effective August 1, 1948.

Otis F. Hall, M.F., as instructor, Division of Forestry, effective July 1, 1948.

Allan Hemingway, Ph.D., as professor, Division of Veterinary Medicine, effective September 16, 1948.

M. C. Hervey, Ph.D., as associate professor, Division of Dairy Husbandry, effective April 1, 1949.

F. G. Holdaway, Ph.D., as lecturer, Division of Entomology and Economic Zoology, effective September 1, 1948.

Arne Kemp, M.F., as instructor, Division of Forestry, effective March 1, 1949.

T. H. King, Ph.D., as assistant professor, Division of Plant Pathology and Botany, effective July 1, 1948.

Frederick Kristjanssen, M.S., as research fellow, Division of Animal Husbandry, effective September 1, 1948.

C. L. Larson, B.A.E., as instructor, Division of Agricultural Engineering, effective July 1, 1948.

G. W. Mather, D.V.M., as instructor, Division of Veterinary Medicine, effective September 16, 1948.

W. E. McDaniel, M.S., as instructor, Division of Agricultural Economics, effective September 16, 1948.

L. S. Mix, B.S., as research fellow, Division of Dairy Husbandry, effective October 1, 1948.

H. A. Morris, M.S., as instructor, Division of Dairy Husbandry, effective July 1, 1948.

John R. Neetzel, M.F., as research associate, Division of Forestry, effective October 1, 1948.

T. B. O'Dell, A.B., as instructor, Division of Veterinary Medicine, effective March 1, 1949.

W. A. Oitto, B.S., as research fellow, Division of Horticulture, effective December 16, 1948.

W. R. Pritchard, D.V.M., as instructor, Division of Veterinary Medicine, effective April 16, 1949.

Robert G. Rupp, B.S., as instructor and extension information specialist, Division of Publications, effective September 10, 1948.

C. H. Vaux, M.S., as associate professor, Division of Forestry, effective September 1, 1948.

## Promotions

R. A. Bottomley, Ph.D., research fellow to assistant professor, Division of Agricultural Biochemistry, effective April 1, 1949.

R. O. Bridgford, M.S., assistant professor to associate professor, West Central Experiment Station, effective July 1, 1948.

J. N. Cummings, Ph.D., research fellow to associate professor, Division of Animal Husbandry, effective January 1, 1949.

S. A. Engene, Ph.D., assistant professor to associate professor, Division of Agricultural Economics, effective July 1, 1948.

R. Fenstermacher, D.V.M., associate professor to professor, Division of Veterinary Medicine, effective July 1, 1948.

H. L. Hansen, Ph.D., assistant professor to associate professor, Division of Forestry, effective July 1, 1948.

A. L. Harvey, Ph.D., associate professor to professor, Division of Animal Husbandry, effective July 1, 1948.

P. S. Jordan, B.S., assistant professor to associate professor, West Central Experiment Station, effective July 1, 1948.

P. W. Manson, M.S., associate professor to professor, Division of Agricultural Engineering, effective July 1, 1948.

Douglas G. Marshall, Ph.D., assistant professor to associate professor, Rural Sociology, effective September 15, 1948.

J. C. Olson, Jr., Ph.D., instructor to associate professor, Division of Dairy Husbandry, effective July 1, 1948.

E. L. Pinnell, Ph.D., instructor to assistant professor, Division of Agronomy and Plant Genetics, effective July 1, 1948.

B. S. Pomeroy, D.V.M., Ph.D., associate professor to professor, Division of Veterinary Medicine, effective July 1, 1948.

J. H. Sautter, D.V.M., Ph.D., instructor to assistant professor, Division of Veterinary Medicine, effective December 16, 1948.

C. F. Sierk, Ph.D., research fellow to associate professor, Division of Animal Husbandry, effective August 1, 1948.

## Leaves of Absence

C. H. Bailey, Ph.D., dean and director, Department of Agriculture, to continue to serve as Agricultural Research Training Specialist, American Mission for Aid to Greece, Athens, Greece, July 1, 1948, to July 8, 1948.

C. R. Burnham, Ph.D., professor, Division of Agronomy and Plant Genetics, to continue sabbatical leave, July 1, 1948, to August 31, 1948.

A. L. Burroughs, Ph.D., assistant professor, Division of Entomology and Economic Zoology, on leave to Japan to do research work for the U. S. Army, May 1, 1949, to June 30, 1949.

H. D. Fausch, B.S., instructor, Northwest Experiment Station, on leave to continue graduate work in animal husbandry at the University of Minnesota, May 1, 1949, to June 30, 1949.

W. A. Malmquist, D.V.M., instructor, Division of Veterinary Medicine, on leave to conduct research on foot and mouth disease for the Bureau of Animal Industry, U. S. Department of Agriculture, at Lindholm, Denmark, March 16, 1949, to June 30, 1949.

W. H. Peters, M.Agr., professor and chief, Division of Animal Husbandry, on leave due to illness, May 15, 1949, to June 30, 1949.

W. E. Petersen, Ph.D., professor, Division of Dairy Husbandry, on leave on behalf of the New Zealand Dairy Board to meet with dairy research workers and to address groups of dairy farmers in New Zealand, November 1, 1948, to December 31, 1948.

A. J. Schwantes, M.S., professor and chief, Division of Agricultural Engineering on leave half-time to do experimental work for the Ford Motor Company, St. Paul, Minnesota, October 1, 1948, to June 30, 1949.

B. E. Youngquist, B.S., assistant professor, West Central Experiment Station, on leave to continue graduate work at the University of Minnesota, August 14, 1948, to June 30, 1949.

#### Resignations

R. R. Beneke, M.S., instructor, Division of Agricultural Economics, to accept a position as assistant professor of Agricultural Economics and Sociology, Iowa State College, Ames, Iowa, effective September 15, 1948.

H. L. Carnahan, M.S., research fellow, Division of Agronomy and Plant Genetics, to accept a position as assistant professor of Agronomy, Pennsylvania State College, State College, Pennsylvania, effective December 31, 1948.

J. S. Cass, M.S., research fellow, Division of Entomology and Economic Zoology, to enter another field, effective June 30, 1949.

H. Y. Fan, Ph.D., research associate, Division of Entomology and Economic Zoology, to accept a position with the Julius Hyman Company, Denver, Colorado, effective September 30, 1948.

L. O. Gilmore, Ph.D., associate professor, Division of Dairy Husbandry, to accept a position as associate professor of Dairy Husbandry, Ohio State University, Columbus 10, Ohio, effective October 15, 1948.

W. W. Green, Ph.D., associate professor, Division of Animal Husbandry, to accept a position as professor of Animal Husbandry, University of Maryland, College Park, Maryland, effective August 31, 1948.

R. L. Mann, B.S., research fellow, Division of Agricultural Biochemistry, to accept a position as chemist of the Eli Lilly Company, Indianapolis, Indiana, effective March 15, 1949.

H. E. Milliron, Ph.D., instructor, Division of Entomology and Economic Zoology, residence Glendale, West Virginia, effective April 22, 1949.

D. C. Quimby, M.S., instructor, Division of Entomology and Economic Zoology, to accept a position as assistant professor of Zoology, Montana State College, Bozeman, Montana, effective September 25, 1948.

O. C. Turnquist, M.S., research fellow, Division of Horticulture, to accept a position as agent horticulturist with the U. S. Department of Agriculture at the University of Minnesota, St. Paul 1, Minnesota, effective November 15, 1948.

C. H. Vaux, M.S., associate professor, Division of Forestry, to accept a position at Colorado State College, Fort Collins, Colorado, effective June 30, 1949.

#### Retirements

Cornelia Kennedy, Ph.D., associate professor, Division of Agricultural Biochemistry, effective July 1, 1948.

L. E. Longley, Ph.D., assistant professor, Division of Horticulture, effective June 15, 1949.

#### Deaths

None.

## PUBLICATIONS

## AGRICULTURAL EXPERIMENT STATION

## General Bulletin Series

400. Experiments with inbreeding swine. L. M. Winters, D. L. Dailey, P. S. Jordan, O. M. Kiser, R. E. Hodgson, J. N. Cummings, and C. F. Sierk, Animal Husbandry. 32 pages, 7,500.
401. Rural organization of Goodhue County. Frank D. Alexander and Lowry Nelson, Rural Sociology. 86 pages, 6,000.
402. Financial structure of Minnesota agriculture. Rex W. Cox and W. C. Waite, Agricultural Economics. 32 pages, 5,000.
403. Sex determination of geese. T. H. Canfield, Poultry Husbandry. 6 pages, 5,000.
404. Feeding sugar beet tops in the Red River Valley of northwestern Minnesota and northeastern North Dakota. W. H. Peters and O. M. Kiser, Animal Husbandry and Northwest Experiment Station. 8 pages, 5,000.

## Technical Bulletin Series

181. Marketing slaughter cattle by carcass weight and grade. A. A. Dowell, Gerald Engelman, E. F. Ferrin, and P. A. Anderson, Agricultural Economics and Animal Husbandry. 64 pages, 5,000.
182. Ten years results from testing forage grasses. H. L. Thomas, H. K. Hayes, and A. R. Schmid, Agronomy and Plant Genetics. 17 pages, 3,000.
183. Influence of fertilizers on composition and quality of sugar beets. L. E. Dunn and C. O. Rost, Soils. 11 pages, 3,000.
184. A geneology study of the Minnesota No. 1 hog. H. H. Brugman, L. M. Winters, and D. L. Dailey, Animal Husbandry. 28 pages, 3,000.
185. The adequacy of major plant nutrients in certain Minnesota soils under a management program. J. A. Toogood and C. O. Rost, Soils. 14 pages, 3,000.
186. Inheritance of certain economic characters in the squash, *Cucurbita maxima* Duch. Dharampal Singh, Horticulture. 32 pages, 2,500.

## Minnesota Farm and Home Science

- Volume VI, Number 1. 16 pages, 16,500.
- Volume VI, Number 2. 16 pages, 16,500.
- Volume VI, Number 3. 16 pages, 16,550.

## Report Series

- Fifty-fifth Annual Report of the Minnesota Agricultural Experiment Station, July 1, 1947, to June 30, 1948. 36 pages, 2,500.

Miscellaneous Report No. 6. Varietal trials of farm crops. H. K. Hayes, E. R. Ausemus, J. O. Culbertson, J. W. Lambert, and R. G. Robinson, Agronomy and Plant Genetics. 19 pages, 12,500.

Miscellaneous Report No. 7. Maturity ratings of corn hybrids registered for sale in Minnesota. R. F. Crim, H. K. Hayes, E. H. Rinke, Gertrud Joachim, R. E. Hodgson, R. O. Bridgford, and O. C. Soine, Agronomy and Plant Genetics. 10 pages, 7,500.

## AGRICULTURAL EXTENSION SERVICE

## Bulletin Series

130. (Revised) Making the home lawn. L. E. Longley and R. A. Phillips, Horticulture. 12 pages, 7,500.
196. (Revised) Planting the farmstead shelter belt. Parker O. Anderson, Agricultural Extension. 16 pages, 10,000.
232. (Revised) Know your cooperative. W. H. Dankers and Max K. Hinds, Agricultural Economics. 16 pages, 7,500.
244. (Revised) Freezing foods for home use. J. D. Winter, Andrew Hustrulid, and Lillian W. Anderson, Horticulture and Agricultural Engineering. 48 pages, 25,000.
247. (Revised) Water systems and sewage disposal on the farm. D. M. Ryan and G. E. McPhee, Agricultural Engineering and Agricultural Extension. 24 pages, 20,000.
257. (Revised) Fighting the European corn borer in Minnesota. F. G. Holdaway, L. K. Cutkomp, and A. W. Buzicky, Entomology and Economic Zoology. 16 pages, 25,000.
258. (Reprint) Evergreens. L. C. Snyder, Raymond J. Wood, Clyde M. Christensen, and A. C. Hodson, Agricultural Extension, Plant Pathology and Botany, and Entomology and Economic Zoology. 28 pages, 7,500.

## Pamphlet Series

83. (Revised) List of farm building plans. C. K. Otis, D. M. Ryan, and G. E. McPhee, Agricultural Engineering and Agricultural Extension. 12 pages, 5,000.
162. 1949 livestock and feed outlook. S. B. Cleland, Agricultural Extension. 6 pages, 15,000.
163. 1949 dairy products, egg and poultry outlook. M. K. Hinds and W. H. Dankers, Agricultural Extension. 8 pages, 15,000.
164. 1949 outlook, Agricultural Act of 1948. D. C. Dvoracek, Agricultural Extension. 6 pages, 15,000.
165. 1949 general outlook for agriculture. S. B. Cleland, Agricultural Extension. 6 pages, 12,000.
166. 1949 family living outlook. Dorothy Simmons, Agricultural Extension. 6 pages, 12,000.
167. 1949 wheat, flax, and soybean outlook. Max K. Hinds and Ralph Backstrom, Agricultural Extension. 6 pages, 10,000.

168. Chemical weed control in Minnesota. R. S. Dunham, R. F. Crim, and H. G. Heggeness, Agronomy and Plant Genetics, Agricultural Extension, and Plant Pathology and Botany. 12 pages, 30,000.

#### Folder Series

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

148. Built-up litter for poultry houses. Cora Cooke, Agricultural Extension. 4 pages, 10,000.

149. Cannibalism in poultry. Cora Cooke, Agricultural Extension. 4 pages, 10,000.

150. Community nests—clean-egg nests. Cora Cooke, Agricultural Education. 4 pages, 10,000.

#### Newsletters

Name of publication	Issues	Pages	Circulation
Ask University Farm .....	12	50	4,742
Bob Hodgson's Farm Talks .....	12	114	1,488
Club Leader Letter .....	3	12	14,436
Dairy Herd Improvement News .....	2	11	5,532
Farm Business Notes .....	12	48	30,686
Garden Fact Sheet .....	5	12	1,899
Garden and Table .....	3	12	1,188
Home Garden Tips .....	5	21	1,973
Information Letter for Market Gardeners.....	1	2	1,172
Minnesota Farm and Home Science .....	3	48	46,126
Minnesota Rural Youth .....	3	12	7,241
Poultry News Letter .....	6	14	2,060
Reaching Rural People .....	4	9	538
Turkey Letter .....	6	12	13,337
University Farm Radio Shorts .....	50	113	3,061
University Farm Shorts .....	12	24	4,742
Visual Aids Tip Sheet .....	12	28	3,326
	151	542	143,547

#### Boys' and Girls' Club Bulletin Series

3. (Revised) 4-H beef project. W. E. Morris, Agricultural Extension. 16 pages, 5,000.

9. (Reprint) 4-H dairy heifer project. H. R. Searles, Agricultural Extension. 8 pages, 7,000.

16. (Reprint) Our goal is health. Eleanor Loomis, Agricultural Extension. 4 pages, 7,000.

24. (Reprint) Farm and home safety. Glenn Prickett, Agricultural Extension. 16 pages, 20,000.

32. (Reprint) Food preparation. Ina Rowe and Eva Blair, Agricultural Extension. 12 pages, 10,000.

#### SCIENTIFIC JOURNAL SERIES PAPERS

##### Agricultural Biochemistry

2359. Report on the determination of bromates in wheat flour. W. F. Geddes. *Journal of the Association of Official Agricultural Chemists* 31:260-268. 1948.

2387. Studies on wheat germ lipase. I. Methods of estimation, purification, and general properties of the enzyme. T. P. Singer and B. H. J. Hofstee. *Archives of Biochemistry* 18:229-243. 1948.

2388. Studies on wheat germ lipase. II. Kinetics. T. P. Singer and B. H. J. Hofstee. *Archives of Biochemistry* 18:245-259. 1948.

2398. The reducing capacity of milk and milk products as measured by a modified ferricyanide method. L. K. Crowe, Robert Jenness, and S. T. Coulter. *Journal of Dairy Science* 31:595-610. 1948.

2416. Some changes in dry whole milk during storage. S. T. Coulter, Robert Jenness, and L. K. Crowe. *Journal of Dairy Science* 31:986-1003. 1948.

2435. Grain storage studies. VIII. Relation of molds in moist stored cottonseed to increased production of carbon dioxide, fatty acids, and heat. C. M. Christensen, Jon H. Olafson, and W. F. Geddes. *Cereal Chemistry* XXVI(2):109-128. March, 1949.

2439. Some factors influencing the reducing systems in dry whole milk. H. A. Harland, S. T. Coulter, and Robert Jenness. *Journal of Dairy Science* XXXII(4):334-344. April, 1949.

2444. Identification of L-ascorbic acid in the urine of normal and chloretone treated rats. G. W. Probst, and M. O. Schultze. *Federation Proceedings* 8:239. 1949.

2445. Conversion of carotene to vitamin A by the rat. J. G. Bieri. *Federation Proceedings* 8:184. 1949.

2446. Growth and reproduction of rats on rations devoid of animal protein. M. O. Schultze. *Federation Proceedings* 8:395. 1949.

2449. A biologically-active, reversible oxidation products of a-tocopherol. P. D. Boyer. *Federation Proceedings* 8:187. 1949.

2450. Immunochemical studies of factors modifying interaction of egg albumin and rabbit anti-egg albumin. W. J. Kleinschmidt and P. D. Boyer. *Federation Proceedings* 8:213. 1949.

## Agricultural Economics

2425. Research into the problems involved in marketing slaughter livestock by carcass weight and grade. A. A. Dowell and Gerald Engelman. *Journal of Farm Economics* 31(1):343. February, 1949.

## Agricultural Engineering

2330. Durability of concretes and mortars in acid soils, with particular reference to drain tile. D. G. Miller and P. W. Manson. *University of Minnesota Agricultural Experiment Station Technical Bulletin* 180:1-80. June, 1948.

2412. Essential characteristics of durable concrete drain tile for alkali soils. P. W. Manson and D. G. Miller. *Journal of the American Society of Agricultural Engineers* 29:485-487. 1948.

2413. Essential characteristics of durable concrete drain tile for acid soils. D. G. Miller and P. W. Manson. *Journal of the American Society of Agricultural Engineers* 29:437-441. 1948.

2436. How do fluctuating storage temperatures affect frozen foods? Andrew Hustrulid, J. D. Winter, and Isabel Noble. *Refrigerating Engineering* 57:38-41, 88-90. January, 1949.

## Agronomy and Plant Genetics

2395. Comparative reaction of sugar beet strains to black root in field tests at Blissfield, Michigan, and Waseca, Minnesota, in 1947. John O. Gaskill, H. W. Bockstahler, and Oscar E. Reece. *Proceedings of the American Society of Sugar Beet Technologists* pp. 1-9. 1949.

2396. Progress report on breeding of sugar beets in Minnesota for resistance to black root. H. W. Bockstahler and O. E. Reece. *Proceedings of the American Society of Sugar Beet Technologists* 1948:1-5. 1949.

2433. The response of flax to rates and formulations of 2,4-Dichlorophenoxyacetic acid. R. K. Tandon. *Agronomy Journal* 41:213-218. 1949.

2443. Tests of bromegrass strains in Minnesota. H. L. Thomas and E. L. McPherron. *Agronomy Journal* 41:189-190. 1949.

2451. Cold resistance of various legumes and grasses in early stages of growth. H. R. Arakeri and A. R. Schmid. *Agronomy Journal* 41:182-185. 1949.

## Animal Husbandry

2414. The effect of plane of nutrition on the economy of production and carcass quality of swine. L. M. Winters, C. F. Sierk, and J. N. Cummings. *Journal of Animal Science* 8:132-140. February, 1949.

2426. A study of the variations of muscle, fat and bone of swine carcasses. W. J. Aunan and L. M. Winters. *Journal of Animal Science* 8:182-190. May, 1949.

2438. A "toxemic-uremic" syndrome in baby pigs fed on dried skim milk. W. W. Green, H. C. H. Kernkamp, M. H. Roepke, and L. M. Winters. *American Journal of Veterinary Research* 10:256-264. July, 1949.

## Dairy Husbandry

2391. Effect of feeding tocopherols to dairy cows on the quantity and the fat content of milk produced. T. W. Gullickson, J. B. Fitch, and L. O. Gilmore. *Journal of Dairy Science* 31:557-560. 1948.

2397. The effect of preparation of the cow on the rate of milking. V. R. Smith and W. E. Petersen. *Journal of Dairy Science* 31:589-593. 1948.

2398. The reducing capacity of milk and milk products as measured by a modified ferricyanide method. L. K. Crowe, Robert Jenness, and S. T. Coulter. *Journal of Dairy Science* 31:595-610. 1948.

2399. Sacral deformity in the "Wrytail" abnormality in cattle. L. O. Gilmore and A. F. Sellers. *Journal of Dairy Science* 31:797-803. September, 1948.

2401. Effect of infused streptomycin in the mammary gland. W. E. Petersen, C. R. Smith, and R. W. Brown. *Proceedings of the Society for Experimental Biology and Medicine* 68:216-219. 1948.

2416. Some changes in dry whole milk during storage. S. T. Coulter, Robert Jenness, and L. K. Crowe. *Journal of Dairy Science* 31:986-1003. 1948.

2431. Packaging of print butter. T. A. Nickerson and S. T. Coulter. *American Butter and Cheese Review* 10(12):18-28. 1948. Also, *National Butter and Cheese Journal* 40(1):26-27, 52, 54-57. 1949.

2434. The inheritance of functional causes of reproductive inefficiency: A review. L. O. Gilmore. *Journal of Dairy Science* 32:71-91. 1949.

2439. Some factors influencing the reducing systems in dry whole milk. H. A. Harland, S. T. Coulter, and Robert Jenness. *Journal of Dairy Science* XXXII(4):334-344. April, 1949.

## Entomology and Economic Zoology

2299. Taxonomic and biological investigations in the genus *Megastigmus*, with particular reference to the taxonomy of the nearctic species (Hymenoptera: Chalcidoidea: Callimomidae). Herbert E. Milliron. *American Midland Naturalist* 4:257-420. 1949.

2404. Notes on biology of Cyclopic bees. Mykola H. Haydak. *Journal of Economic Entomology* 41:663-664. 1948.



2409. Ruffed grouse populations in Minnesota in relation to blood and intestinal parasitism. Arnold B. Erickson, Paul R. Highby, and C. Edward Carlson. *Journal of Wildlife Management* 13:188-194. 1949.

2415. The classification of insects. Clarence E. Mickel. *Annals of the Entomological Society of America* 52:1-6. 1949.

2418. The identity of two introduced clover seed weevils (Coleoptera; Curculionidae). H. E. Milliron. *Journal of the New York Entomological Society* 57:109-116. 1949.

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#### Home Economics

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2385. Ascorbic acid and dehydroascorbic acid content of raw and cooked vegetables. Isabel Noble and Margaret Devore Hanig. *Food Research* 13(6):461-471. 1948.

2386. Thiamine and riboflavin retention in beef tongue. Isabel Noble, Joan Gordon and Lois Catterson. *Journal of the American Dietetic Association* 24(12):1068-1069. December, 1948.

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#### Horticulture

2364. Effect of temperatures above and below freezing on the breaking of rest in the Latham raspberry. R. C. Lamb. *Proceedings of the American Society for Horticultural Science* 51:313-315. 1948.

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#### Poultry Husbandry

2363. The reaction of the fowl to inbreeding. R. N. Shoffner. *Poultry Science* 27:448-452. 1948.

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2406. Performance of "incrosses" among lines of leghorns (abstract). R. N. Shoffner. *Poultry Science* 27:683. 1948.

#### Veterinary Medicine

2399. Sacral deformity in the "Wrytail" abnormality in cattle. L. O. Gilmore and A. F. Sellers. *Journal of Dairy Science* 31:797-803. September, 1948.

2401. Effect of infused streptomycin in the mammary gland. W. E. Petersen, C. R. Smith, and R. W. Brown. *Proceedings of the Society for Experimental Biology and Medicine* 68:216-219. 1948.

2402. Tularemia in beaver and its transmission to man. R. Fenstermacher, J. H. Sautter, and B. S. Pomeroy. *North American Veterinarian* 30:250-255. April, 1949.

2403. Some observations of postparturient cows in four separate herds as related to expulsion of their fetal membranes. W. L. Boyd and A. F. Sellers. *Cornell Veterinarian* 38:263-266. July, 1948.

2405. A case of bovine lymphoblastoma (leukemia) with unusual blood findings and an apparently short clinical course. J. H. Sautter and A. F. Sellers. *Cornell Veterinarian* 38:317-324. July, 1948.

2417. Vaccination of pigs with *Brucella abortus* vaccine strain 19. H. C. H. Kernkamp and M. H. Roepke. *Journal of the American Veterinary Medical Association* 113:564-567. December, 1948.

2420. Atypical pseudorabies and listeriosis in cattle. A. F. Sellers, B. S. Pomeroy, J. H. Sautter, L. H. Pint, and C. E. Schrafel. *Journal of the American Veterinary Medical Association* 114:69-73. February, 1949.

2421. The incidence of variant pullorum in Minnesota. J. E. Williams, B. S. Pomeroy, R. Fenstermacher, and Adelaide Holland. *Cornell Veterinarian* 39:129-135. April, 1949.

2432. The milk and cream ring test for brucellosis. M. H. Roepke, L. B. Clausen, and Andrew L. Walsh. *Proceedings 52nd Annual Meeting of the U. S. Livestock Sanitary Association* 1948:147-159. 1948.

2437. Swine influenza as a possible factor in suckling pig mortalities. I. Seasonal occurrence in adult swine as indicated by hemagglutinin inhibitors in serum. George A. Young, Jr. and Norman R. Underdahl. *Cornell Veterinarian* 39:105-119. April, 1949.

II. Colostral transfer of hemagglutinin inhibitors for swine influenza virus from dam to offspring. George A. Young, Jr. and Norman R. Underdahl. *Cornell Veterinarian* 39:120-128. April, 1949.

2438. A "toxemic-uremic" syndrome in baby pigs fed on dried skim milk. W. W. Green, H. C. H. Kernkamp, M. H. Roepke, and L. M. Winters. *American Journal of Veterinary Research* 10:256-264. July, 1949.

#### MISCELLANEOUS JOURNAL SERIES PAPERS

##### Agricultural Biochemistry

603. Some biochemical aspects of metabolism of iron and copper. M. O. Schultze. *Nutritional Anemia* 1:99-114. August, 1948.

##### Agronomy and Plant Genetics

633. A machine for tying cereal nursery bundles. E. R. Ausemus. *Journal of the American Society of Agronomy* 40:851-852. 1948.

640. Effect of 2,4-D on flax with and without weeds. R. S. Dunham and R. G. Robinson. *Fifth Annual North Central Weed Control Conference Research Report* Section III No. 39. 1948.

641. Response of flax varieties to 2,4-D. R. S. Dunham and R. G. Robinson. *Fifth Annual North Central Weed Control Conference Research Report* Section III No. 40. 1948.

642. Growth and yields of 1st generation progeny from 2,4-D sprayed flax plants. R. S. Dunham and R. G. Robinson. *Fifth Annual North Central Weed Control Conference Research Report* Section III No. 41. 1948.

644. Where are we in weed control? R. S. Dunham. *Minnesota Seed Grower* 21(6):1-2. 1948.
645. Soybeans take their place in Minnesota's Agriculture. J. W. Lambert. *Cook's Farm Directory* Wabasha Co.:43. 1949. Also, *Cook's Farm Directory* Goodhue Co.:42. 1949. Also, *Cook's Farm Directory* Olmsted Co.:58. 1949.
647. Further studies on cultural control of weeds. R. S. Dunham. *Proceedings of the American Flax Institute*. 1948.
648. The response of flax to 2,4-D. R. S. Dunham. *Proceedings of the Fifth Annual Meeting of the North Central Weed Control Conference*:26-28. 1948.
654. New winter wheat developed for Minnesota and South Dakota area. E. R. Ausemus. *What's New in Crops and Soils* 1(7):30. 1949.
656. Andrew and Zephyr, two new Minnesota oats. Carl Borgeson. *What's New in Crops and Soils* 1(7):7. 1949.

#### Animal Husbandry

619. The famous Minnesota hogs. L. M. Winters. *The Westerner* 12:16, 17, 37, 40, 41. 1948.

#### Dairy Husbandry

639. Vitamin E in the nutrition of cattle. I. Effect of feeding vitamin E poor rations on reproduction, health, milk production, and growth. T. W. Gullickson, L. S. Palmer, W. L. Boyd, J. W. Nelson, F. C. Olson, C. E. Calverley, and P. D. Boyer. *Journal of Dairy Science* 32:495-508. 1949.
659. Testing cream for sediment. A. W. Rudnick, Jr., S. T. Coulter, W. B. Combs, H. A. Hoffman, C. Pesek, and J. P. Hortsch. *American Butter and Cheese Review* 11(5):8, 40-43. 1949.

#### Entomology and Economic Zoology

594. Knowledge of insects and physiology essential for most effective chemical control. *Agricultural Chemicals* 3(8):33-34, 77. 1948.
618. Stimulative feeding of bees in the spring. Mykola H. Haydak. *Scottish Beekeeper* 24:80-81, 95. 1948.
630. Take care when you spray. Lawrence K. Cutkomp. *Everybody's Health* 33(7):5, 15. 1948.
631. Training bees. Mykola H. Haydak. *Gleanings in Bee Culture* 76:518, 528. 1948.
634. Minnesota forest insect and disease survey report for 1946 and 1947. C. M. Christensen and A. C. Hodson. St. Paul: Department of Conservation, Division of Forestry. 1948.
646. Honey as food. Mykola H. Haydak. *State Apiarist Report* pp. 42-52. 1948.

650. Honeybees—The map readers and harvest makers. Mykola H. Haydak. *Southern Beekeeper* 3(2):67. 1949.
653. Effectiveness of modern fish management practices: Planting. Lloyd L. Smith, Jr. *Proceedings 38th Convention of International Association of Game, Fish and Conservation Commissioners* pp. 42-48. 1948.
661. Notes on history of beekeeping in Minnesota. M. H. Haydak. *Minnesota Beekeeper* 2(2):9-16. 1949.
662. Directions for preparing and using pollen substitutes. M. H. Haydak. Mimeographed circular by Archer, Daniels, Midland Company, Minneapolis. pp. 1-2. 1949.

#### Forestry

613. Governmental regulation of cutting practices on privately owned forest in Sweden. Gunnar C. Haug and J. H. Allison. *Journal of Forestry* 46(11):799-806. November, 1948.

#### Home Economics

643. Today's textiles—fibers, fabrics and finishes. Ethel L. Phelps. *Journal of Home Economics* 41(2):79-82. February, 1949.

#### Horticulture

637. A study on the use of 2,4-D for weed control in strawberries. R. E. Nylund. *Fifth Annual North Central Weed Control Conference Research Report*. Springfield, Illinois. December 8-10, 1948.
638. A study on the chemical control of weeds in onions. R. E. Nylund. *Fifth Annual North Central Weed Control Conference Research Report*. Springfield, Illinois. December 8-10, 1948.
649. Chemical control of weeds in onions by post-emergence sprays. R. E. Nylund. *Proceedings of the Fifth Annual Meeting of the North Central Weed Control Conference*. Springfield, Illinois. pp. 45-47. December 8-10, 1948.
651. New garden chrysanthemums. L. E. Longley. *The Minnesota Horticulturist* 77:23. February, 1949.
652. Five new varieties of fruit. W. H. Alderman, T. S. Weir, W. G. Brierley, A. N. Wilcox, J. D. Winter, and K. W. Hanson. *The Minnesota Horticulturist* 77:37. March, 1949.
663. How hardy are our perennials. Violet L. Clark. *The Minnesota Horticulturist* 77:86. June, 1949.

#### Plant Pathology and Botany

634. Minnesota forest insect disease survey report for 1946 and 1947. A. C. Hodson and C. M. Christensen. pp. 1-10. 1948.

665. High pressure jet inoculation of wheat and barley with loose smut. M. B. Moore and D. E. Munnecke. Mimeographed by the Minnesota Agricultural Experiment Station. 1949.

#### Rural Sociology

601. Speaking of tongues. Lowry Nelson. *The American Journal of Sociology* LIV (3):202-210. November, 1948.

635. Factors associated with variations in school attendance of Minnesota farm boys. Douglas G. Marshall and Milo J. Peterson. University of Minnesota lithographed report. July, 1948.

#### Veterinary Medicine

626. Traumatic pericarditis caused by bristles from steel broom. Harvey H. Hoyt. *North American Veterinarian* 29:639. October, 1948.

#### SUMMARY OF PUBLICATIONS

July 1948—June 1949

Kind of publication	Number issued	Number of pages	Number of copies in edition
General Series Bulletins .....	5	164	28,500
Technical Series Bulletins .....	6	166	19,500
Minnesota Farm and Home Science .....	3	48	49,550
Report Series .....	3	65	22,500
Extension Service			
Bulletins .....	7	160	102,500
Pamphlets .....	8	62	114,000
Folders .....	4	18	40,000
4-H Bulletins .....	5	56	49,000
Newsletters .....	151	542	143,547
	192	1,281	569,097

#### SUMMARY OF JOURNAL SERIES PAPERS

Division	Scientific Journal Series		Miscellaneous Journal Series	
	Number issued	Number of pages	Number issued	Number of pages
Agricultural Biochemistry .....	11	98	1	16
Agricultural Economics .....	1	1	0	0
Agricultural Engineering .....	4	92	0	0
Agronomy and Plant Genetics.....	5	26	10	15
Animal Husbandry .....	2	18	1	5
Dairy Husbandry .....	9	105	2	18
Entomology and Economic Zoology	7	211	10	49
Forestry .....	0	0	1	8
Home Economics .....	6	29	1	4
Horticulture .....	9	61	6	8
Plant Pathology and Botany.....	8	78	2	11
Poultry Husbandry .....	3	19	0	0
Soils .....	0	0	0	0
Veterinary Medicine .....	10	87	1	1
Rural Sociology .....	0	0	2	33
	75	825	37	168
Total Publications .....	306			

## NEW EXPERIMENT STATION PROJECTS

## Agricultural Biochemistry

201. The biochemistry of carotinoid pigments in animals.

## Agricultural Engineering

145. Development of an experimental machine for placing fertilizer with seeded corn.

146. Housing and management of dairy cattle with relation to efficiency and economy. (See also Dairy Husbandry 146.)

FH-2212-2. Design and development of equipment and methods for weed control.

FH-2212-3. Farm housing costs in Minnesota.

## Agronomy and Plant Genetics

146. Field pea variety test.

FH-2213-2. Cytogenetics of crop plants.

## Animal Husbandry

430. The development of a dual-purpose breed, or inbred line of cattle by attempting to bring together a more desirable genetic complex, to be done by drawing on several existent breeds of dual-purpose cattle.

431. Fungicide treated oats as a feed for swine.

432. Limited feeding of fattening lambs.

433. Feeding potatoes to beef cattle.

434. High levels of iron and copper in rations for pregnant gilts.

## Dairy Husbandry

146. Housing and management of dairy cattle with relation to efficiency and economy. (See also Agricultural Engineering 146.)

## Entomology and Economic Zoology

112. Biological and taxonomic studies in the family Mymaridae (Hymenoptera; Chalcidoidea).

113. Biological and taxonomic investigations in Bombidae.

163. Epidemiology and epizootiology of the Arthropod-borne virus encephalitides with particular emphasis on western equine encephalitis.

164. Minnesota sport and commercial fishery investigations.

## Forestry

FH-2219-2. The production, marketing, and utilization of treated fence posts.

## Rural Sociology

FH-2250-2. A study of the factors associated with selective migration in the rural farm population of Minnesota.

## Soils

118. Soil organic matter investigations.

## SUMMARY OF PROJECTS

Division	Total	Active	Inactive	Closed	New
Agricultural Biochemistry .....	18	18	0	0	1
Agricultural Economics .....	27	27	0	1	0
Agricultural Engineering .....	20	20	0	1	4
Agronomy and Plant Genetics.....	26	26	0	1	2
Animal Husbandry .....	14	14	0	4	5
Dairy Husbandry .....	16	16	0	0	1
Entomology and Economic Zoology	22	22	0	0	4
Forestry .....	10	10	0	0	1
Home Economics .....	14	14	0	0	0
Horticulture .....	20	20	0	0	0
Plant Pathology and Botany .....	31	31	0	0	0
Poultry Husbandry .....	8	8	0	1	0
Soils .....	9	9	0	1	1
Veterinary Medicine .....	10	10	0	1	0
Rural Sociology .....	4	4	0	0	1
North Central Experiment Station....	4	4	0	0	0
Northeast Experiment Station .....	6	6	0	0	0
Northwest Experiment Station .....	7	6	1	0	0
Southeast Experiment Station .....	1	1	0	0	0
West Central Experiment Station....	6	6	0	0	0
<b>Total .....</b>	<b>273</b>	<b>272</b>	<b>1</b>	<b>10</b>	<b>20</b>

**FINANCIAL STATEMENT**  
Income 1948-1949

Sources of Revenue	University Farm	Branch Stations					Total
		Crookston	Morris	Grand Rapids	Duluth	Waseca	
<b>Federal appropriations:</b>							
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 fund .....	66,813.91						66,813.91
Research and Marketing fund.....	89,407.19						89,407.19
Regional Research fund .....	29,474.33						29,474.33
<b>State appropriations:</b>							
General University support.....	698,746.33	\$43,579.11	\$48,363.49	\$35,746.50	\$25,617.09	\$37,369.91	889,422.43
Special appropriations .....	177,000.00						177,000.00
<b>Endowments, fellowships, and other similar grants .....</b>							
	102,293.06						102,293.06
<b>Fees, sales, and miscellaneous.....</b>							
	101,862.45	34,855.41	33,178.58	23,704.71	20,251.28	42,478.03	256,330.46
<b>Total .....</b>	<b>\$1,355,597.27</b>	<b>\$78,434.52</b>	<b>\$81,542.07</b>	<b>\$59,451.21</b>	<b>\$45,868.37</b>	<b>\$79,847.94</b>	<b>\$1,700,741.38</b>

**EXPENDITURES 1948-1949**

Classification	University Farm	Branch Stations					Total
		Crookston	Morris	Grand Rapids	Duluth	Waseca	
Services and labor .....	\$ 879,932.83	\$52,237.55	\$58,457.86	\$33,098.13	\$28,862.12	\$49,277.15	\$1,101,865.64
Travel expenses .....	29,515.93	448.00	513.04	198.05	673.04	191.25	31,539.31
Transportation of things .....	5,542.01	597.95	916.66	471.87	105.41	407.49	8,041.39
Communication service .....	7,114.91	551.45	419.22	354.76	333.41	312.45	9,086.20
Rents and utility service .....	15,726.66	1,958.33	883.14	1,740.49	729.78	1,623.81	22,662.21
Printing and binding .....	6,096.84	16.32	136.97				6,250.13
Other contractual services .....	74,001.77	6,266.19	2,972.77	5,466.95	5,324.76	10,956.46	104,988.90
Supplies and materials .....	194,827.30	13,297.61	11,646.14	14,397.40	8,239.78	9,849.61	252,257.84
Equipment .....	82,319.11	3,061.12	5,596.27	3,723.56	1,600.07	5,290.62	101,590.75
Lands and structures (contractual).....	14,352.95					1,939.10	16,292.05
Annuities .....	1,386.50						1,386.50
Balance brought forward for R.M. and R.R.F. funds .....	44,780.46						44,780.46
<b>Total .....</b>	<b>\$1,355,597.27</b>	<b>\$78,434.52</b>	<b>\$81,542.07</b>	<b>\$59,451.21</b>	<b>\$45,868.37</b>	<b>\$79,847.94</b>	<b>\$1,700,741.38</b>

## EXPERIMENT STATION STAFF

## The Board of Regents

THE HON. JAMES F. BELL, Minneapolis	- - - - -	1951
THE HON. DANIEL C. Gainey, Owatonna	- - - - -	1955
THE HON. RICHARD L. GRIGGS, Duluth	- - - - -	1951
THE HON. J. S. JONES, St. Paul	- - - - -	1953
THE HON. GEORGE W. LAWSON, St. Paul	- - - - -	1951
THE HON. A. J. LOBB, Rochester	- - - - -	1953
THE HON. E. E. NOVAK, New Prague	- - - - -	1955
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## Section of Nutrition, Dairy Chemistry, and Analytical Service

M. O. SCHULTZE, Ph.D., Agricultural Biochemist  
 P. D. BOYER, Ph.D., Associate Agricultural Biochemist  
 ROBERT JENNESS, Ph.D., Associate Agricultural Biochemist  
<sup>3</sup>CORNELIA KENNEDY, Ph.D., Associate Agricultural Biochemist

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

<sup>4</sup>J. A. SCHRICKER, B.S., Assistant Biochemist

## DIVISION OF AGRICULTURAL ECONOMICS

O. B. JESNESS, Ph.D., Agricultural Economist, Chief  
 A. A. DOWELL, Ph.D., Agricultural Economist  
 E. F. KOLLER, Ph.D., Agricultural Economist  
 G. A. POND, Ph.D., Agricultural Economist  
 W. C. WAITE, Ph.D., Agricultural Economist  
 S. A. ENGEL, Ph.D., Associate Agricultural Economist  
 R. W. COX, Ph.D., Assistant Agricultural Economist  
 G. ENGELMAN, Ph.D., Research Associate  
 TRUMAN R. NODLAND, Ph.D., Assistant Agricultural Economist  
<sup>5</sup>R. R. BENEKE, M.S., Assistant in Agricultural Economics  
<sup>6</sup>W. E. McDANIEL, M.S., Assistant in Agricultural Economics  
 F. R. TAYLOR, M.S., Assistant in Agricultural Economics

<sup>1</sup> Resigned March 15, 1949

<sup>2</sup> On leave July 1, 1948, to July 8, 1948

<sup>3</sup> Retired July 1, 1948

<sup>4</sup> Resigned September 1, 1948

<sup>5</sup> Resigned September 15, 1948

<sup>6</sup> Appointed September 16, 1948

## DIVISION OF AGRICULTURAL ENGINEERING

<sup>1</sup>A. J. SCHWANTES, M.S., Agricultural Engineer, Chief

## Section of Farm Power and Machinery

A. J. SCHWANTES, M.S., Agricultural Engineer  
 JOHN STRAIT, M.S., Assistant Agricultural Engineer  
 J. B. TORRANCE, B.S., Assistant Agricultural Engineer  
 J. G. DENT, Assistant in Agricultural Engineering  
 V. H. JOHNSON, B.A.E., Assistant in Agricultural Engineering

## Section of Farm Structures

C. H. CHRISTOPHERSON, M.A., Associate Agricultural Engineer  
 C. K. OTIS, M.S., Associate Agricultural Engineer  
 A. H. BURMAN, B.A., Assistant in Agricultural Engineering

## Section of Agricultural Physics and Rural Electrification

ANDREW HUSTRULID, Ph.D., Agricultural Engineer  
 A. G. TYLER, B.S., Assistant Agricultural Engineer  
 A. M. FLIKKE, M.S., Assistant in Agricultural Engineering

## Section of Soil and Water Conservation

P. W. MANSON, M.S., Agricultural Engineer  
 E. R. ALLRED, M.S., Assistant Agricultural Engineer  
<sup>4</sup>C. L. LARSON, B.A.E., Assistant in Agricultural Engineering

## Section of Land Clearing

M. J. THOMPSON, M.S., Land Clearing Specialist

Detailed by the Public Roads Administration of Federal Works Agency, for  
 Cooperative Work

D. G. MILLER, C.E., Materials Engineer

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

R. E. LARSON, B.A.E., Agent

Detailed by the United States Department of Agriculture, Soil Conservation Service,  
 Division of Research, for Cooperative Work

<sup>9,10</sup>R. E. KEPPEL, Agricultural Engineer

## DIVISION OF AGRONOMY AND PLANT GENETICS

H. K. HAYES, D.Sc., Agronomist and Plant Geneticist, Chief

<sup>11</sup>C. R. BURNHAM, Ph.D., Plant Geneticist

R. S. DUNHAM, M.S., Agronomist

R. F. CRIM, B.S., Associate Agronomist and Extension Specialist in Agriculture

E. H. RINKE, Ph.D., Associate Plant Geneticist

<sup>7</sup> On leave October 1, 1948, to June 30, 1949

<sup>8</sup> Appointed July 1, 1948

<sup>9</sup> Appointed January 1, 1949

<sup>10</sup> Resigned June 30, 1949

<sup>11</sup> On leave July 1, 1948, to August 31, 1948

H. L. THOMAS, Ph.D., Associate Plant Geneticist

CARL BORGESON, M.S., Assistant Agronomist

J. W. LAMBERT, Ph.D., Assistant Plant Geneticist

E. L. PINNELL, Ph.D., Assistant Plant Geneticist

R. G. ROBINSON, Ph.D., Assistant Agronomist

A. R. SCHMID, Ph.D., Assistant Agronomist

<sup>12</sup>H. L. CARNAHAN, M.S., Research Fellow

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

E. R. AUSEMUS, Ph.D., Agronomist

J. O. CULBERTSON, Ph.D., Agronomist

<sup>13</sup>L. M. STAHLER, Ph.D., Associate Agronomist

J. H. MILLER, M.S., Agent

<sup>14</sup>O. E. REECE, M.S., Agent

## DIVISION OF ANIMAL HUSBANDRY

<sup>15</sup>W. H. PETERS, M.Agr., Animal Husbandman, Chief

A. L. HARVEY, Ph.D., Animal Husbandman

P. A. ANDERSON, B.S., Associate Animal Husbandman

R. M. ANDERSON, M.S., Instructor

W. J. AUNAN, M.S., Instructor

## Section of Animal Feeding

E. F. FERRIN, M.Agr., Animal Husbandman

## Section of Animal Breeding

L. M. WINTERS, Ph.D., Animal Husbandman

J. N. CUMMINGS, Ph.D., Associate Animal Husbandman

<sup>16</sup>W. W. GREEN, Ph.D., Associate Animal Husbandman

C. F. SIERK, Ph.D., Associate Animal Husbandman

<sup>17</sup>FREDERICK KRISTJANSSEN, M.S., Research Fellow

C. B. ROUBICEK, M.S., Research Fellow

## DIVISION OF DAIRY HUSBANDRY

J. B. FITCH, M.S., Dairy Husbandman, Chief

## Section of Dairy Production

J. B. FITCH, M.S., Dairy Husbandman

<sup>18</sup>W. E. PETERSEN, Ph.D., Dairy Husbandman

<sup>19</sup>L. O. GILMORE, Ph.D., Associate Dairy Husbandman

T. W. GULLICKSON, Ph.D., Associate Dairy Husbandman

<sup>20</sup>M. C. HERVEY, Ph.D., Associate Dairy Husbandman

<sup>21</sup>L. S. MIX, B.S., Research Fellow

<sup>12</sup> Resigned December 31, 1948

<sup>13</sup> Resigned July 1, 1948

<sup>14</sup> Resigned October 31, 1948

<sup>15</sup> On leave May 15, 1949, to June 30, 1949

<sup>16</sup> Resigned August 31, 1948

<sup>17</sup> Appointed September 1, 1948

<sup>18</sup> On leave November 1, 1948, to December 31, 1948

<sup>19</sup> Resigned October 15, 1948

<sup>20</sup> Appointed April 1, 1949

<sup>21</sup> Appointed October 1, 1948



## Section of Dairy Products

W. B. COMBS, M.A., Dairy Husbandman  
 S. T. COULTER, Ph.D., Dairy Husbandman  
 H. A. HARLAND, M.S., Research Associate  
 E. L. THOMAS, M.S., Assistant in Dairy Husbandry  
<sup>22</sup>H. A. MORRIS, M.S., Assistant in Dairy Husbandry

## Section of Dairy Bacteriology

H. MACY, Ph.D., Dairy Bacteriologist  
 J. C. OLSON, JR., Ph.D., Associate Dairy Bacteriologist  
 J. J. JEZESKI, Ph.D., Assistant Dairy Bacteriologist

## DIVISION OF ENTOMOLOGY AND ECONOMIC ZOOLOGY

C. E. MICKEL, Ph.D., Entomologist, Chief  
 A. A. GRANOVSKY, Ph.D., Entomologist  
 A. C. HODSON, Ph.D., Entomologist  
<sup>23</sup>F. G. HOLDAWAY, Ph.D., Entomologist  
 M. H. HAYDAK, Ph.D., Associate Apiculturist  
 W. H. MARSHALL, Ph.D., Associate Zoologist  
 A. G. RICHARDS, Ph.D., Associate Entomologist  
 L. L. SMITH, JR., Ph.D., Associate Zoologist  
 T. L. AAMODT, B.S., Assistant Entomologist  
<sup>24</sup>JAMES R. BEER, Ph.D., Assistant Zoologist  
<sup>25</sup>A. L. BURROUGHS, Ph.D., Assistant Entomologist  
 L. K. CUTKOMP, Ph.D., Assistant Entomologist  
<sup>26</sup>H. Y. FAN, Ph.D., Research Associate  
<sup>27</sup>J. S. CASS, M.S., Research Fellow  
<sup>28</sup>H. C. CHIANG, Ph.D., Research Fellow  
 R. S. FREEMAN, M.S., Research Fellow  
<sup>29</sup>H. E. MILLIRON, Ph.D., Assistant in Entomology  
 A. G. PETERSON, M.S., Research Fellow  
<sup>30</sup>D. C. QUIMBY, M.S., Assistant in Zoology

## DIVISION OF FORESTRY

F. H. KAUFERT, Ph.D., Forester, Chief  
 J. H. ALLISON, Ph.B., M.F., Forester  
 T. SCHANTZ-HANSEN, Ph.D., Forester and Director of Lake Itasca Forestry  
 and Biological Station  
 HENRY SCHMITZ, Ph.D., Forester  
 R. M. BROWN, M.F., Associate Forester  
 H. L. HANSEN, Ph.D., Associate Forester  
 R. L. HOSSFELD, Ph.D., Associate Forester  
 L. W. REES, Ph.D., Associate Forester

<sup>22</sup> Appointed July 1, 1948<sup>23</sup> Appointed September 1, 1948<sup>24</sup> Appointed March 1, 1949<sup>25</sup> On leave May 1, 1949, to June 30, 1949<sup>26</sup> Resigned September 30, 1948<sup>27</sup> Resigned June 30, 1949<sup>28</sup> Appointed July 1, 1948<sup>29</sup> Resigned April 22, 1949<sup>30</sup> Resigned September 25, 1948

<sup>31,32</sup>C. H. VAUX, M.S., Associate Forester  
<sup>33</sup>JOHN R. NEETZEL, M.F., Research Associate  
 D. P. DUNCAN, M.S., Assistant in Forestry  
<sup>34</sup>OTIS F. HALL, M.F., Assistant in Forestry  
<sup>35</sup>ARNE KEMP, M.F., Assistant in Forestry

## DIVISION OF HOME ECONOMICS

W. B. MCNEAL, M.A., Home Economist, Chief  
 ALICE BIESTER, M.A., Home Economist  
 JANE M. LEICHSENRING, Ph.D., Home Economist  
 ISABEL NOBLE, Ph.D., Home Economist  
 ETHEL PHELPS, M.S., Home Economist  
 MARGUERITE L. PAULSON, M.S., Assistant in Home Economics

## DIVISION OF HORTICULTURE

W. H. ALDERMAN, B.S.A., Horticulturist, Chief and Superintendent of  
 Fruit Breeding Station  
 J. D. WINTER, M.S., Associate Horticulturist

## Section of Pomology

W. G. BRIERLEY, Ph.D., Horticulturist  
 B. F. DUNN, B.S., Research Associate

## Section of Fruit Breeding

T. S. WEIR, M.S., Associate Horticulturist and Assistant Superintendent of  
 Fruit Breeding Station  
 A. N. WILCOX, Ph.D., Associate Horticulturist

## Section of Vegetable Gardening

T. M. CURRENCE, Ph.D., Horticulturist  
 F. A. KRANTZ, Ph.D., Horticulturist  
 A. E. HUTCHINS, Ph.D., Associate Horticulturist  
 R. E. NYLUND, Ph.D., Assistant Horticulturist  
<sup>36</sup>W. A. OITTO, B.S., Research Fellow  
<sup>37</sup>O. C. TURNQUIST, M.S., Research Fellow

## Section of Floriculture and Ornamental Horticulture

<sup>38</sup>L. E. LONGLEY, Ph.D., Assistant Horticulturist  
 R. A. PHILLIPS, B.S., Assistant in Horticulture

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

KENNETH W. HANSEN, Special Agent

<sup>39</sup>FLORIAN I. LAUER, Special Agent

<sup>31</sup> Appointed September 1, 1948<sup>32</sup> Resigned June 30, 1949<sup>33</sup> Appointed October 1, 1948<sup>34</sup> Appointed July 1, 1948<sup>35</sup> Appointed March 1, 1949<sup>36</sup> Appointed December 16, 1948<sup>37</sup> Resigned November 15, 1948<sup>38</sup> Retired June 15, 1949<sup>39</sup> Appointed November 1, 1948

"MARVIN P. STEINBERG, M.S., Special Agent  
 "O. C. TURNQUIST, M.S., Agent Horticulturist

#### DIVISION OF PLANT PATHOLOGY AND BOTANY

E. C. STAKMAN, Ph.D., Plant Pathologist and Botanist, Chief  
 C. M. CHRISTENSEN, Ph.D., Plant Pathologist  
 J. J. CHRISTENSEN, Ph.D., Plant Pathologist  
 C. J. EIDE, Ph.D., Plant Pathologist  
 HELEN HART, Ph.D., Plant Pathologist  
 LOUISE T. DOSDALL, Ph.D., Assistant Plant Pathologist  
 M. F. KERNKAMP, Ph.D., Assistant Plant Pathologist  
 "T. H. KING, Ph.D., Assistant Plant Pathologist  
 R. H. LANDON, Ph.D., Assistant Plant Physiologist  
 A. H. LARSON, B.S., Assistant Botanist  
 "J. M. DALY, M.S., Assistant in Plant Pathology  
 H. G. HEGGENESS, M.S., Assistant in Plant Physiology  
 THOR KOMMEDAHL, M.S., Assistant in Plant Pathology  
 C. E. LOGSDON, B.A., Research Fellow  
 M. B. MOORE, M.S., Assistant in Plant Pathology

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

#### Division of Cereal Crops and Diseases

M. N. LEVINE, Ph.D., Pathologist

#### Division of Sugar Plant Investigation

"C. L. SCHNEIDER, B.S., Assistant Pathologist

#### Bureau of Entomology and Plant Quarantine Division of Plant Disease Control

R. U. COTTER, Ph.D., Pathologist  
 THAIN H. STEWART, B.S., State Leader of Barberry Eradication  
 W. Q. LOEGERING, Ph.D., Agent

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. C. REGNIER, Chief Inspector, Office of Seed Potato Certification

#### DIVISION OF POULTRY HUSBANDRY

H. J. SLOAN, Ph.D., Poultry Husbandman, Chief  
 T. H. CANFIELD, M.S., Associate Poultry Husbandman  
 G. M. BRIGGS, Ph.D., Assistant Poultry Husbandman  
 R. N. SHOFFNER, Ph.D., Assistant Poultry Husbandman

<sup>40</sup> Appointed July 12, 1948  
<sup>41</sup> Appointed November 16, 1948  
<sup>42</sup> Appointed July 1, 1948  
<sup>43</sup> Appointed July 1, 1948  
<sup>44</sup> Appointed September 1, 1948

#### DIVISION OF SOILS

C. O. ROST, Ph.D., Soils Chemist, Chief  
 P. R. McMILLER, M.S., Soils Chemist  
 P. M. BURSON, M.S., Associate Soils Chemist and Extension Specialist in  
 Soils  
 A. C. CALDWELL, Ph.D., Associate Soils Chemist  
 J. M. MACGREGOR, Ph.D., Assistant Soils Chemist  
 H. F. ARNEMAN, M.S., Assistant in Soils Chemistry

#### DIVISION OF VETERINARY MEDICINE

W. L. BOYD, D.V.S., Veterinarian, Chief  
 R. FENSTERMACHER, D.V.M., Pathologist  
<sup>45</sup>ALLAN HEMINGWAY, Ph.D., Biological Chemist  
 H. C. H. KERNKAMP, D.V.M., M.S., Veterinarian  
 B. S. POMEROY, D.V.M., Ph.D., Animal Pathologist  
 M. H. ROEPKE, Ph.D., Biological Chemist  
<sup>46</sup>J. N. CAMPBELL, D.V.S., B.S., Associate Veterinarian  
<sup>47</sup>H. J. GRIFFITHS, D.V.M., Ph.D., Associate Animal Parasitologist  
 J. H. SAUTTER, D.V.M., Ph.D., Assistant Veterinarian  
<sup>48</sup>D. E. BARTLETT, D.V.M., Assistant in Veterinary Medicine  
 R. W. BROWN, B.S., V.M.D., Research Fellow  
 G. H. CONNER, D.V.M., B.S., M.S., Assistant in Veterinary Medicine  
 W. J. HADLOW, D.V.M., Assistant in Veterinary Medicine  
 H. H. HOYT, D.V.M., Assistant in Veterinary Medicine  
 R. L. KITCHELL, D.V.M., Assistant in Veterinary Medicine  
<sup>49</sup>W. A. MALMQUIST, D.V.M., Assistant in Veterinary Medicine  
<sup>50</sup>G. W. MATHER, D.V.M., Assistant in Veterinary Medicine  
<sup>51</sup>T. B. O'DELL, A. B., Assistant in Veterinary Medicine  
<sup>52</sup>W. R. PRITCHARD, D.V.M., Assistant in Veterinary Medicine  
 A. F. SELLERS, D.V.M., M.S., Assistant in Veterinary Medicine  
 F. A. SPURRELL, D.V.M., B.S., Assistant in Veterinary Medicine  
 J. E. WILLIAMS, D.V.M., Research Fellow

#### RURAL SOCIOLOGY

LOWRY NELSON, Ph.D., Rural Sociologist  
 DOUGLAS G. MARSHALL, Ph.D., Associate Rural Sociologist

#### NORTH CENTRAL EXPERIMENT STATION

D. L. DAILEY, B.S., Superintendent  
 RICHARD B. AAKRE, B.S., Assistant Agricultural Engineer  
 C. H. GRIFFITH, M.S., Assistant Agronomist  
 K. P. MILLER, M.S., Assistant Animal Husbandman  
 C. R. OLSEN, B.S., Assistant in Horticulture and Poultry

<sup>45</sup> Appointed September 16, 1948  
<sup>46</sup> Appointed December 16, 1948  
<sup>47</sup> Appointed August 1, 1948  
<sup>48</sup> Appointed September 1, 1948  
<sup>49</sup> On leave March 16, 1949, to June 30, 1949  
<sup>50</sup> Appointed September 16, 1948  
<sup>51</sup> Appointed March 1, 1949  
<sup>52</sup> Appointed April 16, 1949