

FIFTY-FIRST ANNUAL REPORT

Agricultural Experiment Station
University of Minnesota

JULY 1, 1943 TO JUNE 30, 1944



UNIVERSITY FARM, ST. PAUL

LETTERS OF TRANSMITTAL

UNIVERSITY OF MINNESOTA, MINNEAPOLIS, MINN.
July 1, 1944

*To His Excellency, Edward J. Thye,
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, 1944.

Respectfully transmitted,
WALTER C. COFFEY,
President of the Board of Regents

UNIVERSITY OF MINNESOTA, MINNEAPOLIS, MINN.
July 1, 1944

*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, 1944.

Respectfully transmitted,
WALTER C. COFFEY,
President of the University of Minnesota

UNIVERSITY FARM, ST. PAUL, MINN.
July 1, 1944

*Walter C. Coffey,
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, 1944.

Respectfully submitted,
C. H. BAILEY, *Director*

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MINNESOTA AGRICULTURAL EXPERIMENT STATION
JULY 1, 1943 TO JUNE 30, 1944

C. H. Bailey, Director

FOREWORD

Agricultural research is never static. New problems arise continually. As agriculture becomes more intensive, it is inevitable that certain diseases, insect pests, soil problems, and economic factors should become more acute. While the basic research methods of the agricultural scientist remain the same, he must adapt his methods to the new and changing conditions. The staff of an agricultural experiment station is small as viewed in the light of the value of agriculture to the state. The value of its researches can be very great, however, be it measured in terms of dollars or some other form of satisfaction.

During the past year there has been a rapid increase of new varieties of grains and of corn hybrids. It is realized that they are not perfect but are better than varieties previously grown. During this critical war period every effort must be made to produce as much food and feed as possible.

A new strain of swine has been synthesized from two old breeds through the application of fundamental knowledge in animal breeding. This strain has growth characteristics which appear to mark a material advance in swine breeding. And this has been accomplished in a relatively short period of time. May we not expect that the application of similar breeding principles will lead to as marked improvement in other types and breeds of livestock?

During this third year of the war, the energies of the research staff have been directed as much as possible toward the solution of problems involved in production of food and feed, control of diseases and insect pests, problems of both human and animal nutrition, and economic problems arising as a result of the war. Much has been accomplished. Scientific research is one of the powerful forces in this war effort.

CHANGES IN STAFF**Appointments**

Andrew Boss, D.Sc., as acting associate director, Agricultural Experiment Station, effective February 28, 1944.

J. M. MacGregor, Ph.D., as assistant soils chemist, Division of Soils, effective July 1, 1943.

H. L. Thomas, Ph.D., as assistant plant geneticist, Division of Agronomy and Plant Genetics, effective April 16, 1944.

H. A. Stewart, Ph.D., as assistant in animal husbandry, Division of Animal and Poultry Husbandry, effective September 1, 1943.

C. A. Evans, Ph.D., as research fellow, Division of Soils, effective July 1, 1943.

R. W. Kunkel, M.S., as research fellow, Division of Dairy Husbandry, effective July 1, 1943.

O. E. Reece, B.S., as research fellow, Division of Agronomy and Plant Genetics, effective January 1, 1944.

Victor Dose, B.S., as field agent, Division of Agricultural Economics, effective October 1, 1943.

A. M. Flikke, M.S., as research fellow, Division of Agricultural Engineering, effective July 1, 1943.

Promotions

W. F. Geddes, Ph.D., agricultural biochemist to agricultural biochemist and acting chief, Division of Agricultural Biochemistry, effective March 16, 1944.

Alice Biester, M.A., associate home economist to home economist, Division of Home Economics, effective July 1, 1943.

D. R. Briggs, Ph.D., associate agricultural biochemist to agricultural biochemist, Division of Agricultural Biochemistry, effective July 1, 1943.

C. R. Burnham, Ph.D., associate plant geneticist to plant geneticist, Division of Agronomy and Plant Genetics, effective July 1, 1943.

A. A. Granovsky, Ph.D., associate entomologist to entomologist, Division of Entomology and Economic Zoology, effective July 1, 1943.

Jane M. Leichsénring, Ph.D., associate home economist to home economist, Division of Home Economics, effective July 1, 1943.

A. C. Hodson, Ph.D., assistant entomologist to associate entomologist, Division of Entomology and Economic Zoology, effective July 1, 1943.

Andrew Hustrulid, Ph.D., assistant agricultural engineer to associate agricultural engineer, Division of Agricultural Engineering, effective July 1, 1943.

P. R. McMiller, M.S., assistant soils chemist to associate soils chemist, Division of Soils, effective July 1, 1943.

C. H. Christopherson, M.A., assistant in agricultural engineering to assistant agricultural engineer, Division of Agricultural Engineering, effective July 1, 1943.

E. H. Rinke, Ph.D., assistant in plant genetics to assistant plant geneticist, Division of Agronomy and Plant Genetics, effective July 1, 1943.

A. R. Schmid, Ph.D., assistant in plant genetics to assistant plant geneticist, Division of Agronomy and Plant Genetics, effective July 1, 1943.

Leaves of Absence

F. R. Immer, Ph.D., associate director, Agricultural Experiment Station, and plant geneticist, Division of Agronomy and Plant Genetics, to serve as operations analyst with the Eighth Air Force in England, effective February 16 to June 30, 1944.

E. C. Stakman, Ph.D., plant pathologist and chief, Division of Plant Pathology and Botany, to advise with the Rockefeller Foundation regarding its agricultural improvement program in Mexico, effective March 1 to April 30, 1944.

H. Macy, Ph.D., dairy bacteriologist, Division of Dairy Husbandry, to enter military service, effective September 22, 1943 to June 30, 1944.

H. J. Sloan, Ph.D., poultry husbandman, Division of Animal and Poultry Husbandry, to study at the University of Chicago, effective January 1 to May 31, 1944.

W. C. Waite, Ph.D., agricultural economist, Division of Agricultural Economics, to assist the Food Distribution of the United States Department of Agriculture in development of its war program with reference to dairy products, effective July 1 to September 15, 1943.

F. H. Kaufert, Ph.D. associate forester, Division of Forestry, to continue as instructor in Army Air Corps School for wood inspection at the Forest Products Laboratory, Madison, Wisconsin, effective July 1, 1943 to June 30, 1944.

C. K. Otis, B.S., assistant agricultural engineer, Division of Agricultural Engineering, to continue leave for military service, effective July 1, 1943 to June 30, 1944.

H. H. Shepard, Ph.D., assistant entomologist, Division of Entomology and Economic Zoology, to serve in allocation of insecticides with the War Food Administration, effective July 16, 1943 to June 30, 1944.

A. R. Schmid, Ph.D., assistant plant geneticist, Division of Agronomy and Plant Genetics, to enter military service, effective April 15 to June 30, 1944.

D. W. Bendsend, Ph.D., assistant in forestry, Division of Forestry, to continue as assistant wood technologist at Forest Products Laboratory, Madison, Wisconsin, effective July 1, 1943 to June 30, 1944.

H. W. Halvorson, M.S., assistant in agricultural economics, Division of Agricultural Economics, to continue leave for military service, effective July 1, 1943 to June 30, 1944.

A. G. Karlson, Ph.D., assistant in veterinary medicine, Division of Veterinary Medicine, to continue leave for military service, effective July 1, 1943 to June 30, 1944.

J. C. Olson, Jr., B.S., assistant in dairy husbandry, Division of Dairy Husbandry, to continue leave for military service, effective July 1, 1943 to June 30, 1944.

J. K. Park, M.S., assistant in agricultural engineering, Division of Agricultural Engineering, to accept employment in essential war work, effective April 8 to June 30, 1944.

R. A. Phillips, B.S., assistant in horticulture, Division of Horticulture, to continue leave for military service, effective July 1, 1943 to June 30, 1944.

E. L. Pinnell, M.S., assistant in plant genetics, Division of Agronomy and Plant Genetics, to enter military service, effective September 23, 1943 to June 30, 1944.

A. F. Sellers, M.S., assistant in veterinary medicine, Division of Veterinary Medicine, to continue leave for military service, effective July 1, 1943 to June 30, 1944.

I. W. Tervet, Ph.D., assistant in plant pathology, Division of Plant Pathology and Botany, for service in Emergency Plant Disease Survey, United States Department of Agriculture, effective August 29, 1943 to June 30, 1944.

Yale Weinstein, B.S., assistant in forestry, Division of Forestry, to continue leave for military service, effective July 1, 1943 to June 30, 1944.

Resignations

R. E. Comstock, Ph.D., assistant animal husbandman, Division of Animal and Poultry Husbandry, to accept a position as associate in animal husbandry in charge of genetics research, North Carolina Agricultural Experiment Station, Raleigh, North Carolina, effective August 31, 1943.

A. M. Flikke, M.S., research fellow, Division of Agricultural Engineering, to accept commission as Ensign in the U. S. Navy, effective June 22, 1944.

C. F. Sierk, M.S., assistant animal husbandman, Division of Animal and Poultry Husbandry, to accept a position as assistant professor of animal husbandry, Montana Agricultural College, Bozeman, Montana, effective October 4, 1943.

A. C. Maack, B.S., assistant in dairy husbandry, Division of Dairy Husbandry, to accept an industrial position, effective December 31, 1943.

C. T. Wilson, M.S., assistant in plant pathology, Division of Plant Pathology and Botany, to accept a position as assistant plant pathologist, Alabama Agricultural Experiment Station, Auburn, Alabama, effective December 31, 1943.

Retirements

W. A. Riley, Ph.D., D.Sc., entomologist and parasitologist and chief, Division of Entomology and Economic Zoology, effective June 15, 1944.

H. B. Roe, C.E., agricultural engineer, Division of Agricultural Engineering, effective June 30, 1944.

Deaths

L. S. Palmer, Ph.D., agricultural biochemist and chief, Division of Agricultural Biochemistry, March 8, 1944.

PUBLICATIONS

General Bulletin Series

347. (Revised) Statistical supplement—Agricultural production and types of farming in Minnesota. Selmer A. Engene and George A. Pond, Division of Agricultural Economics. 28 pages, 8,000.

354. (Revised) Minhybrid corn varieties for Minnesota. E. H. Rinke, H. K. Hayes, Y. S. Tsiang, and Carl Borgeson, Division of Agronomy and Plant Genetics. 36 pages, 10,000.

372. The Minnesota dry milk industry. E. Fred Koller, Division of Agricultural Economics. 28 pages, 7,500.

373. Reducing mileage in farm transportation. A. A. Dowell and S. B. Cleland, Division of Agricultural Economics and Division of Agricultural Extension. 28 pages, 5,000.

374. Maturity ratings of corn hybrids registered for sale in Minnesota in 1943. R. F. Crim, H. K. Hayes, R. O. Bridgford, R. S. Dunham, R. E. Hodgson, F. R. Immer, E. H. Rinke, and Y. S. Tsiang, Division of Agronomy and Plant Genetics. 15 pages, 7,500.

375. Winter behavior of strawberry plants. W. G. Brierley and R. H. Landon, Division of Horticulture and Division of Plant Pathology and Botany. 24 pages, 6,000.

376. The Minnesota farmer's interest in fats and oils. Rex W. Cox, Division of Agricultural Economics. 32 pages, 5,000.

377. Education of the farm population in Minnesota. Lowry Nelson, Rural Sociology. 16 pages, 10,000.

378. Managing the dairy herd for greater returns. T. R. Nodland and G. A. Pond, Division of Agricultural Economics. 24 pages, 5,000.

379. Managing hogs for greater returns. T. R. Nodland and G. A. Pond, Division of Agricultural Economics. 23 pages, 5,000.

380. Trends in prices of purebred cattle. Austin A. Dowell, Division of Agricultural Economics. 16 pages, 5,000.

381. Pesky plants. R. B. Harvey, A. H. Larson, R. H. Landon, and L. C. Erickson, Division of Plant Pathology and Botany. 56 pages, 10,000.

Technical Bulletin Series

164. The extent of hybrid vigor in F_1 and F_2 generations of tomato crosses. Russell E. Larson and T. M. Currence, Division of Horticulture. 32 pages, 2,300.

165. Minnesota Phalaenidae (Noctuidae). Herbert Knutson, Division of Entomology and Economic Zoology. 128 pages, 2,500.

166. Newthatch wheat. E. R. Ausemus, E. C. Stakman, E. W. Hanson, and W. F. Geddes, Division of Agronomy and Plant Genetics, Division of Plant Pathology and Botany, and Division of Agricultural Biochemistry. 20 pages, 2,500.

Minnesota Farm and Home Science

Volume I. Numbers 1, 2, and 3. 48 pages, 46,000.

Postwar Agriculture in Minnesota

Postwar agricultural prospects. O. B. Jesness, Division of Agricultural Economics. 24 pages, 5,000.

Report Series

Fiftieth annual report of the Minnesota Agricultural Experiment Station, July 1, 1942 to June 30, 1943. 31 pages, 2,500.

Miscellaneous Report No. 3. A technique for the sex determination of chicks. Thomas H. Canfield, Division of Animal and Poultry Husbandry. 8 pages, 2,000.

Agricultural Extension Service**Bulletin Series**

241. Well-managed pastures. Ralph F. Crim and Paul M. Burson, Division of Agricultural Extension. 8 pages, 20,000.

242. Minnesota commercial orchard spray program. E. G. Sharvelle and A. C. Hodson, Division of Plant Pathology and Botany and Division of Entomology and Economic Zoology. 8 pages, 12,500.

243. Controlling home orchard pests. A. C. Hodson and E. G. Sharvelle, Division of Entomology and Economic Zoology and Division of Plant Pathology and Botany. 8 pages, 25,000.

244. Freezing foods for home use. J. D. Winter and Andrew Hustulid, Division of Horticulture and Division of Agricultural Engineering. 24 pages, 35,000.

Pamphlet Series

125. A special analysis of the Minnesota artificial breeders' association and its 12 member associations. W. H. Dankers, Division of Agricultural Extension. Mimeographed. 23 pages, 500.

126. ABC's of raising rabbits. Gustav Swanson and Shaler Aldous, Division of Entomology and Economic Zoology. 8 pages, 10,000.

127. Feed shortage, S. B. Cleland and S. A. Engene, Division of Agricultural Extension and Division of Agricultural Economics. 8 pages, 100,000.

128. Look for two eggs from every pound of feed. Cora Cooke, Division of Agricultural Extension. 6 pages, 203,000.

129. Grow Vicland, Tama for better oats. M. L. Armour, Division of Agricultural Extension. 4 pages, 75,000.

130. The Minnesota farm outlook for 1944. W. H. Dankers, Division of Agricultural Extension. 8 pages, 35,000.

131. Machinery troubles. Norton Ives, Division of Agricultural Extension. 8 pages, 25,000.

132. Improving victory garden fertility. Paul M. Burson and C. O. Rost. Division of Agricultural Extension and Division of Soils. 6 pages, 30,000.

133. Increase feed production by better choice of crops. G. A. Pond, Division of Agricultural Economics. 8 pages, 100,000.

134. Custom rates for farm operations. George A. Pond, Division of Agricultural Economics. 4 pages, 35,000.

135. Livestock marketing in Faribault County, Minnesota. Mimeographed. 20 pages, 750.

136. Make your hay by this yardstick. H. R. Searles, Division of Agricultural Extension. 6 pages, 200,000.

137. Get the jump on midsummer slump (more milk for America). H. R. Searles, Division of Agricultural Extension. 6 pages, 200,000.

138. Know your farm business. Truman R. Nodland, Division of Agricultural Economics. 6 pages, 7,500.

139. How much protein for pigs. E. F. Ferrin, Division of Animal and Poultry Husbandry. 4 pages, 20,000.

Folder Series

120. Making lard at home. P. A. Anderson, Division of Animal and Poultry Husbandry. 4 pages, 12,500.

121. Control of the plum curculio, plum gouger, and apple curculio. A. C. Hodson, Division of Entomology and Economic Zoology. 8 pages, 20,000.

122. Apple maggot control. A. C. Hodson, Division of Entomology and Economic Zoology. 8 pages, 20,000.

123. Growing currants and gooseberries in Minnesota. E. M. Hunt, Division of Agricultural Extension. 6 pages, 20,000.

124. Growing grapes in Minnesota. E. M. Hunt, Division of Agricultural Extension. 8 pages, 15,000.

125. Growing potatoes in the home garden. E. M. Hunt, Division of Agricultural Extension. 8 pages, 35,000.

126. Tractor-mounted carrier sweep rakes. Norton Ives and John Strait, Division of Agricultural Extension and Division of Agricultural Engineering. 16 pages, 20,000.

Boys' and Girls' Club Series

31. Clothing construction helps. Margaret Fobes, Ruby Christenson, and Alice Linn, Division of Agricultural Extension. 8 pages, 15,000. Revised edition, Margaret Fobes, Alice Linn, and Ethel Gorham, Division of Agricultural Extension and Division of Home Economics. 8 pages, 15,000.

32. Food preparation. Ina Rowe, Eva Blair, and Mildred Schenck, Division of Agricultural Extension. 12 pages, 10,000.

Home Demonstration Leaflet Series

1. The homemaker as a nurse. Amy Wessel, Division of Agricultural Extension. 8 pages, 40,000.

2. The homemaker practices common nursing procedures. Amy Wessel, Division of Agricultural Extension. 8 pages, 40,000.

3. The homemaker's day with the patient. Amy Wessel, Division of Agricultural Extension. 8 pages, 40,000.

4. Home equipment. Mary May Miller, Division of Agricultural Extension. 8 pages, 25,000.

News Letters

Name of publication	Issues	Pages	Circulation
Bob Hodgson Talks, monthly	12	104	1,506
Club Leader Letter, monthly	11	56	46,861
Current Information Letter	7	9	878
Dairy Herd Improvement Letter	5	58	10,675
Extension News Digest, semimonthly	21	51	17,301
Farm Business Notes, monthly	12	48	25,183
Poultry News Letter	9	20	3,081
Sheep News Letter	2	3	28,667
Turkey News Letter	7	14	12,852
Weekly Review	21	39	3,087
Neighborhood Leader Letter	11	22	302,700
	118	424	452,791

Scientific Journal Series Papers

Agricultural Biochemistry

1961. The thiamin, riboflavin, nicotinic acid, and pantothenic acid contents of wild rice (*Zizania aquatica*). J. Wesley Nelson and Leroy S. Palmer. *Cereal Chemistry* 19:539-40. 1942.

1980. Viscometric estimation of particle dimension. I. The system stearic acid-carbon tetrachloride. J. P. Hollihan and D. R. Briggs. *Journal of Physical Chemistry* 46:685-93. 1942.

1993. Improving the nutritive value of bread. C. H. Bailey. *Journal of Canadian Dietetic Association* 4:1-10. 1942.

1998. Precision of flour moisture results between and within laboratories. W. F. Geddes and C. A. Anker. *Cereal Chemistry* 19:605-609. 1942.
1999. Yeast fermentation and potassium bromate as factors influencing the harmful effects of wheat germ on baking quality. Donald E. Smith and W. F. Geddes. *Cereal Chemistry* 19:785-804. 1942.
2000. Protease activity and reducing matter content of wheat flour doughs in relation to baking behavior. Ting Shen and W. F. Geddes. *Cereal Chemistry* 19:609-31. 1942.
2001. The distribution of thiamin in the wheat plant at successive stages of kernel development. W. F. Geddes and M. N. Levine. *Cereal Chemistry* 19:547-52. 1942.
2004. Biochemical properties of "salt-rising" doughs. Max Milner and W. F. Geddes. *Cereal Chemistry* 19:723-48. 1942.
2007. The complementary baking properties of Minnesota spring and winter wheat varieties. Paul P. Merritt and W. F. Geddes. *Cereal Chemistry* 20:98-103. 1943.
2008. The effect of millroom temperature and relative humidity on experimental flour yields and flour properties. E. G. Bayfield, J. E. Anderson, W. F. Geddes, and F. C. Hildebrand. *Cereal Chemistry* 20:149-71. 1943.
2020. Investigation of a death by asphyxiation in a grain elevator bin containing flaxseed. H. A. Lillevik and W. F. Geddes. *Cereal Chemistry* 20:318-28. 1943.
2025. The activation of papain. E. M. Scott and W. M. Sandstrom. *Archives of Biochemistry* 1:103-109. 1942.
2034. The cooking process. The action of aqueous solutions of pure sodium hydrosulfide on aspen wood. Ralph L. Hossfeld, Ross Aiken Gortner, and Frank H. Kaufert. *Industrial and Engineering Chemistry* 35:717-20. 1943.
2040. Viscometric estimation of particle dimensions. II. Micellar changes involved in the heat-bodying of tung oil. J. P. Hollihan and D. R. Briggs. *Journal of Physical Chemistry* 47:30-39. 1943.
2046. The gums from the carob bean, *Ceratonia siliqua*, L. Baak Wai Lew and R. A. Gortner. *Archives of Biochemistry* 1:325-38. 1943.
2076. Rennin action in relation to the water binding and electrokinetic properties of calcium and sodium caseinate sols. C. L. Hankinson and L. S. Palmer. *Journal of Dairy Science* 26:1043-56. 1943.
2082. Sulphur in plants: I. The effect of applications of gypsum and sodium selenate on sulphur distribution and manganese, iron and copper contents of alfalfa. Leon H. Johnson, H. V. Lindstrom, and R. A. Gortner. With technical assistance of Mildred Malm. *Archives of Biochemistry* 2:435-41. 1943.
2097. The experimental error of the thiochrome method for thiamine assay. F. C. Hildebrand and W. F. Geddes. *Cereal Chemistry* 20:714-17. 1943.

2110. The structure and properties of the natural fat globule "Membrane." Leroy S. Palmer. *Journal of Dairy Science* 27:471-81. 1944.

2116. Electrokinetics XXVI. The electroviscous effect. III. In β -lactoglobulin systems. An interpretation of the meaning of $K\phi$ values obtained from electroviscosity data. D. R. Briggs and Martin Hanig. *Journal of Physical Chemistry* 48:1-12. 1944.

2117. A rapid method for the determination of thiamine in wheat and flour. A. Hoffer, A. W. Alcock, and W. F. Geddes. *Cereal Chemistry* 20:717-29. 1943.

2119. Effect of scab on the quality of hard red spring wheat. P. P. Merritt and E. R. Ausemus. *Cereal Chemistry* 21:199-209. 1944.

2121. The viability, chemical composition and internal microflora of frost damaged soybeans. Max Milner, Benjamin Warshowsky, I. W. Tervet, and W. F. Geddes. *Oil and Soap* 20:265-68. 1943.

2128. Crystalline albumin from chicken blood. Michael Laskowski. *Archives of Biochemistry* 4:41-44. 1944.

2138. The effect of variations in Canadian spring wheat on the thiamine and ash of long extraction flours. A. Hoffer, A. W. Alcock, and W. F. Geddes. *Cereal Chemistry* 21:210-22. 1944.

2147. The chemical composition and nutritional value of pollens collected by bees. A. Earl Vivino and L. S. Palmer. *Archives of Biochemistry* 4:129-36. 1944.

2154. An electrophoretic study of gliadin. George W. Schwert, Frank W. Putnam, and D. R. Briggs. *Archives of Biochemistry* 4:371-87. 1944.

2168. Studies on the fractionation of zein. Ross Aikin Gortner and Robert Theis MacDonald. *Cereal Chemistry* 21:324-33. 1944.

Agricultural Economics

1987. Economic aspects of artificial insemination of commercial dairy cows. A. A. Dowell and L. M. Winters. *Journal of Farm Economics* 24:665-76. 1942.

Agricultural Engineering

2032. The soil moisture and cropping problems on peat and muck lands in the northern United States. H. B. Roe. *United States Department of Agriculture, Soil Conservation Service*. 76 mimeographed pages. 1943.

2060. Causes of barn failures due to wind. C. K. Otis. *Journal of the American Society of Agricultural Engineers* 24:115-18. 1943.

2118. The effect of fluctuating storage temperatures on frozen fruits and vegetables. Andrew Hustrulid and J. D. Winter. *Journal of the American Society of Agricultural Engineers* 24:416. 1943.

2122. A logical modification of the rational formula for runoff from small agricultural areas. H. B. Roe and C. G. Snyder. *Journal of the American Society of Agricultural Engineers* 24:423-27. 1943.

2123. Conditions in a two-story insulated poultry house. C. K. Otis and H. B. White. *Journal of the American Society of Agricultural Engineers* 24:407-11. 1943.

2131. Expansion of clay and concrete drain tile due to increase of temperature and moisture content. Dalton G. Miller and Charles G. Snyder. *Journal of the American Society of Agricultural Engineers* 25:179-80. 1944.

Agronomy and Plant Genetics

2057. Studies of microbial activity, chlorate reduction, and chlorate toxicity in soils treated with sodium chlorate. Russell T. Nelson. *Journal of Agricultural Research* 68:221-37. 1944.

2088. Linkage studies in barley. F. R. Immer and M. T. Henderson. *Genetics* 28:419-40. 1943.

2090. Methods of detasseling and yield of hybrid seed corn. Carl Borgeson. *Journal of the American Society of Agronomy* 35:919-22. 1943.

2092. The location of two genes for mature plant characters in barley in linkage group No. 1. D. W. Robertson, F. R. Immer, G. A. Wiebe, and H. Stevens. *Journal of the American Society of Agronomy* 36:66-72. 1944.

2094. Selection in self-pollinated lines of *Bromus inermis* Leyss., *Festuca elatior* L., and *Dactylis glomerata* L. H. K. Hayes and A. R. Schmid. *Journal of the American Society of Agronomy* 35:934-43. 1943.

2109. Control of noxious plants. H. K. Wilson. *Botanical Review* 10:279-326. 1944.

2120. Agronomic advances in the agriculture of the corn belt and the great plains regions. H. K. Wilson. *Science* 99:499-505. 1944.

2135. Variation and inheritance of certain characters of brome grass, *Bromus inermis* Leyss. Y. S. Tsiang. *Journal of the American Society of Agronomy* 36:508-22. 1944.

2145. Agronomic considerations of mechanized sugar beet production. J. O. Culbertson. *Journal of the American Society of Agronomy* 36:558-65. 1944.

Animal and Poultry Husbandry

1945. Measures of growth rate for use in swine selection. R. E. Comstock, L. M. Winters, P. S. Jordan, and O. M. Kiser. *Journal of Agricultural Research* 65:379-89. 1942.

2048. The development of an inbred line of swine (Minnesota No. 1) from a crossbred foundation. L. M. Winters, R. E. Comstock, and D. L. Dailey. *Journal of Animal Science* 2:129-37. 1943.

2083. Overestimation of mean squares by the method of expected numbers. R. E. Comstock. *Journal of the American Statistical Association* 38:335-40. 1943.

2099. The effect of sex on the development of the pig. III. Differences in growth rate between gilts and barrows by lines of breeding. R. E. Comstock, L. M. Winters, and John N. Cummings. *Journal of Animal Science* 3:120-28. 1944.

2104. The development of body form in swine. R. E. Comstock and L. M. Winters. *Journal of Animal Science* 3:188-93. 1944.

2113. Hereditary and environmental factors affecting growth rate in swine. Arne W. Nordskog, R. E. Comstock, and L. M. Winters. *Journal of Animal Science* 3:257-72. 1944.

2158. Histological studies of boar testes. W. W. Green and L. M. Winters. *Journal of Morphology* 75:291-301. 1944.

Dairy Husbandry

2009. Effect of certain hormones and drugs on the perfused mammary gland. W. E. Petersen. *Proceedings of the Society for Experimental Biology and Medicine* 50:298-300. 1942.

2115. Observations on the use of roller process sweet cream butter-milk powder in ice cream. E. L. Thomas and W. B. Combs. *Journal of Dairy Science* 27:419-32. 1944.

2124. The action of the mechanical milker in relation to completeness of milking and udder injury. W. E. Petersen. *Journal of Dairy Science* 27:433-40. 1944.

2126. The effect of thyroidectomy on lactation in the bovine. A. A. Spielman, W. E. Petersen, and J. B. Fitch. *Journal of Dairy Science* 27:441-48. 1944.

2129. The effect of complete evacuation of the mammary gland by pitocin upon milk and fat production. C. B. Knodt and W. E. Petersen. *Journal of Dairy Science* 27:449-57. 1944.

2141. Albinism in cattle. W. E. Petersen, L. O. Gilmore, J. B. Fitch, and L. M. Winters. *Journal of Heredity* 35:135-44. 1944.

Entomology and Economic Zoology

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Home Economics

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Veterinary Medicine

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Agronomy and Plant Genetics

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Horticulture

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Soils

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SUMMARY OF PUBLICATIONS

Kind of publication	Number issued	Number of pages	Number of copies in edition	
General Series Bulletins	12	326	84,000	
Technical Series Bulletins	3	180	7,300	
Minnesota Farm and Home Science	3	48	46,000	
Postwar Agriculture in Minnesota	1	24	5,000	
Reports	2	39	4,500	
Extension Service				
Bulletins	4	48	92,500	
Pamphlets	15	125	1,041,750	
Folders	7	58	142,500	
4-H Bulletins	2	20	40,000	
Home Demonstration Leaflets	4	32	145,000	
News Letters	118	424	452,791	
	171	1,324	2,061,341	
	Scientific Journal Series		Miscellaneous Journal Series	
	Number issued	Number of pages	Number issued	Number of pages
Papers				
Agricultural Biochemistry	28	304	.....	.....
Agricultural Economics	1	11	1	11
Agricultural Engineering	6	93	.....	.....
Agronomy and Plant Genetics	9	148	4	14
Animal and Poultry Husbandry	7	68	1	2
Dairy Husbandry	6	52	1	5
Entomology and Economic Zoology	13	182	10	29
Forestry .....	.....	.....	1	2
Home Economics	7	34	.....	.....
Horticulture	8	39	2	5
Plant Pathology and Botany	15	128	2	7
Soils	3	35	1	4
Veterinary Medicine	5	30	.....	.....
Rural Sociology .....	.....	.....	1	8
Northwest Experiment Station	1	3	.....	.....
	109	1,127	24	87
Total publications	280			

NEW EXPERIMENT STATION PROJECTS

Agricultural Economics

139. Prices of Minnesota agricultural products.
 Subproject: Governmental policies and their influence upon Minnesota agricultural prices.
 Subproject: Margins in the processing and distribution of Minnesota agricultural products.
 Subproject: Demand for specified Minnesota agricultural products.
 Subproject: Methods of price analysis.
140. Income and expense of Minnesota agriculture.
 Subproject: State income and expenses.
 Subproject: District income and expenses.
141. A study of the trends of sale prices of purebred beef and dairy cattle.

Agricultural Engineering

138. Studies in the use of insulation board in poultry house construction. (Cooperative with the Division of Animal and Poultry Husbandry and the Minnesota and Ontario Paper Company)
139. Studies of various types of small gasoline engines with reference to farm use. (Cooperative with the Fairbanks, Morse and Company)
140. Harvesting and handling the seed flax crop with the view of preparing the straw for use as a source of fiber. (Cooperative with the Department of Chemical Engineering)

Animal and Poultry Husbandry

423. Stretching the protein concentrates in rations for growing pigs.
424. Self-feeding pregnant gilts.
425. The protein needs of growing pigs.

Entomology and Economic Zoology

159. Raising domestic rabbits for meat. (Cooperative with the Division of Animal Husbandry, the Division of Veterinary Medicine, and the Division of Horticulture)

Home Economics

117. Effect of canning method on the vitamin C content of tomatoes. (Cooperative with the Division of Horticulture)
118. The relative serviceability of fabrics containing various percentages of new and reused wool. (Cooperative with the Division of Home Economics, South Dakota Agricultural Experiment Station)
 Subproject: The comparative properties of experimental fabrics containing various percentages of new and reused wool.
 Subproject: The performance in service and changes in properties due to wear and dry cleaning of these experimental fabrics.

SUMMARY OF PROJECTS

Division	Total	Active	Inactive	Closed	New
Agricultural Biochemistry	20	18	2	2	0
Agricultural Economics	24	20	4	8	3
Agricultural Engineering	20	15	5	2	3
Agronomy and Plant Genetics	24	24	0	3	0
Animal and Poultry Husbandry	15	15	0	4	3
Dairy Husbandry	15	15	0	2	0
Entomology and Economic Zoology	29	28	1	5	1
Forestry	18	13	5	2	0
Home Economics	10	10	0	0	2
Horticulture	25	22	3	5	0
Plant Pathology and Botany	24	24	0	0	0
Soils	8	8	0	0	0
Veterinary Medicine	5	5	0	0	0
Rural Sociology	3	2	1	1	0
North Central Experiment Station	4	4	0	0	0
Northeast Experiment Station	6	6	0	0	0
Northwest Experiment Station	8	7	1	2	0
Southeast Experiment Station	2	2	0	0	0
West Central Experiment Station	7	7	0	1	0
Total	267	245	22	37	12

FINANCIAL STATEMENT
Income

Source of Revenue	University Farm	Branch Stations					Total
		Crookston	Morris	Grand Rapids	Duluth	Waseca	
Federal appropriations:							
Hatch fund	\$ 15,000.00						\$ 15,000.00
Adams fund	15,000.00						15,000.00
Purnell fund	60,000.00						60,000.00
Bankhead-Jones fund	57,269.04						57,269.04
State appropriations:							
General University support	168,828.35	\$26,945.90	\$22,764.38	\$13,479.27	\$ 9,127.35	\$ 5,937.18	247,082.43
Special appropriations	69,000.00						69,000.00
Endowments, fellowships, and other similar grants							
.....	78,770.27						78,770.27
Fees, sales, and miscellaneous							
.....	25,037.18	15,459.59	19,156.15	6,485.07	8,112.78	22,742.58	96,993.35
Total	\$488,904.84	\$42,405.49	\$41,920.53	\$19,964.34	\$17,240.13	\$28,679.76	\$639,115.09

Expenditures

Classification	University Farm	Branch Stations					Total
		Crookston	Morris	Grand Rapids	Duluth	Waseca	
Salaries and labor	\$362,781.98	\$27,437.17	\$27,611.02	\$10,470.29	\$10,351.56	\$15,228.66	\$453,880.68
Travel expenses	8,069.36	237.42	375.28	284.51	303.78	67.59	9,337.94
Transportation of things	2,326.44	199.91	210.96	200.65	71.07	92.07	3,101.10
Communication service	2,788.89	459.75	299.40	182.76	176.94	139.17	4,046.91
Rents and utility services	4,812.26	1,025.76			294.87	903.63	7,036.52
Printing and binding	3,773.13	74.67	932.73	630.22			5,410.75
Other contractual service	20,914.81	2,574.89	1,788.28	2,352.64	2,080.59	3,151.14	32,862.35
Supplies and materials	65,015.22	9,445.69	8,715.20	5,506.61	3,774.72	7,757.79	100,215.23
Equipment	14,936.39	950.23	1,865.83	336.66	186.60	1,339.71	19,615.42
Lands and structures (contractual)	1,197.31		121.83				1,319.14
Annuities	2,289.05						2,289.05
Total	\$488,904.84	\$42,405.49	\$41,920.53	\$19,964.34	\$17,240.13	\$28,679.76	\$639,115.09

EXPERIMENT STATION STAFF

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L. HARRIS, B.S., Editor
RIET W. SEWALL, B.A., Librarian

¹leave February 16 to June 30, 1944.

²appointed February 28, 1944.

³March 8, 1944.

⁴appointed March 15, 1944.

⁵June 15, 1944.

Division of Agricultural Biochemistry

⁶L. S. PALMER, Ph.D., Agricultural Biochemist
W. F. GEDDES, Ph.D., Agricultural Biochemist

Section of Proteins and Colloids

W. M. SANDSTROM, Ph.D., Agricultural Biochemist
D. R. BRIGGS, Ph.D., Agricultural Biochemist

Section of Cereal Technology and Analytical Service

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C. H. BAILEY, Ph.D., Agricultural Biochemist
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JOHN STRAIT, B.S., Assistant in Agricultural Engineering
J. G. DENT, Assistant in Agricultural Engineering
¹⁰ARNOLD M. FLIKKE, M.S., Research Fellow

⁶ Died March 8, 1944.

⁷ On leave July 1 to September 15, 1943.

⁸ On leave July 1, 1943 to June 30, 1944.

⁹ Appointed October 1, 1943.

¹⁰ Resigned June 22, 1944.

Section of Farm Structures

H. B. WHITE, M.S., Assistant Agricultural Engineer
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¹⁶A. R. SCHMID, Ph.D., Assistant Plant Geneticist
¹⁷E. L. PINNELL, M.S., Assistant in Plant Genetics
 M. T. HENDERSON, M.S., Assistant in Plant Genetics
 Y. S. TSIANG, Ph.D., Assistant in Plant Genetics
¹⁸O. E. REECE, B.S., Research Fellow

Detailed by the United States Department of Agriculture for Cooperative Work

Division of Cereal Crops and Diseases

E. R. AUSEMUS, Ph.D., Agronomist
 J. O. CULBERTSON, Ph.D., Associate Agronomist
 A. H. MOSEMAN, M.S., Associate Agronomist
 L. M. STAHLER, Ph.D., Associate Agronomist

Division of Animal and Poultry Husbandry

W. H. PETERS, M.Agr., Animal Husbandman
 P. A. ANDERSON, B.S., Assistant Animal Husbandman
 A. L. HARVEY, Ph.D., Assistant Animal Husbandman
¹⁹C. F. SIERK, M.S., Assistant Animal Husbandman

¹¹ On leave July 1, 1943 to June 30, 1944.

¹² Retired June 30, 1944.

¹³ On leave April 8 to June 30, 1944.

¹⁴ On leave February 16 to June 30, 1944.

¹⁵ Appointed April 16, 1944.

¹⁶ On leave September 23, 1943 to June 30, 1944.

¹⁷ On leave April 15 to June 30, 1944.

¹⁸ Appointed January 1, 1944.

¹⁹ Resigned October 4, 1943.

Section of Animal Feeding

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

Section of Animal Breeding

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

²⁰R. E. COMSTOCK, Ph.D., Assistant Animal Husbandman

W. W. GREEN, Ph.D., Assistant Animal Husbandman

²¹H. A. STEWART, Ph.D., Assistant in Animal Husbandry

Section of Poultry Husbandry

²²H. J. SLOAN, Ph.D., Poultry Husbandman

T. H. CANFIELD, M.S., Assistant in Poultry Husbandry

R. N. SHOFFNER, M.S., Assistant in Poultry Husbandry

Division of Dairy Husbandry

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

Section of Dairy Production

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

W. E. PETERSEN, Ph.D., Dairy Husbandman

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

L. O. GILMORE, Ph.D., Assistant Dairy Husbandman

Section of Dairy Products

W. B. COMBS, M.A., Dairy Husbandman

S. T. COULTER, Ph.D., Associate Dairy Husbandman

²³J. C. OLSON, JR., B.S., Assistant in Dairy Husbandry

²⁴A. C. MAACK, B.S., Assistant in Dairy Husbandry

²⁵R. W. KUNKEL, M.S., Research Fellow

Section of Dairy Bacteriology

²⁶HAROLD MACY, Ph.D., Dairy Bacteriologist

Division of Entomology and Economic Zoology

²⁷W. A. RILEY, Ph.D., D.Sc., Entomologist and Parasitologist

C. E. MICKEL, Ph.D., Entomologist

M. C. TANQUARY, Ph.D., Apiculturist

A. A. GRANOVSKY, Ph.D., Entomologist

A. C. HODSON, Ph.D., Associate Entomologist

GUSTAV SWANSON, Ph.D., Associate Zoologist

²⁸H. H. SHEPARD, Ph.D., Assistant Entomologist

M. H. HAYDAK, Ph.D., Assistant in Apiculture

A. B. ERICKSON, Ph.D., Junior Entomologist

²⁰ Resigned August 31, 1943.

²¹ Appointed September 1, 1943.

²² On leave January 1 to May 31, 1944.

²³ On leave July 1, 1943 to June 30, 1944.

²⁴ Resigned December 31, 1943.

²⁵ Appointed July 1, 1943.

²⁶ On leave July 1, 1943 to June 30, 1944.

²⁷ Retired June 15, 1944.

²⁸ On leave July 16, 1943 to June 30, 1944.

Division of Forestry

HENRY SCHMITZ, Ph.D., Forester
 E. G. CHEYNEY, A.B., Forester
 J. H. ALLISON, Ph.B., M.F., Forester
 T. SCHANTZ-HANSEN, Ph.D., Associate Forester
²⁹F. H. KAUFERT, Ph.D., Associate Forester
 R. M. BROWN, M.F., Assistant Forester
 L. W. REES, Ph.D., Assistant Forester
³⁰YALE WEINSTEIN, B.S., Assistant in Forestry
³¹D. W. BENSEND, B.S., Assistant in Forestry

Division of Home Economics

WYLLE B. MCNEAL, M.A., Home Economist
 ALICE BIESTER, M.A., Home Economist
 JANE M. LEICHSENRING, Ph.D., Home Economist
 EVA G. DONELSON, Ph.D., Associate Home Economist
 ISABEL T. NOBLE, Ph.D., Associate Home Economist
 ETHEL L. PHELPS, M.S., Associate Home Economist

Division of Horticulture

W. H. ALDERMAN, B.S.A., Horticulturist, Superintendent Fruit Breeding Station
 R. B. HARVEY, Ph.D., Horticulturist
 J. D. WINTER, M.S., Assistant in Horticulture

Section of Pomology

W. G. BRIERLEY, Ph.D., Horticulturist

Section of Fruit Breeding

A. N. WILCOX, Ph.D., Associate Horticulturist
 F. E. HARALSON, Assistant Superintendent, Fruit Breeding Station
 T. S. WEIR, M.S., Assistant in Horticulture

Section of Vegetable Gardening

F. A. KRANTZ, Ph.D., Horticulturist
 T. M. CURRENCE, Ph.D., Associate Horticulturist
 A. E. HUTCHINS, Ph.D., Assistant Horticulturist
 R. E. NYLUND, M.S., Assistant in Horticulture

Section of Floriculture and Ornamental Horticulture

L. E. LONGLEY, Ph.D., Assistant Horticulturist
³²R. A. PHILLIPS, B.S., Assistant in Horticulture

*Detailed by the United States Department of Agriculture for Cooperative Work
 Bureau of Plant Industry*

E. P. LANA, B.S., Agent

Division of Plant Pathology and Botany

³³E. C. STAKMAN, Ph.D., Plant Pathologist and Botanist

²⁹ On leave July 1, 1943 to June 30, 1944.

³⁰ On leave July 1, 1943 to June 30, 1944.

³¹ On leave July 1, 1943 to June 30, 1944.

³² On leave July 1, 1943 to June 30, 1944.

³³ Cooperating with the Division of Plant Disease Control, Bureau of Entomology and Plant Quarantine; on leave March 1 to April 30, 1944.

Section of Plant Pathology

³³E. C. STAKMAN, Ph.D., Plant Pathologist
 J. J. CHRISTENSEN, Ph.D., Plant Pathologist
 LOUISE DOSDAL, Ph.D., Assistant Plant Pathologist
 C. J. EIDE, Ph.D., Assistant Plant Pathologist
 E. G. SHARVELLE, Ph.D., Assistant Plant Pathologist
 HELEN HART, Ph.D., Assistant Plant Pathologist
 C. M. CHRISTENSEN, Ph.D., Assistant Plant Pathologist
 M. B. MOORE, M.S., Assistant in Plant Pathology
³⁴I. W. TERVET, Ph.D., Assistant in Plant Pathology
³⁵C. T. WILSON, M.S., Assistant in Plant Pathology
 E. F. DARLEY, B.S., Research Fellow, Firestone Plantations Company Fellowship

Section of Plant Physiology and Agricultural Botany

R. B. HARVEY, Ph.D., Plant Physiologist and Agricultural Botanist
 A. H. LARSON, M.S., Assistant Botanist
 R. H. LANDON, Ph.D., Assistant in Plant Physiology

Detailed by the United States Department of Agriculture for Cooperative Work

Bureau of Plant Industry

Division of Cereal Crops and Diseases

M. N. LEVINE, Ph.D., Pathologist
 E. W. HANSON, M.S., Agent

Division of Sugar Plant Investigations

³⁶ANDREW DOWNIE, Ph.D., Assistant Pathologist
³⁷H. W. BOCKSTAHLER, M.S., Assistant Pathologist

Bureau of Entomology and Plant Quarantine

Division of Plant Disease Control

R. U. COTTER, Ph.D., Associate Pathologist
 L. W. MELANDER, Ph.D., Associate Pathologist (State Leader of Barberry Eradication)
 W. Q. LOEGERING, B.S., Agent

Detailed by the State Department of Agriculture for Cooperative Work

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

Division of Soils

C. O. ROST, Ph.D., Soils Chemist
 P. R. McMILLER, M.S., Associate Soils Chemist
 A. C. CALDWELL, Ph.D., Assistant Soils Chemist
³⁸J. M. MACGREGOR, Ph.D., Assistant Soils Chemist

³³ Cooperating with the Division of Plant Disease Control, Bureau of Entomology and Plant Quarantine; on leave March 1 to April 30, 1944.

³⁴ On leave August 29, 1943 to June 30, 1944.

³⁵ Resigned December 31, 1943.

³⁶ Resigned March 31, 1944.

³⁷ Appointed June 15, 1944.

³⁸ Appointed July 1, 1943.

L. E. DUNN, Ph.D., Research Fellow
 OLAF C. SOINE, Research Fellow
⁸⁰C. A. EVANS, Ph.D., Research Fellow

Division of Veterinary Medicine

W. L. BOYD, D.V.S., Veterinarian
 M. H. ROEPKE, Ph.D., Biological Chemist
 H. C. H. KERNKAMP, D.V.M., Associate Veterinarian
 R. FENSTERMACHER, D.V.M., Assistant Pathologist
 W. G. ANDBERG, D.V.M., Assistant Veterinarian
 F. J. WEIRETHER, B.S., Assistant Bacteriologist
 B. S. POMEROY, D.V.M., Ph.D., Assistant in Animal Pathology
⁴⁰A. G. KARLSON, Ph.D., Assistant in Veterinary Medicine
⁴¹A. F. SELLERS, V.M.D., Assistant in Veterinary Medicine

Rural Sociology

LOWRY NELSON, Ph.D., Rural Sociologist

North Central Experiment Station

D. L. DAILEY, B.S., Superintendent
 A. F. DAHLBERG, B.S., Assistant in Poultry Husbandry
 C. H. GRIFFITH, M.S., Assistant in Agronomy
 K. P. MILLER, Assistant in Animal Husbandry
 A. L. RICHARDSON, M.S., Assistant in Horticulture

Northeast Experiment Station

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

Northwest Experiment Station

T. M. McCALL, M.S., Superintendent
 R. S. DUNHAM, M.S., Assistant Agronomist
 O. M. KISER, M.S., Assistant Animal Husbandman
⁴²R. J. CHRISTGAU, M.S., Assistant Animal Husbandman
 A. M. PILKEY, Assistant in Poultry Husbandry
 A. M. FOKER, Assistant Agricultural Engineer
 J. H. WAMPOLE, M.S., Assistant in Horticulture
⁴³H. W. SODERBERG, M.A., Assistant in Agricultural Engineering

Southeast Experiment Station

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

West Central Experiment Station

T. H. FENSKE, M.S., Superintendent
 R. O. BRIDGFORD, M.S., Assistant Agronomist
 P. S. JORDAN, B.S.Agr., Assistant Animal Husbandman
 A. W. EDSON, M.S., Assistant Poultry Husbandman
 J. A. ANDERSON, B.S.Agr., Assistant Horticulturist
 A. C. HEINE, Assistant in Agricultural Engineering

⁸⁰ Appointed July 1, 1943.

⁴⁰ On leave July 1, 1943 to June 30, 1944.

⁴¹ On leave July 1, 1943 to June 30, 1944.

⁴² On leave July 1, 1943 to June 30, 1944.

⁴³ Appointed August 1, 1943.