

FIFTY-NINTH ANNUAL REPORT

Agricultural Experiment Station
University of Minnesota

JULY 1, 1951, to JUNE 30, 1952



UNIVERSITY FARM, ST. PAUL

LETTERS OF TRANSMITTAL

University of Minnesota, Minneapolis, Minn.

July 1, 1952

To His Excellency, C. Elmer Anderson,
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, 1952.

Respectfully transmitted,
JAMES L. MORRILL,
President of the Board of Regents

University of Minnesota, Minneapolis, Minn.

July 1, 1952

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, 1952.

Respectfully transmitted,
JAMES L. MORRILL,
President of the University of Minnesota

University Farm, St. Paul, Minn.

July 1, 1952

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, 1952.

Respectfully submitted,
H. MACY, Director

CONTENTS

	Page
Foreword	4
Changes in staff	6
Appointments	6
Promotions	7
Leaves of absence	8
Resignations	9
Retirements	11
Publications	12
General bulletin series	12
Technical bulletin series	12
Minnesota Farm and Home Science	13
Report series	13
Agricultural Extension Service	13
Bulletin series	13
Pamphlet series	14
Folder series	15
Newsletters	16
Boys' and girls' club bulletin series	16
Scientific journal series papers	17
Miscellaneous journal series papers	26
Summary of publications	29
New Experiment Station projects	30
Animal husbandry	30
Entomology and economic zoology	30
Home economics	30
Poultry husbandry	30
Soils	30
Veterinary medicine	30
Summary of projects	31
Financial statement	32
Experiment Station staff	34

FIFTY-NINTH ANNUAL REPORT
AGRICULTURAL EXPERIMENT STATION
UNIVERSITY OF MINNESOTA

JULY 1, 1951, TO JUNE 30, 1952

H. Macy, Director

FOREWORD

THE NECESSITY for an acceleration of agricultural research and educational programs becomes increasingly evident to anyone conversant with the farm problem. Not many years ago about 85 per cent of the people in the United States were living in rural areas and only about 15 per cent in the cities. Today the situation is surprisingly the reverse, with only about 15 per cent of our population living in rural areas.

The 1950 census shows that Minnesota for the first time has more than half of its people living in urban localities. This means that fewer farmers must meet the demands of an ever-increasing population, consisting mainly of those people living in urban centers. There is some prospect of additional land being made available for agricultural purposes in this country. On the other hand, the chances are good that the farmer will be able to supply food and fiber for the added millions of people in the next 25 years only through increased efficiency of operations, modern machinery, better varieties of crops, improved breeds of livestock, closer control or eradication of plant and animal diseases, conservation of soil and water resources, and wider use of fertilizers.

Most of the improvements that can be made in the production of food, fiber, and shelter will be based upon the facts uncovered by the agricultural research worker, and brought to the attention of all our people, both rural and urban, by our schools, colleges, extension services, organizations, and media of mass communication, such as television, radio, and press.

There are cases where the backlog of research information has been badly depleted and in some cases, exhausted. This means, of course, that our people must be ready to increase their support of agricultural research and education if we are to reach the goals set for agriculture and to maintain the high standard of living which has become so precious to the American people.

While the agricultural experiment stations and other agencies, private and public, have been making steady progress in research, there still remain multitudes of complex problems which demand

solution. The public must decide whether it wishes to invest in productive research or to suffer the penalty of losing those things which contribute to better living.

The scientists at the agricultural experiment stations are pressing ahead with zeal and imagination. Their progress is limited largely by the lack of financial resources and the facilities which can be provided only if funds are available. Fundamental research will be necessary to build a background of basic facts which can be applied to the solution of the everyday problems of the production, utilization, and distribution of the products of the soil which are so essential to the public health and welfare. Our researchers are utilizing all of the talents and facilities now available to them. They are working together as never before to find answers to the questions being raised by the farmer and other citizens. A splendid spirit of teamwork has developed at the University of Minnesota, and this is being extended to active cooperation between this institution and other research agencies in neighboring states and throughout the nation. The fruits of the investigation will be bountiful under such a program. If the necessary investment is made to support the studies required, definite assurance can be given that there will be abundant returns.

During the year 1951-52, the Minnesota Agricultural Experiment Station has reported progress in all fields of agricultural research. The information has been disseminated to the state and to the world through a variety of publications, through a wider use of television and radio, through short courses, and in the classrooms of schools and colleges, as well as through the activities of agricultural extension specialists, county agents, home agents, and 4-H Club leaders. The problems that are being studied are those which seem to be most pressing.

The whole program of research at the Minnesota Station has been reviewed during the year by an Agricultural Advisory Council, consisting of representatives of farm organizations together with men and women engaged in agriculture or home-making or in the industries based upon agriculture. This Agricultural Advisory Council has offered constructive suggestions for the improvement of our program of agricultural research and education. Likewise, the Council is firmly convinced that the program deserves, and must have, added financial support from the people of Minnesota, so that there may be "an equitable balance between agriculture and other sections of our economy."

CHANGES IN STAFF

Appointments

A. R. Barr, Ph.D., as instructor, Division of Entomology and Economic Zoology, effective June 1, 1952.

J. R. Berggren, D.V.M., as instructor, Division of Veterinary Medicine, effective November 1, 1951.

R. C. Blake, as special agent, Division of Horticulture, effective July 2, 1951.

James Broyles, M.S., as research fellow, Division of Plant Pathology and Botany, effective January 1, 1952.

Edward Butler, M.S., as research fellow, Division of Plant Pathology and Botany, effective July 1, 1951.

D. H. Clifford, D.V.M., as instructor, Division of Veterinary Medicine, effective April 1, 1952.

W. W. Cochrane, Ph.D., as professor, Division of Agricultural Economics, effective August 27, 1951.

James DeVay, B.S., as research fellow, Division of Plant Pathology and Botany, effective July 1, 1951.

H. E. Dziuk, B.S., as instructor, Division of Veterinary Medicine, effective July 1, 1951.

L. J. Elling, Ph.D., as research associate, Division of Agronomy and Plant Genetics, effective July 1, 1951.

R. L. Fischer, Ph.D., as research fellow, Division of Entomology and Economic Zoology, effective July 16, 1951.

A. L. Good, D.V.M., as research fellow, Division of Veterinary Medicine, effective August 1, 1951.

P. B. Hammond, D.V.M., as instructor, Division of Veterinary Medicine, effective October 1, 1951.

B. A. Haws, M.S., as research fellow, Division of Entomology and Economic Zoology, effective January 1, 1952.

E. B. Hayden, B.S., as assistant professor, Division of Plant Pathology and Botany, effective December 21, 1951.

F. E. Hilton, D.V.M., as instructor, Division of Veterinary Medicine, effective June 16, 1952.

Kuan-Jen Hsu, Ph.D., as research fellow, Division of Agronomy and Plant Genetics, effective July 1, 1951.

R. V. Keppel, M.S., as instructor, Division of Agricultural Engineering, effective July 1, 1951.

Keh-Shing Koo, Ph.D., as research fellow, Division of Agronomy and Plant Genetics, effective July 1, 1951.

S. F. Krause, M.S., as research fellow, Division of Agricultural Economics, effective May 1, 1952.

R. M. Leary, D.V.M., as instructor, Division of Veterinary Medicine, effective July 16, 1951.

A. J. Luedke, B.S., as instructor, Division of Veterinary Medicine, effective October 16, 1951.

J. R. Meyer, M.F., as instructor, School of Forestry, effective June 15, 1952.

Rex Montgomery, Ph.D., as research associate, Division of Agricultural Biochemistry, effective July 1, 1951.

J. E. Moulton, D.V.M., as instructor, Division of Veterinary Medicine, effective October 1, 1951.

J. H. Pomroy, B.A.E., as instructor, Division of Agricultural Engineering, effective January 1, 1952.

J. E. Rose, B.S., as research assistant, Division of Veterinary Medicine effective July 1, 1951.

H. C. Rowsell, D.V.M., as research fellow, Division of Veterinary Medicine, effective October 1, 1951.

Frank Sauer, D.V.M., as research assistant, Division of Veterinary Medicine, effective October 8, 1951.

V. L. Sorenson, M.S., as research fellow, Division of Agricultural Economics, effective August 1, 1951.

David Stanley, D.V.M., as instructor, Division of Veterinary Medicine, effective March 15, 1952.

B. F. Stanton, M.S., as instructor, Division of Agricultural Economics, effective September 10, 1951.

L. A. Stedman, Ph.D., as professor and director, School of Home Economics, effective July 1, 1951.

C. E. Stevens, B.S., as instructor, Division of Veterinary Medicine, effective October 16, 1951.

H. L. Strandberg, B.S., as instructor, Division of Veterinary Medicine, effective September 16, 1951.

M. H. Swanson, Ph.D., as assistant professor, Division of Poultry Husbandry, effective April 1, 1952.

H. W. Thoele, M.S., as instructor, Division of Dairy Husbandry, effective July 1, 1951.

Alan Thomas, M.S., as instructor, Division of Dairy Husbandry, effective August 1, 1951.

Raimunds Zemjanis, D.V.M., as instructor, Division of Veterinary Medicine, effective April 1, 1952.

Promotions

H. F. Arneman, M.S., instructor to assistant professor, Division of Soils, effective July 1, 1951.

W. J. Aunan, Ph.D., instructor to assistant professor, Division of Animal Husbandry, effective July 1, 1951.

Carl Borgeson, M.S., assistant professor to associate professor, Division of Agronomy and Plant Genetics, effective July 1, 1951.

L. S. Cuendet, Ph.D., instructor to assistant professor, Division of Agricultural Biochemistry, effective July 1, 1951.

D. P. Duncan, Ph.D., instructor to assistant professor, School of Forestry, effective July 1, 1951.

W. R. Hess, Ph.D., instructor to research fellow, Division of Veterinary Medicine, effective January 1, 1952.

H. H. Hoyt, D.V.M., Ph.D., assistant professor to associate professor, Division of Veterinary Medicine, effective July 1, 1951.

V. H. Johnson, M.S., instructor to assistant professor, Division of Agricultural Engineering, effective July 1, 1951.

T. H. King, Ph.D., assistant professor to associate professor, Division of Plant Pathology and Botany, effective July 1, 1951.

O. M. Kiser, M.S., assistant professor to associate professor, Northwest Experiment Station, effective July 1, 1951.

R. L. Kitchell, D.V.M., Ph.D., instructor to associate professor, Division of Veterinary Medicine, effective July 1, 1951.

G. W. Mather, Ph.D., instructor to associate professor, Division of Veterinary Medicine, effective January 1, 1952.

W. F. Millier, Ph.D., research fellow to instructor, Division of Agricultural Engineering, effective January 1, 1952.

R. E. Nylund, Ph.D., assistant professor to associate professor, Division of Horticulture, effective July 1, 1951.

A. G. Peterson, Ph.D., research fellow to research associate, Division of Entomology and Economic Zoology, effective July 1, 1951.

E. L. Thomas, Ph.D., instructor to assistant professor, Division of Dairy Husbandry, effective July 1, 1951.

A. F. Weber, D.V.M., Ph.D., assistant professor to associate professor, Division of Veterinary Medicine, effective July 1, 1951.

Leaves of Absence

A. H. Burman, B.S., instructor, Division of Agricultural Engineering, on military leave, July 1, 1951, to July 7, 1951.

A. A. Dowell, Ph.D., professor, Division of Agricultural Economics, on leave due to illness, July 1, 1951, to September 30, 1951.

H. D. Fausch, M.S., instructor, Northwest Experiment Station, on leave for graduate study, September 16, 1951, to June 16, 1952.

W. F. Geddes, Ph.D., professor and chief, Division of Agricultural Biochemistry, on leave to study in Europe, June 11, 1952, to June 30, 1952.

A. A. Granovsky, Ph.D., professor, Division of Entomology and Economic Zoology, on leave due to illness, November 16, 1951, to December 31, 1951.

L. L. Larson, B.S., instructor, Division of Veterinary Medicine, on leave to work full time for the Minnesota State Livestock Sanitary Board, July 1, 1951, to September 15, 1951.

W. H. Marshall, Ph.D., professor, Division of Entomology and Economic Zoology, on leave to review certain wildlife management programs and practices of the midwestern states, October 1, 1951, to June 30, 1952.

W. E. Petersen, Ph.D., professor, Division of Dairy Husbandry, on leave to lead group of farmers on a tour for the Farm Journal, May 25, 1952, to June 30, 1952.

E. H. Rinke, Ph.D., professor, Division of Agronomy and Plant Genetics, on leave to act as U. S. Government Adviser for mutual security mission, April 16, 1952, to June 30, 1952.

A. E. Schneider, M.A., associate professor, School of Forestry, on leave to continue graduate work at the University of Washington, Seattle, October 15, 1951, to June 30, 1952.

Dorothy F. Simmons, M.S., associate professor, School of Home Economics, on leave due to illness, April 14, 1952, to May 3, 1952.

E. C. Stakman, Ph.D., professor and chief, Division of Plant Pathology and Botany, on leave to travel in South America for Rockefeller Foundation as chairman of agricultural advisory committee, March 30, 1952, to April 12, 1952.

Resignations

J. R. Berggren, D.V.M., instructor, Division of Veterinary Medicine, to enter private practice, effective December 15, 1951.

R. W. Brown, V.M.D., B.S., research fellow, Division of Veterinary Medicine, to accept a position with the Bureau of Animal Industry at Beltsville, Maryland, effective September 30, 1951.

A. H. Burman, B.S., instructor, Division of Agricultural Engineering, to accept a position as assistant engineer officer, U. S. Veterans Administration, Camp White, Oregon, effective January 14, 1952.

A. L. Burroughs, Ph.D., assistant professor, Division of Entomology and Economic Zoology, to accept a position with the U. S. Public Health Service, September 15, 1951.

B. F. Dunn, B.S., research associate, Division of Horticulture, discontinuance of Mayo, Forestry, Horticultural Institute of which he was Superintendent, effective December 31, 1951.

R. B. England, D.V.M., B.S.A., instructor, Division of Veterinary Medicine, to accept a position at the McGinnis Veterinary Hospital, Peoria, Illinois, effective October 31, 1951.

K. W. Hanson, special agent, Division of Horticulture, to accept a position at the University of Georgia, Athens, Georgia, effective September 30, 1951.

Allan Hemingway, Ph.D., professor, Division of Veterinary Medicine, to accept a position as Head of the Physiology Department of the Medical School at the University of California, Los Angeles, California, effective August 31, 1951.

F. C. Heneman, B.A., research fellow, Division of Veterinary Medicine, to accept position in Bureau of Animal Industry, Washington, D.C., effective September 15, 1951.

Thorkil Jensen, Ph.D., research fellow, Division of Entomology and Economic Zoology, to accept a position as assistant professor, University of Kansas Medical Center, Kansas City, Kansas, June 30, 1952.

R. E. Larson, B.A.E., assistant professor, Division of Agricultural Engineering, to accept a position with the U. S. Department of Agriculture, Columbia, Missouri, effective May 1, 1952.

R. M. Leary, D.V.M., instructor, Division of Veterinary Medicine, to enter private practice at Rochester, Minnesota, effective June 30, 1952.

A. J. Luedke, B.S., instructor, Division of Veterinary Medicine, to return to school at University of Minnesota, effective June 30, 1952.

W. A. Malmquist, D.V.M., instructor, Division of Veterinary Medicine, to accept position with the Cutter Laboratories at Berkeley, California, effective April 7, 1952.

D. G. Marshall, Ph.D., associate professor, Rural Sociology, to accept a position in Department of Rural Sociology, University of Wisconsin, Madison, Wisconsin, effective June 15, 1952.

W. E. McDaniel, M.S., instructor, Division of Agricultural Economics, to accept a position in the Department of Agricultural Economics, University of Delaware, Newark, Delaware, August 31, 1951.

L. S. Mix, B.S., research fellow, Division of Dairy Husbandry, to accept a position as Director of Research for Beacon Milling Company, Cayuga, New York, effective June 1, 1952.

J. E. Moulton, B.S., D.V.M., instructor, Division of Veterinary Medicine, to accept position at the University of California, Davis, California, effective May 31, 1952.

G. G. Nahas, B.A., M.D., M.S., instructor, Division of Veterinary Medicine, to accept position in the Medical School on the Minneapolis Campus of the University of Minnesota, April 1, 1952.

Henry Schmitz, Ph.D., professor, Division of Forestry, Dean of the College of Agriculture, Forestry, Home Economics, and Veterinary Medicine, to accept a position as President of the University of Washington, Seattle, Washington, effective June 30, 1952.

David Siminovitch, Ph.D., research fellow, Division of Agricultural Biochemistry, to accept a position in the Department of Chemistry, Dominion Experiment Farm, Ottawa, Canada, effective June 30, 1951.

David Stanley, D.V.M., instructor, Division of Veterinary Medicine, to enter private practice, effective June 15, 1951.

C. C. Turbes, D.V.M., M.S., instructor, Division of Veterinary Medicine, to accept a position in the School of Veterinary Medicine, Indiana University, Bloomington, Indiana, effective September 30, 1951.

Retirements

J. H. Allison, Ph.B., M.F., professor, Division of Forestry, effective June 30, 1952.

W. L. Boyd, D.V.S., professor and chief, Division of Veterinary Medicine, effective June 30, 1952.

H. K. Hayes, D.Sc., professor and chief, Division of Agronomy and Plant Genetics, effective June 30, 1952.

O. M. Kiser, M.S., associate professor, Northwest Experiment Station, effective June 30, 1952.

PUBLICATIONS

AGRICULTURAL EXPERIMENT STATION

General Bulletin Series

403. (Reprint) Sex determination of geese. Thomas H. Canfield, Poultry Husbandry, 6 pages, 5,000.
409. Our changing poultry enterprise and its relation to dairy cattle and hogs. Frank T. Hady and Truman Nodland, Agricultural Economics, 16 pages, 7,000.
410. Loans of production credit associations to Minnesota farmers. Sherwood O. Berg, E. Fred Koller, and O. B. Jesness, Agricultural Economics, 32 pages, 5,000.
411. The economic importance of egg quality. Frederick R. Taylor and O. B. Jesness, Agricultural Economics, 20 pages, 4,000.
412. Statistics of farmers' cooperatives in Minnesota, 1950. E. Fred Koller, T. W. Manning, and O. B. Jesness, Agricultural Economics, 108 pages, 8,000.
413. Costs of drying milk in Minnesota plants. Dale E. Butz and E. Fred Koller, Agricultural Economics, 32 pages, 4,000.
414. Objective carcass grade standards for slaughter hogs. North Central Livestock Marketing Research Committee, Agricultural Economics and North Central Region (Regional Publication No. 30), 56 pages, 10,000.
415. Clovers for Minnesota. H. L. Thomas, E. R. Duncan, M. F. Kernkamp, A. G. Peterson, and A. R. Schmid, Agronomy and Plant Genetics, Agricultural Extension, Plant Pathology, and Entomology and Economic Zoology, 28 pages, 10,000.

Technical Bulletin Series

197. The effect of 2, 4-dichlorophenoxyacetic acid on certain weed and crop seeds. L. E. Everson and R. S. Dunham, Agronomy and Plant Genetics, 24 pages, 3,000.
198. Pollination studies with stone fruits. W. H. Alderman and T. S. Weir, Horticulture, 16 pages, 2,500.
199. The diameter of the fiber used in certain wool fabrics and its relation to fabric properties. Ethel L. Phelps, Florence Petzel, Gypsy Frankenberg Adam, and Helen Ward Norton, Home Economics, 24 pages, 2,500.
200. Investigations on physiologic specialization and parasitism of *Rhizoctonia solani*. M. F. Kernkamp, D. J. deZeeuw, S. M. Chen, B. C. Ortega, C. T. Tsiang, and A. M. Khan, Plant Pathology and Botany, 36 pages, 3,000.
201. The stoneflies of Minnesota (Plecoptera). Philip H. Harden and Clarence E. Mickel, Entomology and Economic Zoology, 84 pages, 3,000.

202. Thermal death-time studies of coliform bacteria in milk. J. C. Olson, Jr., H. Macy, and H. O. Halvorson, Dairy Husbandry and Bacteriology and Immunology, 24 pages, 2,500.

203. Butter pricing and marketing at country points in the North Central Region. Hugh L. Cook (University of Wisconsin), Paul L. Kelley (Kansas State College), E. Fred Koller (University of Minnesota), and Arthur H. Miller (Federal-State Cooperator, Wisconsin), Agricultural Economics and North Central Region (Regional Publication No. 26), 60 pages, 11,000.

204. Influence of fertilizers on four legumes when grown as green manures. Donald G. Baker, C. O. Rost, and H. W. Kramer, Soils, 16 pages, 3,000.

Minnesota Farm and Home Science

- Volume IX, Number 1. 16 pages, 16,600.
- Volume IX, Number 2. 16 pages, 16,200.
- Volume IX, Number 3. 16 pages, 16,200.

Report Series

- Fifty-eighth annual report of the Minnesota Agricultural Experiment Station, July 1, 1950, to June 30, 1951, 40 pages, 2,500.
- Miscellaneous Report No. 14. (Original and reprint) Maturity ratings of corn hybrids registered for sale in Minnesota in 1951. E. H. Rinke, Gertrud Joachim, and N. C. Olmeim, Agronomy and Plant Genetics, 12 pages, 5,000.
- Miscellaneous Report No. 15. 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, 24 pages, 12,500.

AGRICULTURAL EXTENSION SERVICE

Bulletin Series

121. (Revised) Poultry housing. Cora Cooke, Agricultural Extension, 16 pages, 20,000.
218. (Revised) Feeding the dairy herd. H. R. Searles, R. W. Wayne, and T. W. Gullickson. Agricultural Extension and Dairy Husbandry, 64 pages, 40,000.
232. (Revised) Know your cooperative. W. H. Dankers, Agricultural Extension, 16 pages, 7,500.
244. (Revised) Freezing foods for home use. J. D. Winter, Andrew Hustrulid, Shirley Trantanella, and Woodrow J. Aunan, Horticulture, Agricultural Engineering, and Animal Husbandry, 48 pages, 30,000.
247. (Revised) Sewage disposal and water systems on the farm. D. M. Ryan, Agricultural Extension, 24 pages, 20,000.

250. (Reprint) Landscaping the farmstead. Leon C. Snyder, Agricultural Extension, 24 pages, 10,000.
255. (Revised) The home fruit planting. Leon C. Snyder, Agricultural Extension, 28 pages, 10,000.
263. (Revised) Insecticides. L. K. Cutkomp, Entomology and Economic Zoology, 24 pages, 10,000.
266. (Reprint) The road to better meetings. Charlotte Kirchner and Robert R. Pinches, Agricultural Extension, 12 pages, 7,500.
267. Woody plants for Minnesota. Leon C. Snyder and Marvin E. Smith, Agricultural Extension, 24 pages, 10,000.
268. Lampshades you can make. Charlotte Kirchner, Agricultural Extension, 12 pages, 10,000.
269. Slip covering your furniture. Charlotte Kirchner, Agricultural Extension, 16 pages, 10,000.
270. Backgrounds for your home. Charlotte Kirchner, Agricultural Extension, 12 pages, 10,000.
271. Refinishing your furniture. Charlotte Kirchner, Agricultural Extension, 8 pages, 10,000.

Pamphlet Series

40. (Reprint) Round top brooder house. Agricultural Extension, 8 pages, 5,000.
174. (Reprint) Your property and your heirs. Mary May Miller, Agricultural Extension, 8 pages, 20,000.
175. (Reprint) Getting your money's worth. Mary May Miller, Agricultural Extension, 6 pages, 5,000.
178. Inflation. O. B. Jesness, Agricultural Economics, 4 pages, 40,000.
179. Health is everybody's business. Minnesota Department of Health and Agricultural Extension, 4 pages, 45,000.
180. Looking ahead to 1952. Harold Pederson and Mary May Miller, Agricultural Extension, 10 pages, 7,500.
181. (Original and reprint) Chemical weed control in Minnesota—1952. R. S. Dunham, R. E. Nylund, R. F. Crim, and H. L. Hansen, Agronomy and Plant Genetics, Horticulture, Agricultural Extension, and Forestry, 6 pages, 22,000.
182. (Original and reprint) Wipe out brucellosis in cattle. W. L. Boyd, Veterinary Medicine, 4 pages, 50,000.
183. Mental health—its foundations in childhood. John E. Anderson, Institute of Child Welfare, 4 pages, 40,000.
184. Fruit spray schedules. L. C. Snyder, T. H. King, and A. C. Hodson, Agricultural Extension, Plant Pathology, and Entomology and Economic Zoology, 8 pages, 7,500.
185. Who gets the consumer's dollar? D. C. Dvoracek, Agricultural Extension, 4 pages, 45,000.

Folder Series

22. (Revised) Improved varieties of farm crops. Minnesota Agricultural Experiment Station, 24 pages, 10,000.
37. (Revised) Fattening lambs. W. E. Morris and P. S. Jordan, Agricultural Extension and West Central Experiment Station, 8 pages, 10,000.
80. (Revised) More money for eggs. W. H. Dankers and Cora Cooke, Agricultural Extension, 8 pages, 25,000.
149. (Revised) Canibalism and egg eating in poultry. Cora Cooke, Agricultural Extension, 6 pages, 10,000.
154. (Revised and reprint) Vegetable varieties for Minnesota. Orrin C. Turnquist, Agricultural Extension, 8 pages, 12,500.
155. (Revised and reprint) Managing the home with ease and satisfaction. Mary May Miller, Agricultural Extension, 8 pages, 25,000.
157. (Revised) Hay crop silage. M. L. Armour, J. B. Fitch, and H. R. Searles, Agricultural Extension and Dairy Husbandry, 4 pages, 7,500.
160. Your dairy calf—feeding and care. Thor W. Gullickson, Dairy Husbandry, 4 pages, 10,000.
161. Pruning fruit trees. T. S. Weir and L. C. Snyder, Horticulture and Agricultural Extension, 10 pages, 10,000.
162. Strawberries for Minnesota. L. C. Snyder, Agricultural Extension, 8 pages, 10,000.
163. Raspberries for Minnesota. L. C. Snyder, Agricultural Extension, 8 pages, 10,000.
164. Getting started with your vegetable garden. Orrin C. Turnquist, Agricultural Extension, 10 pages, 10,000.
165. The home lawn. Leon C. Snyder, Agricultural Extension, 8 pages, 10,000.
166. More corn per acre. A. C. Caldwell, Soils, 6 pages, 10,000.
167. Summer care of vegetable gardens. Orrin C. Turnquist, Agricultural Extension, 10 pages, 7,500.
168. Barnyard manure. Harold E. Jones, Agricultural Extension, 10 pages, 10,000.
169. Pasture feeding of beef cattle. S. B. Cleland and W. E. Morris, Agricultural Extension, 12 pages, 10,000.
170. How to control wireworms. A. A. Granovsky, Entomology and Economic Zoology, 6 pages, 5,000.
171. How to control cutworms. A. A. Granovsky, Entomology and Economic Zoology, 8 pages, 5,000.
172. Harvesting and storing garden vegetables. Orrin C. Turnquist, Agricultural Extension, 8 pages, 10,000.

Newsletters

Name of Publication	Issues	Pages	Circulation
Ask University Farm	52	52	8,060
Bob Hodgson's Talk	52	130	6,500
Club Leader Letter	1	4	4,910
Dairy Herd Improvement Association Summary	1	53	3,500
Farm Business Notes	8	32	10,128
Garden Fact Sheet	8	24	1,520
Home Garden Tips	31	31	6,200
Minnesota Feed Service	4	16	8,200
Minnesota State Florists' Letter	6	48	2,400
Our Land	52	52	21,476
Poultry News Letter	6	15	456
Radio Shorts	52	156	4,420
Reaching Rural People	13	28	2,288
Turkey Letter	6	12	11,580
University Farm Shorts	12	24	8,060
Visual Aids Tip Sheet	12	24	4,428
Minnesota Vegetable Growers' Letter	2	4	2,000
	318	705	106,126

Boys' and Girls' Club Bulletin Series

- (Reprint) Minnesota 4-H secretary's record book. Carol Shubeck, Agricultural Extension, 64 pages, 5,000.
- (Reprint) 4-H pig project. H. G. Zavoral, Agricultural Extension, 8 pages, 10,000.
- (Reprint) 4-H beef project. W. E. Morris, Agricultural Extension, 16 pages, 10,000.
- (Reprint) 4-H bread. Carol Sanstead and Ina Rowe, Agricultural Extension, 24 pages, 10,000.
- (Reprint) 4-H dairy heifer project. H. R. Searles, Agricultural Extension, 8 pages, 10,000.
- (Revised) 4-H sheep project. W. E. Morris, Agricultural Extension, 8 pages, 7,000.
- (Reprint) Our goal is health. Agricultural Extension, 4 pages, 40,000.
- (Reprint) Clothing project. Adapted by Athelene Scheid and Gwendolyn M. Bacheller from Iowa State College bulletin by Elsie K. Williams, Agricultural Extension, 40 pages, 20,000.
- (Revised) 4-H food preparation. Mary R. Anderson and Grace D. Brill, Agricultural Extension, 36 pages, 20,000.

SCIENTIFIC JOURNAL SERIES PAPERS

Agricultural Biochemistry

2283. The utilization of solubilized aqueous carotene by normal and hypothyroid rats. J. G. Bieri and M. O. Schultze. *Archives of Biochemistry and Biophysics* 34:280-84. 1951.
2288. Chemical structure in relation to vitamin E function. P. D. Boyer, M. Rabinovitz, and E. Liebe. *The Journal of Biological Chemistry* 192:95-103. 1951.
2291. The reduction of sugars with sodium borohydride. M. Abdel-Akher, J. K. Hamilton, and F. Smith. *Journal of the American Chemical Society* 73:4691-4692. 1951.
2292. An evaluation of the methods used for determining the baking quality of nonfat dry milk solids. Bruce L. Larson, Robert Jenness, W. F. Geddes, and S. T. Coulter. *Cereal Chemistry* 28:351-370. 1951.
2297. The constitution of mesquite gum. Part III. The structure of the monomethyl glucuronic acid component. F. Smith. *Journal of the Chemical Society*, pp. 2646-2652. 1951.
2619. Comments on the microspectrophotometric determination of vitamin A and carotene in blood. J. G. Bieri and M. O. Schultze. *Archives of Biochemistry and Biophysics* 34:273-279. 1951.
2661. The distribution of thiamine and riboflavin in the wheat kernel at different stages of maturity. J. Marshall Pollock and W. F. Geddes. *Cereal Chemistry* 28:289-299. 1951.
2667. The detection of carbohydrate esters and lactones after separation by paper chromatography. M. Abdel-Akher and F. Smith. *Journal of the American Chemical Society* 73:5859. 1951.
2669. The intraperitoneal toxicity to concentrates of the soybean trypsin inhibitor. Irvin E. Liener. *The Journal of Biological Chemistry* 193:183-191. 1951.
2671. The carbohydrates of Gramineae. I. The sugars of the flour of wheat (*Triticum vulgare*). R. B. Koch, W. F. Geddes, and F. Smith. *Cereal Chemistry* 28:424-430. 1951.
2677. The control of pyruvate oxidation in a cell-free rat heart preparation by phosphate acceptors. M. Rabinovitz, M. P. Stulberg, and P. D. Boyer. *Science* 114:641-642. 1951.
2681. Non-enzymatic cleavage of p-nitrophenyl esters. B. M. Dirks and P. D. Boyer. *Cereal Chemistry* 28:483-490. 1951.
2682. An automatically-controlled five-cabinet system for food stability studies. S. M. Barer, N. H. Ceaglske, and W. F. Geddes. *Food Technology* 6:26-28. 1952.
2684. Improvement in anthrone method for determination of carbohydrates. Frank A. Loewus. *Analytical Chemistry* 24:219. 1952.

2685. The excretion of N¹-methylnicotinamide and creatinine as influenced by vitamin B₁₂ and various methyl donors. I. E. Liener and M. O. Schultze. *The Journal of Nutrition* 46:223-237. 1952.
2694. Methylation of partially methylated sugar anilides. I. Ehrenthal, M. C. Rafique, and F. Smith. *Journal of the American Chemical Society* 74:1341. 1952.
2695. A new synthesis of glycosides. J. E. Cadotte, F. Smith, and D. Spriestersbach. *Journal of the American Chemical Society* 74:1501-1504. 1952.
2697. Nutritional value of plant materials. VII. Dietary factors affecting pre-weaning and post-weaning mortality of rats. M. O. Schultze, I. E. Liener, and R. L. Glass. *The Journal of Nutrition* 46:171-179. 1952.
2698. Grain storage studies. X. The influence of aeration time and moisture content on fat acidity, nonreducing sugars, and mold flora of stored yellow corn. R. A. Bottomley, C. M. Christensen, and W. F. Geddes. *Cereal Chemistry* 29:53-64. 1952.
2702. Note on the synthesis of symmetrical triglycerides. B. M. Craig, W. O. Lundberg, and W. F. Geddes. *The Journal of the American Oil Chemists' Society* 29:169-170. 1952.
2703. Dilatometric studies of pure triglycerides and mixtures. B. M. Craig, W. O. Lundberg, and W. F. Geddes. *The Journal of the American Oil Chemists' Society* 29:128-133. 1952.
2710. A reinvestigation of the preparation of B-methyl lactoside. F. Smith and J. W. Van Cleve. *Journal of the American Chemical Society* 74:1912-1913. 1952.

Agricultural Engineering

2281. Automatic shutoff device for ground-grain conveyor. C. K. Otis, A. E. Domning, and S. J. Otis. *Journal of the American Society of Agricultural Engineers* 32(10):546-549. 1951.
2303. Batch weighing and processing of the dairy ration. W. F. Millier. *Journal of the American Society of Agricultural Engineers* 32(10):547-549. 1951.
2801. Heating water with the heat pump. Andrew Hustrulid and H. A. Cloud. *Journal of the American Society of Agricultural Engineers* 33(6):357-359. 1952.

Agronomy and Plant Genetics

2268. Studies of inheritance of seed size and other characters in a cross between an Indian and a North American variety of flax. K. H. Chu and J. O. Culbertson. *Agronomy Journal* 44:26-30. 1952.
2736. The effect of herbicides on legumes sown with oats. J. H. Miller and R. S. Dunham. *Research Report Eighth Annual North Central Weed Control Conference*, p. 77. 1951.

2737. Varietal response of legumes to herbicides. J. H. Miller and R. S. Dunham. *Research Report of Eighth Annual North Central Weed Control Conference*, p. 77. 1951.
2738. The effect of herbicides on established legumes. J. H. Miller and R. S. Dunham. *Research Report Eighth Annual North Central Weed Control Conference*, p. 78. 1951.
2739. The effect of herbicides on legumes sown with flax. J. H. Miller and R. S. Dunham. *Research Report Eighth Annual North Central Weed Control Conference*, p. 76. 1951.
2748. Control of annual weeds in flax by post-emergence applications of TCA. O. C. Soine and R. S. Dunham. *Research Report Eighth Annual North Central Weed Control Conference*, p. 102. 1951.
2749. A comparison of 2, 4, 5-T and a mixture of 2, 4, 5-T and 2, 4-D for the control of wild rose. O. H. Shulstad, A. F. Wiese, R. G. Robinson, and R. S. Dunham. *Research Report Eighth Annual North Central Weed Control Conference*, p. 163. 1951.
2750. A comparison of 2,4-D and MCP when sprayed on flax and wild mustard. R. S. Dunham, O. H. Shulstad, A. F. Wiese, and R. G. Robinson. *Research Report Eighth Annual North Central Weed Control Conference*, pp. 96-97. 1951.
2751. Effect of partial vs. total coverage of corn with 2,4-D and TCA. R. G. Robinson and R. S. Dunham. *Research Report Eighth Annual North Central Weed Control Conference*, p. 69. 1951.
2752. The relative tolerance of field crops to residues of TCA in the soil. R. G. Robinson and R. S. Dunham. *Research Report Eighth Annual North Central Weed Control Conference*, p. 62. 1951.
2753. Response of barley varieties to 12 oz. of 2,4-D amine. R. O. Bridgford and R. S. Dunham. *Research Report Eighth Annual North Central Weed Control Conference*, p. 55. 1951.
2754. Control of annual weeds in flax by post-emergence applications of TCA alone and with 2,4-D. R. S. Dunham, O. H. Shulstad, A. F. Wiese, and R. G. Robinson. *Research Report Eighth Annual North Central Weed Control Conference*, p. 97. 1951.
2755. Effect of methods and rates of sowing flax on yields of weeds, flax seed, and flax straw. R. G. Robinson and R. S. Dunham. *Research Report Eighth Annual North Central Weed Control Conference*, pp. 101-102. 1951.
2756. Control of annual weeds in corn with herbicides and tillage. R. S. Dunham and R. G. Robinson. *Research Report Eighth Annual North Central Weed Control Conference*, p. 65. 1951.
2757. Control of annual weeds in first year seedings by mowing and herbicides after oat harvest. R. S. Dunham and R. G. Robinson. *Research Report Eighth Annual North Central Weed Control Conference*, p. 75. 1951.

2758. Effects of preplanting treatments with IPC on wild oats in field crops. R. S. Dunham, R. G. Robinson, and A. F. Wiese. *Research Report Eighth Annual North Central Weed Control Conference*, pp. 40-41. 1951.

2759. Control of annual weeds by tillage, fertilizers, and herbicides after oat harvest. R. S. Dunham and R. G. Robinson. *Research Report Eighth Annual North Central Weed Control Conference*, p. 41. 1951.

2770. Chemical control of grass weeds in flax. Mimeographed proceedings of the Flax Institute of the United States, 1 page. 1951.

2771. Control of foxtail in flax by TCA. R. S. Dunham. *Proceedings of the Northwest Crop Improvement Association Extension Conference*, page 2, distributed as a mimeographed scientific report. 1951.

2784. Control of annual grasses. R. S. Dunham. *Proceedings Eighth Annual Meeting of the North Central Weed Control Conference*, pp. 67-68. 1951.

2791. MCP for flax. *Down to Earth*, Publication of the Dow Chemical Company 7 (4):13. 1952.

Animal Husbandry

2729. A method for measuring the proportion of fat and lean tissue in swine carcasses. W. J. Aunan and L. M. Winters. *Journal of Animal Science* 2 (2):319-325. 1952.

2764. Selection for fertility in two inbred lines of swine. N. C. Fine and L. M. Winters. *Journal of Animal Science* 11 (2):301-312. 1952.

Dairy Husbandry

2687. Some properties of freeze-dried milk. T. A. Nickerson, S. T. Coulter, and Robert Jenness. *Journal of Dairy Science* 35 (1):77-85. January, 1952.

2696. The effect of the various steps in the manufacture on the extent of serum protein denaturation in nonfat dry milk solids. H. A. Harland, S. T. Coulter, and Robert Jenness. *Journal of Dairy Science* 35 (4):363-368. April, 1952.

2772. The bacteriology of surface-taint butter. R. O. Wagenaar. *Journal of Dairy Science* 35 (5):403-423. May, 1952.

Entomology and Economic Zoology

2274. Studies on arthropod cuticle. VI. Intracellular and extracellular formation of cuticle in the developing posterior spiracular chamber of a blowfly larva (*Phormia regina*). Marion B. Clausen and A. Glenn Richards. *Journal of Morphology* 89:199-216. 1951.

2287. Studies on the nutritional value of soybean flour to *Tribolium confusum* Duv. Sping Lin and A. Glenn Richards. *Journal of the New York Entomological Society* 60:107-118. 1952.

2290. The determination of age and rate of growth from the vertebrae of the channel catfish, *Ictalurus lacustris punctatus*. John Appleget and Lloyd L. Smith, Jr. *Transactions of the American Fisheries Society* 80:119-139. 1951.

2560. The Megaloptera and Neuroptera of Minnesota. Sophy I. Parfin. *American Midland Naturalist* 47 (2):421-434. March, 1952.

2609. Food habits of the raccoon (*Procyon lotor hirtus*) in North Central Minnesota. Lyle J. Schoonover and William H. Marshall. *Journal of Mammalogy* 32 (4):422-428. 1951.

2614. An age determination method for the pine marten. William H. Marshall. *Journal of Wildlife Management* 15 (3):276-283. 1951.

2670. The biology and life history of *Monoecocestus* Beddard, 1914 (*Cestoda:Anoplocephalidae*) from the porcupine. Reino S. Freeman. *Journal of Parasitology* 38 (2):111-129. April, 1952.

2676. The effects associated with toxicity and plant translocation of three phosphate insecticides. Mahmoud M. I. Zeid and L. K. Cutkomp. *Journal of Economic Entomology* 44 (6):438-448. 1951.

2679. The common loon in Minnesota. Sigurd T. Olson and William H. Marshall. *Minnesota Museum of Natural History Occ. Papers No. 5*:177. 1952.

2693. Studies on arthropod cuticle. VII. Patent and masked carbohydrate in the epicuticle of insects. A. Glenn Richards. *Science* 115:206-208. February, 1952.

2781. The experimental approach to ecology. A. C. Hodson. *Manitoba Entomological Society Proceedings for 1951*, 8 pages. 1952.

2789. The relationships between egg mass abundance and fall populations of the first-generation corn borer and the justification for insecticidal control in field corn. H. C. Chiang and A. C. Hodson. *Journal of Economic Entomology* 45:320-323. 1952.

Forestry

2272. The reaction of wood with alkaline solution of sodium hydrosulfite. Julio Montano and R. Hossfeld. *Technical Association of the Pulp and Paper Industry* 34 (10):468-470. October, 1951.

2668. Some results of thinning fifteen-year-old red pine. T. Schantz-Hansen. *Journal of Forestry* 50:480. 1952

2704. Autecological studies of important forest trees. D. P. Duncan. *Ecology* 33:285-286. April, 1952.

2765. Extent of recovery of beaked hazel (*Corylus cornuta*) four years after spraying. H. L. Hansen. *North Central Weed Control Conference Research Report*, pp. 155-156. 1951.

2766. A test of ground application of 2,4-D under hazel brush (*Corylus spp.*). H. L. Hansen. *North Central Weed Control Conference Research Report*, p. 155. 1951.

2767. Invasion by red raspberry (*Rubus strigosus*) following spraying to control hazel brush. H. L. Hansen. *North Central Weed Control Conference Research Report*, p. 155. 1951.

Home Economics

2286. Is blanching necessary when vegetables are to be kept in frozen storage a month or less? Isabel Noble and J. D. Winter. *Journal of Home Economics* 44 (1):33-35. January, 1952.

2295. The effect of level of intake on calcium and phosphorus metabolism in college women. Jane M. Leichsenring, Loana M. Norris, Sara A. Lamison, Eva Donelson Wilson, and Mary Brown Patton. *Journal of Nutrition* 45 (3):407-418. November, 1951.

2299. Serviceability of four types of cotton fabrics. Ethel L. Phelps, Frances P. McLean, Marian M. Moore, Louise S. Greenwood, June Very, Norma H. Holm, and Vivian White. *Journal of Home Economics* 43 (10):788-793. December, 1951.

2580. Thiamine and riboflavin retention in beef and veal heart. Isabel Noble and Lucille Gomez. *Journal of American Dietetic Association* 27 (9):752-755. September, 1951.

2680. Magnesium metabolism in college women: observations on the effect of calcium and phosphorus intake levels. Jane M. Leichsenring, Loana M. Norris, and Sara Lamison. *Journal of Nutrition* 45 (4):477-486. December, 1951.

Horticulture

2266. Breeding tomatoes for ascorbic acid content. T. M. Currence, Harold Fogle, and J. F. Moore. *Proceedings of American Society for Horticultural Science* 58:245-253. 1951.

2731. Control of weeds in onions with post-emergence herbicide treatments. R. E. Nylund. *Research Report of the Eighth Annual North Central Weed Control Conference*, p. 131. 1951.

2732. Influence of depth of seeding and time and rate of application on the effectiveness of 2,4-D and MCP as pre-emergence herbicides for onions. R. E. Nylund. *Research Report of the Eighth Annual North Central Control Conference*, p. 130. 1951.

2733. Studies on the control of crabgrass in lawns. R. E. Nylund. *Research Report of the Eighth Annual North Central Weed Control Conference*, pp. 44-45. 1951.

2734. Fruiting of nine varieties of June-bearing strawberries as influenced by 2,4-D applications. R. E. Nylund. *Research Report of Eighth Annual North Central Weed Control Conference*, p. 111. 1951.

2735. Pre-emergence control of weeds in onions. R. E. Nylund. *Research Report of Eighth Annual North Central Weed Control Conference*, p. 131. 1951.

2805. Handling fresh sweet corn for market, part 1. J. D. Winter, R. E. Nylund, Anthony F. Legun, and Grover C. Chappell. *Pre-Pack-Age*, pp. 13-21, 32. April, 1952.

Plant Pathology

2284. The effect of 2,4-D on stem-rust development in oats. I. A. Ibrahim. *Phytopathology* 41:951-953. November, 1951.

2285. Strawberry root-rot in Minnesota. E. E. Butler and T. H. King. *Plant Disease Reporter* 35:238. May, 1951.

2294. Fungi on and in wheat seed. Clyde M. Christensen. *Cereal Chemistry* 28:408-415. November, 1951.

2302. The effect of 2,4-D on seedling blight of wheat caused by *Helminthosporium sativum*. Yu Tien Hsia and J. J. Christensen. *Phytopathology* 41:1011-1020. November, 1951.

2635. Identification of histidine and tyrosine by partition chromatography of their azo dyes. J. E. DeVay, W. H. Chang, and R. L. Hossfeld. *Journal American Chemical Society* 73:4977-4978. 1951.

2572. Present status and recent studies on the dwarf leaf rust of barley, *Puccinia hordei*. M. N. Levine and W. I. Cherewick. *U. S. D. A. Technical Bulletin* 1056. 1952.

2672. Physiologic races of *Puccinia graminis* in the United States in 1950. E. C. Stakman and W. Q. Loegering. *U. S. Department of Agriculture, Bureau of Entomology and Plant Quarantine, Bureau of Plant Industry, Soils and Agricultural Engineering, and Minnesota Agricultural Experiment Station (processed)*, 16 pp. July, 1951.

2709. Factors affecting variability in the development of *Melampsora lini*. A. P. Misra. *Phytopathology* 42:204-210. April, 1952.

2713. Free amino-acids and carbohydrates synthesized by *Ustilago zae* (abstract). J. E. DeVay, J. B. Rowell, and E. C. Stakman. *Phytopathology* 42:6. 1952.

2714. Sugar and amino acid composition and variations found in urediospores of races of cereal rusts (abstract). James W. Broyles. *Phytopathology* 42:3-4. 1952.

2715. Factors and results in the partial-vacuum inoculation of seedling corn with *Ustilago zae* (abstract). J. B. Rowell and J. E. DeVay. *Phytopathology* 42:17. 1952.

2716. The importance of the styler region of the pepper fruit in the control of fruit disease (abstract). M. Evans and T. H. King. *Phytopathology* 42:7. 1952.

2717. The inhibition of wheat stem rust by sulfadiazine and the reversal of this effect by para-amino benzoic acid and folic acid (abstract). H. H. Hotson. *Phytopathology* 42:11. 1952.

2718. A "deep freeze" method of maintaining virulent inoculum of the alfalfa wilt bacterium *Corynebacterium insidiosum* (abstract). M. F. Kernkamp and Glen Hemerick. *Phytopathology* 42:13. 1952.

2719. Inoculation of potatoes with ring rot tissues from different sources (abstract). Charles E. Logsdon. *Phytopathology* 42:25. 1952.

2720. Effects of seed-piece treatment on yields and seed-piece decay of potato (abstract). Donald S. Olmsted. *Phytopathology* 42:26. 1952.

2721. Host range of the sugar beet root-rot fungus *Aphanomyces cochliodes drecsh* (abstract). C. L. Schneider. *Phytopathology* 42:18. 1952.

2722. The production of zoospore inoculum of *Aphanomyces* (abstract). C. L. Schneider and H. G. Johnson. *Phytopathology* 42:18. 1952.

2723. Parasitism as related to physiologic specialization in *Colletotrichum lini* Bolley (abstract). E. A. Schwingamer. *Phytopathology* 42:18-19. 1952.

2724. Purple and brown blotch of onions (abstract). Robert L. Skiles. *Phytopathology* 42:20. 1952.

2727. Diseases of soybeans new to Minnesota. M. F. Kernkamp and J. M. Gibler. *Plant Disease Reporter* 35:309-310. 1951.

2742. The phytotoxic effects of aqueous extracts of leafy spurge. Duane J. LeTourneau. *Research Report of the Eighth Annual North Central Weed Control Conference*, p. 181. 1951.

2743. Disodium 3,6-endoxyhexahydrophthalate as a post-emergence herbicide in flax. Duane J. LeTourneau and H. Heggeness. *Research of the Eight Annual North Central Weed Control Conference*, p. 98. 1951.

2744. Disodium 3,6-endoxyhexahydrophthalate as an herbicide for wheat in the boot stage of development. H. G. Heggeness and D. J. LeTourneau. *Research Report of the Eighth Annual North Central Weed Control Conference*, p. 61. 1951.

2745. Evaluation of herbicides for pre-emergence use in flax. Duane J. LeTourneau and H. Heggeness. *Research Report of the Eighth Annual North Central Weed Control Conference*, p. 98. 1951.

2746. Comparative tests of various culture media in the study of air-borne molds. Clyde M. Christensen. *Report to meeting of College of Allergists, Pittsburgh, Pa.* April 7-10, 1952.

2776. The mutagenic action of dilute colloidal polonium on fungi (abstract). 1085 in nuclear Science Abstracts 6:138. 1952. J. B. Rowell, E. C. Stakman, and E. E. Butler. *Atomic Energy Commission*. Publ. A. E. C. U. 1823, 6 pp. 1952.

2783. Some oat diseases in Minnesota. 1951. S. Goto and M. B. Moore. *Plant Disease Reporter* 36:69-70. March, 1952.

2795. Whitehead of oats in Minnesota. S. Goto, J. W. Gibler, and A. Buzicky. *Plant Disease Reporter* 36:151-152. April, 1952.

Poultry Husbandry

2267. Studies with antibiotics in chick and poul starting rations. R. L. Davis and G. M. Briggs. *Poultry Science* 30:767-771. September, 1951.

2279. Sex determination of turkey poults. T. H. Canfield. *Poultry Science* 31:54-56. January, 1952.

2675. Crystalline vitamin B₁₂ for turkey poults. D. H. Sherwood and G. M. Briggs. *Poultry Science* 30:902-903. November, 1951.

2797. A review of recent developments in poultry nutrition: Vitamin B₁₂, antibiotics, and new growth factors. G. M. Briggs. *Transactions, American Association of Cereal Chemists* 10:31-50. February, 1952.

Soils

2276. The long-time effect of varied rates of barnyard manure on the yield and some chemical constituents of the soil. B. L. Brage, M. J. Thompson, and A. C. Caldwell. *Journal, American Society of Agronomy* 44(1):17-20. 1952.

2589. The long-time effect of rotation length on the yield and chemical constituents of the soil. B. L. Brage, M. J. Thompson, and A. C. Caldwell. *Proceedings of Soil Science Society of America* 15:262-264. 1951.

2666. Characteristics of some well-drained soils of the northern portion of the Lake States. Iver J. Nygard, P. R. McMiller, and Francis D. Hole. *Proceedings of Soil Science Society of America* 16(2):123-129. 1952.

2782. Corn needs nitrogen—especially on sandy soils. J. M. MacGregor. *Minnesota Farm and Home Science* 9(3):16. May, 1952.

Veterinary Medicine

2264. The propagation of the causative agent of infectious sinusitis of the turkey in the chicken embryo. Harvey H. Hoyt, B. S. Pomeroy, and M. H. Roepke. *American Journal of Veterinary Research* 12:329-333. 1951.

2296. A non-specific Brucella agglutinating substance in bovine serum. William R. Hess and M. H. Roepke. *Proceedings of the Society for Experimental Biology and Medicine* 77:469-472. 1951.

2304. Results of county-wide blood tests following two to four county-wide ring tests for brucellosis. Fred C. Driver and Martin H. Roepke. *Proceedings Book, American Veterinary Medical Association, Eighty-Eighth Annual Meeting*, pp. 148-153. 1951.

2553. Neutralization and hemoagglutination inhibition of swine influenza virus by serum from suckling swine and by milk from their dams. George A. Young, Jr. and Norman R. Underdahl. *Journal of Immunology* 65:369-373. 1950.

2615. Studies of electrolytes in body fluids of dairy cattle. I. Effects of water diuresis on renal excretion of several elements. A. F. Sellers and M. H. Roepke. *American Journal of Veterinary Research* 12:183-186. 1951.

2616. Studies of electrolytes in body fluids of dairy cattle. II. Effects of estrogen on electrolyte levels in body fluids in late pregnancy. A. F. Sellers and M. H. Roepke. *American Journal of Veterinary Research* 12:292-295. 1951.

2617. Studies of electrolytes in body fluids of dairy cattle. III. Effects of potassium on electrolyte levels in body fluids in midlactation. A. F. Sellers, Toby L. Gitis, and M. H. Roepke. *American Journal of Veterinary Research* 12:296-301. 1951.

2686. Biological products in the prevention and control of poultry diseases. B. S. Pomeroy. *Proceedings Book, American Veterinary Medical Association, Eighty-Eighth Annual Meeting*, pp. 215-222. 1951.

2691. Reciprocal relations between the hypophysis and adrenals in fetal rats: Effects of unilateral adrenalectomy and of implanted cortisone, DOCA and sex hormones. R. L. Kitchell and L. J. Wells. *Endocrinology* 50:83-93. 1952.

2726. Infectious atrophic rhinitis. H. C. H. Kernkamp. *North American Veterinarian* 33:88-91. 1952.

MISCELLANEOUS JOURNAL SERIES PAPERS

Agronomy and Plant Genetics

762. Weed and brush control. R. G. Robinson. Mimeographed Proceedings of the Institute for County Highway Engineers, pp. 99-103. April, 1952.

767. Crop varieties for Minnesota. H. K. Hayes. *Minnesota Seed Grower* 25 (1):1-3. 1952.

773. Alfalfa-brome makes best pasture base. A. R. Schmid. *Minnesota Feed Service*, p. 4. March 4, 1952.

776. A corn breeder's thoughts on borer resistant corn. E. L. Pinnell. *Minnesota Seed Grower* 25 (2):1-2. 1952.

777. New corn hybrids for southern Minnesota. E. L. Pinnell and E. H. Rinke. *Minnesota Seed Grower* 25 (2):2-3. 1952.

782. Spray those weeds and certify seed. R. G. Robinson and R. S. Dunham. *Minnesota Seed Grower* 25 (3):1-2. 1952.

Dairy Husbandry

760. Yogurt—is it true what they say about it? J. C. Olson, Jr. *Milk Plant Monthly* 40 (11):26-28. 1951.

Entomology and Economic Zoology

749. Spring work in the apiary. Mykola H. Haydak. *The Minnesota Beekeeper* 5 (2):9-13. 1952.

753. Some observations on the birds of Basswood Lake. James R. Beer and Fred Prievert. *The Flicker* 23 (4):61-68. 1951.

757. Summer work with the bees. M. H. Haydak. *The Minnesota Beekeeper* 4 (3):4-6. 1951.

766. Food value of honey. M. H. Haydak. *The Minnesota Beekeeper* 5 (3):10-13. 1952.

774. Causes of swarming. M. H. Haydak. *American Bee Journal* 92:189-190. 1952.

778. Soil insects in greenhouses. A. A. Granovsky. *Minnesota State Florists' Bulletin*, pp. 1-4. June 1, 1952.

Forestry

740. George Washington, surveyor and ecological observer. Stephen H. Spurr. *Ecology* 32 (3):544-549. July, 1951.

754. The harvest from one of Minnesota's oldest coniferous forest plantations. Henry L. Hansen. *Conservation Volunteer*, pp. 28-30. May-June, 1951.

756. Post-war forestry in western Germany. Stephen H. Spurr. *American-German Review*, pp. 9-11. August, 1951.

763. The forests and forest products industries of Minnesota. F. H. Kaufert. *Mississippi Valley Lumberman*, pp. 26-29. January 11, 1952.

Horticulture

759. Growing nut trees in Minnesota. W. G. Brierley. *Minnesota Horticulturist* 80 (1):4, 5, 15; 80 (2):30, 31; 80 (3):46, 47; 80 (4):62, 63. 1952.

765. Garden 'mums for Minnesota. R. A. Phillips. *Minnesota Horticulturist* 80 (2):19, 20. 1952.

779. Control of crabgrass in lawns. R. E. Nylund. *Minnesota Horticulturist* 80 (6):89, 95. 1952.

780. Scandinavian Christmas begonias. R. E. Widmer. *Florists' Bulletin*, pp. 5-6. June, 1952.

Plant Pathology

746. Adaptation in fungi. J. J. Christensen and J. M. Daly. *Annual Review of Microbiology* 5:57-70. 1951.

755. Technologies of increasing food production. J. J. Christensen. *World Population and Future Resources*, pp. 94-107. 1952.

Soils

758. A machine for harvesting hay and small grains. J. M. MacGregor. *Journal, American Society of Agronomy* 44(1):50-51. January, 1952.

768. Heavy fertilization of corn. C. O. Rost. *Hormel Farmer* 15(6):4-5. 1952.

771. A comparison of different phosphate materials. A. C. Caldwell. Mimeographed Proceedings of the phosphorus sub-committee of the North Central Region, p. 7. January, 1952.

772. The uptake and recovery of phosphorus applied broadcast to established stands of alfalfa. A. C. Caldwell, J. M. MacGregor, F. L. Hammer, and A. Flikke. Mimeographed Proceedings of the phosphorus sub-committee of the North Central Region, p. 47. January, 1952.

775. What about kriliium? A. C. Caldwell. *Hormel Farmer* 15(8):2. 1952.

Veterinary Medicine

752. A diet and technic for starting pigs without colostrum. George A. Young, Jr. and N. R. Underdahl. *Archives of Biochemistry and Biophysics* 32:449-450. 1951.

SUMMARY OF PUBLICATIONS

July 1951—June 1952

Kind of publication	Number issued	Number of pages	Number of copies in edition
General series bulletins	8	298	53,000
Technical series bulletins	8	284	30,500
<i>Minnesota Farm and Home Science</i>	3	48	49,000
Report series	3	76	20,000
Extension Service			
Bulletins	14	328	205,000
Pamphlets	11	66	287,000
Folders	20	174	217,500
4-H bulletins	9	208	132,000
Newsletters	318	705	106,126
	394	2,187	1,100,126

SUMMARY OF JOURNAL SERIES PAPERS

Division	Scientific Journal Series		Miscellaneous Journal Series	
	Number issued	Number of pages	Number issued	Number of pages
Agricultural Biochemistry	22	143	0	0
Agricultural Economics	0	0	0	0
Agricultural Engineering	3	10	0	0
Agronomy and Plant Genetics	21	29	6	15
Animal Husbandry	2	19	0	0
Dairy Husbandry	3	36	1	3
Entomology and Economic Zoology ..	12	302	6	26
Forestry	6	10	4	16
Home Economics	5	35	0	0
Horticulture	7	24	4	15
Plant Pathology and Botany	29	83	2	28
Poultry Husbandry	4	30	0	0
Rural Sociology	0	0	0	0
Soils	4	30	5	14
Veterinary Medicine	10	57	1	2
	128	808	29	119
Total publications	157			

NEW EXPERIMENT STATION PROJECTS

Animal Husbandry

FH-2214-1. A study of the factors affecting prenatal and post-natal viability in farm animals.

Entomology and Economic Zoology

170. The European Corn Borer in Minnesota—It's ecology and physiology and the reduction of economic loss caused by it.

171. Minnesota wildlife studies.

Home Economics

126. The relation between the serviceability of wool suitings and those made wholly or in part of chemically manufactured fibers.

Poultry Husbandry

512. Use of dried whey products in poultry nutrition.

Soils

441. Land use and pasture management in beef cattle production.

Veterinary Medicine

221. A study of milk formation by the use of radioactive carbon compounds.

SUMMARY OF PROJECTS

Division	Total	Active	Inactive	Closed	New
Agricultural Biochemistry	17	17	0	0	0
Agricultural Economics	26	26	0	2	0
Agricultural Engineering	13	13	0	1	0
Agronomy and Plant Genetics	21	21	0	0	0
Animal Husbandry	16	16	0	3	1
Dairy Husbandry	16	16	0	0	0
Entomology and Economic Zoology..	20	20	0	2	2
Forestry	10	10	0	0	0
Home Economics	14	14	0	0	1
Horticulture	21	21	0	3	0
Plant Pathology and Botany	22	22	0	1	0
Poultry Husbandry	11	11	0	1	1
Rural Sociology	4	4	0	0	0
Soils	13	13	0	0	1
Veterinary Medicine	10	10	0	0	1
North Central Experiment Station....	4	3	1	0	0
Northeast Experiment Station	6	6	0	0	0
Northwest Experiment Station	6	6	0	0	0
Southeast Experiment Station	2	2	0	0	0
West Central Experiment Station.....	6	6	0	0	0
Total	258	257	1	13	7

FINANCIAL STATEMENT

Income 1949-1950

1951-52

Sources 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	68,128.03						68,128.03
Research and Marketing							
9(b)1-2	111,442.51						111,442.51
Regional Research Fund	43,931.03						43,931.03
State appropriations:							
General University support	811,593.73	\$56,278.64	\$61,969.69	\$36,613.70	\$41,621.53	\$38,766.54	1,046,843.83
Special appropriations	366,000.00						366,000.00
Endowments, fellowships, and other similar grants							
	192,397.32						192,397.32
Fees, sales, and miscellaneous							
	449,925.45						449,925.45
Total	\$2,133,418.07	\$56,278.64	\$61,969.69	\$36,613.70	\$41,621.53	\$38,766.54	\$2,368,668.17

EXPENDITURES 1951-52

Classification	University Farm	Branch Stations					Total
		Crookston	Morris	Grand Rapids	Duluth	Waseca	
Services and labor	\$1,348,786.70	\$67,480.29	\$68,214.14	\$33,944.67	\$38,669.48	\$62,727.77	\$1,619,823.05
Travel expenses	35,919.36	973.96	1,004.85	511.44	565.83	402.52	39,377.96
Transportation of things	5,138.97	283.46	258.19	300.38	117.54	292.21	6,390.75
Communication service	10,719.48	605.33	457.10	290.11	358.93	312.70	12,743.65
Rents and utility service	17,836.80	3,170.92	1,469.84	1,052.31	1,099.34	1,798.97	26,428.18
Printing and binding	16,156.11		190.15	88.18			16,434.44
Other contractual services	128,380.62	5,366.23	3,283.47	2,257.38	9,847.24	3,982.51	153,117.45
Supplies and materials	271,194.37	18,492.28	18,766.17	12,168.33	8,485.34	22,646.23	351,752.72
Equipment	113,708.80	3,906.69	6,961.60	2,254.13	850.00	4,955.55	132,636.77
Lands and structures (contractual)	7,931.94	333.30					8,265.24
Annuities	1,697.14						1,697.14
Balance brought forward from Bankhead-Jones fund	.82						.82
Total	\$1,957,471.11	\$100,612.46	\$100,605.51	\$52,866.93	\$59,993.70	\$97,118.46	\$2,368,668.17

EXPERIMENT STATION STAFF

The Board of Regents

THE HON. JAMES F. BELL, Minneapolis	-	-	-	-	1957
THE HON. DANIEL C. GAINNEY, Owatonna	-	-	-	-	1955
THE HON. RICHARD L. GRIGGS, Duluth	-	-	-	-	1957
THE HON. J. S. JONES, St. Paul	-	-	-	-	1953
THE HON. GEORGE W. LAWSON, St. Paul	-	-	-	-	1957
THE HON. LESTER A. MALKERSON, Minneapolis	-	-	-	-	1953
THE HON. CHARLES W. MAYO, Rochester	-	-	-	-	1953
THE HON. E. E. NOVAK, New Prague	-	-	-	-	1955
THE HON. A. J. OLSON, Renville	-	-	-	-	1955
THE HON. RAY J. QUINLIVAN, St. Cloud	-	-	-	-	1957
THE HON. HERMAN F. SKYBERG, Fisher	-	-	-	-	1955
THE HON. SHELDON V. WOOD, Minneapolis	-	-	-	-	1953

Administrative Officers

J. L. MORRILL, B.A., L.L.D., President of the University of Minnesota
 C. H. BAILEY, Ph.D., Dean, Department of Agriculture
 H. MACY, Ph.D., Director
 T. H. FENSKE, M.S., Associate Director of Agricultural Administration
 W. T. MIDDLEBROOK, A.B., M.C.S., Treasurer
 W. F. GEDDES, Ph.D., Chief, Division of Agricultural Biochemistry
 O. B. JESNESS, Ph.D., Chief, Division of Agricultural Economics
 A. J. SCHWANTES, M.S., Chief, Division of Agricultural Engineering
 H. K. HAYES, D.Sc., Chief, Division of Agronomy and Plant Genetics
 E. F. FERRIN, M.Agr., Chief, Division of Animal Husbandry
 J. B. FITCH, M.S., Chief, Division of Dairy Husbandry
 C. E. MICKEL, Ph.D., Chief, Division of Entomology and Economic Zoology
 F. H. KAUFERT, Ph.D., Director, School of Forestry
 LOUISE A. STEDMAN, Ph.D., Director, School of Home Economics
 W. H. ALDERMAN, B.S.A., Chief, Division of Horticulture; Superintendent,
 Fruit Breeding Farm, Excelsior
 E. C. STAKMAN, Ph.D., Chief, Division of Plant Pathology and Botany
 H. J. SLOAN, Ph.D., Chief, Division of Poultry Husbandry
 C. O. ROST, Ph.D., Chief, Division of Soils
 W. L. BOYD, D.V.S., Chief, Division of Veterinary Medicine
 A. C. HEINE, B.S., Superintendent, Agricultural Experiment Station,
 Rosemount
 C. L. COLE, M.S., Superintendent, North Central Experiment Station,
 Grand Rapids
 M. J. THOMPSON, M.S., Superintendent, Northeast Experiment Station,
 Duluth
 T. M. MCCALL, M.S., Superintendent, Northwest Experiment Station,
 Crookston
 R. E. HODGSON, M.S., Superintendent, Southeast Experiment Station,
 Waseca
 A. W. EDSON, M.S., Superintendent, West Central Experiment Station,
 Morris
 THORVALD SCHANTZ-HANSEN, Ph.D., Director of the Forestry and Biologi-
 cal Station, Itasca Park

H. B. SWANSON, M.S., Editor
 E. W. MCDIARMID, Ph.D., Librarian
 HARALD OSTVOLD, B.S., Agricultural Librarian

DIVISION OF AGRICULTURAL BIOCHEMISTRY

W. F. GEDDES, Ph.D., Agricultural Biochemist, Chief

Section of Colloids, Carbohydrates, and Proteins

D. R. BRIGGS, Ph.D., Agricultural Biochemist
 FRED SMITH, B.Sc., Ph.D., D.Sc., Agricultural Biochemist
 DAVID SIMINOVITCH, Ph.D., Research Fellow
 REX MONTGOMERY, Ph.D., Research Associate

Section of Cereal Technology

C. H. BAILEY, Ph.D., Agricultural Biochemist
 W. F. GEDDES, Ph.D., Agricultural Biochemist
 L. S. CUENDET, Ph.D., Assistant Agricultural Biochemist

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
 I. E. LIENER, Ph.D., Assistant Agricultural 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. W. COCHRANE, Ph.D., Agricultural Economist
 R. W. COX, Ph.D., Associate Agricultural Economist
 S. A. ENGINE, Ph.D., Associate Agricultural Economist
 TRUMAN R. NODLAND, Ph.D., Assistant Agricultural Economist
 R. P. DAHL, M.S., Assistant in Agricultural Economics
 TRAVIS R. MANNING, M.S., Research Fellow
 R. E. OLSON, M.S., Research Fellow
 W. E. MCDANIEL, M.S., Assistant in Agricultural Economics
 B. F. STANTON, M.S., Assistant in Agricultural Economics
 R. W. GRAY, M.S., Research Fellow
 V. L. SORENSON, M.S., Research Fellow
 S. F. KRAUSE, M.S., Research Fellow

DIVISION OF AGRICULTURAL ENGINEERING

A. J. SCHWANTES, M.S., Agricultural Engineer, Chief

¹ On leave June 11, 1952, to June 30, 1952
² Resigned June 30, 1951
³ Appointed July 1, 1951
⁴ On leave July 1, 1951, to September 30, 1951
⁵ Appointed August 27, 1951
⁶ Resigned August 31, 1951
⁷ Appointed September 10, 1951
⁸ Appointed August 1, 1951
⁹ Appointed May 1, 1952

Section of Farm Power and Machinery

A. J. SCHWANTES, M.S., Agricultural Engineer
 JOHN STRAIT, M.S., Associate Agricultural Engineer
 V. H. JOHNSON, M.S., Assistant Agricultural Engineer
 J. G. DENT, Assistant in Agricultural Engineering
¹⁰R. V. KEPPEL, M.S., Assistant in Agricultural Engineering

Section of Farm Structures

C. K. OTIS, M.S., Agricultural Engineer
 C. H. CHRISTOPHERSON, M.A., Associate Agricultural Engineer
¹¹A. H. BURMAN, B.S., Assistant in Agricultural Engineering
 W. F. MILLER, Ph.D., Assistant in Agricultural Engineering
¹²J. H. POMROY, B.A.E., Assistant in Agricultural Engineering

Section of Agricultural Physics and Rural Electrification

ANDREW HUSTRULID, Ph.D., Agricultural Engineer
 A. M. FLIKKE, M.S., Assistant Agricultural Engineer
 H. A. CLOUD, M.S., Assistant in Agricultural Engineering

Section of Soil and Water Conservation

P. W. MANSON, M.S., Agricultural Engineer
 E. R. ALLRED, M.S., Associate Agricultural Engineer
 C. L. LARSON, M.S., Assistant in Agricultural Engineering

Section of Land Clearing

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

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

¹³R. E. LARSON, B.A.E., Assistant Agricultural Engineer

DIVISION OF AGRONOMY AND PLANT GENETICS

¹⁴H. K. HAYES, D.Sc., Agronomist and Plant Geneticist, Chief
 C. H. BURNHAM, Ph.D., Agronomist and Plant Geneticist
 R. S. DUNHAM, M.S., Agronomist and Plant Geneticist
¹⁵E. H. RINKE, Ph.D., Agronomist and Plant Geneticist
 CARL BORGESON, M.S., Associate Agronomist and Associate Plant Geneticist
 R. F. CRIM, B.S., Associate Agronomist and Associate Plant Geneticist
 J. W. LAMBERT, Ph.D., Associate Agronomist and Associate Plant Geneticist
 A. R. SCHMID, Ph.D., Associate Agronomist and Associate Plant Geneticist
 H. L. THOMAS, Ph.D., Associate Agronomist and Associate Plant Geneticist
 E. L. PINNELL, Ph.D., Assistant Agronomist and Assistant Plant Geneticist
 R. G. ROBINSON, Ph.D., Assistant Agronomist and Assistant Plant Geneticist

¹⁰ Appointed July 1, 1951

¹¹ On leave July 1, 1951, to July 7, 1951

Resigned January 14, 1952

¹² Appointed January 1, 1952

¹³ Resigned May 1, 1952

¹⁴ Retired June 30, 1952

¹⁵ On leave April 16, 1952, to June 30, 1952

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

R. E. AUSEMUS, Ph.D., Agronomist
 J. O. CULBERTSON, Ph.D., Agronomist
 J. H. MILLER, M.S., Assistant Agronomist
¹⁶L. J. ELLING, Ph.D., Research Associate
¹⁷KEH-SHING-KOO, Ph.D., Research Fellow
¹⁸KUAN-JEN HSU, Ph.D., Research Fellow

DIVISION OF ANIMAL HUSBANDRY

E. F. FERRIN, M.Agr., Animal Husbandman, Chief
 A. L. HARVEY, Ph.D., Animal Husbandman
 P. A. ANDERSON, B.S., Associate Animal Husbandman
 R. M. ANDERSON, Ph.D., Assistant Animal Husbandman
 W. J. AUNAN, Ph.D., Assistant Animal Husbandman

Section of Animal Feeding

L. E. HANSON, Ph.D., Animal Husbandman

Section of Animal Breeding

L. M. WINTERS, Ph.D., Animal Husbandman
 J. N. CUMMINGS, Ph.D., Associate Animal Husbandman
 W. E. KEMPEL, M.S., Assistant in Animal Husbandry
 R. E. ROUFS, 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
 T. W. GULLICKSON, Ph.D., Dairy Husbandman
¹⁹W. E. PETERSEN, Ph.D., Dairy Husbandman
 M. C. HERVEY, Ph.D., Associate Dairy Husbandman
²⁰L. S. MIX, B.S., Research Fellow
²¹H. W. THOELE, M.S., Assistant in Dairy Husbandry

Section of Dairy Products

W. B. COMBS, M.A., Dairy Husbandman
 S. T. COULTER, Ph.D., Dairy Husbandman
 H. A. HARLAND, Ph.D., Research Associate
 E. L. THOMAS, Ph.D., Assistant Dairy Husbandman
 H. A. MORRIS, M.S., Assistant in Dairy Husbandry
 A. W. RUDNICK, JR., M.S., Assistant in Dairy Husbandry
²²ALAN THOMAS, M.S., Assistant in Dairy Husbandry

¹⁶ Appointed July 1, 1951

¹⁷ Appointed July 1, 1951

¹⁸ Appointed July 1, 1951

¹⁹ On leave May 26, 1952, to June 9, 1952

²⁰ Resigned May 31, 1952

²¹ Appointed July 1, 1951

²² Appointed August 1, 1951

Section of Dairy Bacteriology

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

DIVISION OF ENTOMOLOGY AND ECONOMIC ZOOLOGY

C. E. MICKEL, Ph.D., Entomologist, Chief
²³A. A. GRANOVSKY, Ph.D., Entomologist
 A. C. HODSON, Ph.D., Entomologist
²⁴W. H. MARSHALL, Ph.D., Zoologist
 A. G. RICHARDS, Ph.D., Entomologist
 H. J. GRIFFITHS, Ph.D., Associate Zoologist
 M. H. HAYDAK, Ph.D., Associate Apiculturist
 L. L. SMITH, JR., Ph.D., Associate Zoologist
 T. L. AAMODT, B.S., Assistant Entomologist
 JAMES R. BEER, Ph.D., Assistant Zoologist
²⁵A. L. BURROUGHS, Ph.D., Assistant Entomologist
 L. K. CUTKOMP, Ph.D., Assistant Entomologist
 T. A. GOCHNAUER, Ph.D., Research Associate
 A. G. PETERSON, Ph.D., Research Associate
²⁶A. R. BARR, Ph.D., Assistant in Entomology
 H. C. CHIANG, Ph.D., Research Fellow
 E. F. COOK, Ph.D., Assistant in Entomology
²⁷THORKIL JENSEN, M.S., Research Fellow
²⁸R. L. FISCHER, Ph.D., Research Fellow
²⁹B. A. HAWS, M.S., Research Fellow

SCHOOL OF FORESTRY

F. H. KAUFERT, Ph.D., Forester, Director
³⁰J. H. ALLISON, Ph.B., M.F., Forester
 THORVALD SCHANTZ-HANSEN, Ph.D., Forester; Director, Lake Itasca Forestry and Biological Station
³¹HENRY 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
³²A. E. SCHNEIDER, M.A., Associate Forester
 S. H. SPURR, Ph.D., Associate Forester
 J. R. NEETZEL, M.F., Research Associate
 D. P. DUNCAN, Ph.D., Assistant Forester
 O. F. HALL, M.F., Assistant in Forestry
 A. K. KEMP, M.F., Assistant in Forestry
³³M. P. MEYER, M.F., Assistant in Forestry

²³ On leave November 16, 1951, to December 31, 1951

²⁴ On leave October 1, 1951, to June 30, 1952

²⁵ Resigned September 15, 1951

²⁶ Appointed June 1, 1952

²⁷ Resigned June 30, 1952

²⁸ Appointed July 16, 1951

²⁹ Appointed January 1, 1952

³⁰ Retired June 30, 1952

³¹ Resigned June 30, 1952

³² On leave October 15, 1951, to June 30, 1952

³³ Appointed June 15, 1952

SCHOOL OF HOME ECONOMICS

³⁴LOUISE A. STEDMAN, Ph.D., Professor and Director
 ALICE BIESTER, A.M., Home Economist
 JANE M. LEICHSENRRING, Ph.D., Home Economist
 ISABEL NOBLE, Ph.D., Home Economist
 ETHEL PHELPS, M.S., Home Economist
³⁵DOROTHY F. SIMMONS, M.S., Associate Home Economist

DIVISION OF HORTICULTURE

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

Section of Pomology

W. G. BRIERLEY, Ph.D., Horticulturist
³⁶B. 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., Associate Horticulturist

Section of Floriculture and Ornamental Horticulture

R. A. PHILLIPS, M.S., Assistant Horticulturist
 R. E. WIDMER, M.S., Assistant in Horticulture

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

³⁷ROLAND C. BLAKE, Special Agent

³⁸KENNETH W. HANSON, Special Agent

FLORIAN I. LAUER, Special Agent

DIVISION OF PLANT PATHOLOGY AND BOTANY

³⁹E. C. STAKMAN, Ph.D., Plant Pathologist and Botanist, Chief
 J. J. CHRISTENSEN, Ph.D., Plant Pathologist, Acting Chief
 C. M. CHRISTENSEN, Ph.D., Plant Pathologist
 C. J. EIDE, Ph.D., Plant Pathologist
 HELEN HART, Ph.D., Plant Pathologist
 M. F. KERNKAMP, Ph.D., Associate Plant Pathologist
 T. H. KING, Ph.D., Associate Plant Pathologist

³⁴ Appointed July 1, 1951

³⁵ On leave April 14, 1952, to May 3, 1952

³⁶ Resigned December 31, 1951

³⁷ Appointed July 2, 1951

³⁸ Resigned September 30, 1951

³⁹ On leave March 30, 1952, to April 12, 1952

L. T. DOSDALL, Ph.D., Assistant Plant Pathologist
 R. H. LANDON, Ph.D., Assistant Plant Physiologist
 A. H. LARSON, B.S., Assistant Botanist
 JOHN B. ROWELL, Ph.D., Research Associate
 DAVID W. FRENCH, M.F., Assistant in Plant Pathology
 H. G. HEGGENESS, M.S., Assistant in Plant Pathology
 M. B. MOORE, M.S., Assistant in Plant Pathology
 *JAMES BROYLES, M.S., Research Fellow
 *EDWARD BUTLER, M.S., Research Fellow
 *JAMES DEVAY, B.S., Research Fellow

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
 *C. B. HAYDEN, B.S., 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
 DONALD M. STEWART, B.S., Pathologist

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

A. G. TOLASS, 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
 R. N. SHOFFNER, Ph.D., Associate Poultry Husbandman
 *M. H. SWANSON, Ph.D., Assistant Poultry Husbandman

DIVISION OF SOILS

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

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

I. J. NYGARD, Ph.D., Senior Soil Scientist and Correlator
 ROUSE S. FARNHAM, Ph.D., Research Fellow

*⁴⁰ Appointed January 1, 1952
 *⁴¹ Appointed July 1, 1951
 *⁴² Appointed July 1, 1951
 *⁴³ Appointed December 21, 1951
 *⁴⁴ Appointed April 1, 1952

Soil Conservation Service

ALEX ROBERTSON, B.S., Collaborator Soil Scientist

DIVISION OF VETERINARY MEDICINE

*⁴⁵W. L. BOYD, D.V.S., Veterinarian, Chief
 J. N. CAMPBELL, D.V.S., Veterinarian
 REUEL FENSTERMACHER, D.V.M., Pathologist
 *⁴⁶ALLAN 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
 H. J. GRIFFITHS, D.V.M., Ph.D., Associate Animal Parasitologist
 H. H. HOYT, D.V.M., Ph.D., Associate Veterinarian
 R. L. KITCHELL, D.V.M., Ph.D., Associate Veterinarian
 G. W. MATHER, D.V.M., Ph.D., Associate Veterinarian
 R. A. MERRILL, D.V.M., Associate Veterinarian
 J. H. SAUTTER, D.V.M., Ph.D., Associate Veterinarian
 A. F. SELLERS, D.V.M., Ph.D., Associate Veterinarian
 A. F. WEBER, D.V.M., Ph.D., Associate Veterinarian
 D. E. BARTLETT, D.V.M., Assistant in Veterinary Medicine
 J. P. ARNOLD, D.V.M., Assistant in Veterinary Medicine
 *⁴⁷J. R. BERGGREN, D.V.M., Assistant in Veterinary Medicine
 E. N. BERGMAN, B.S., Assistant in Veterinary Medicine
 *⁴⁸R. W. BROWN, V. M. D., B. S., Research Fellow
 *⁴⁹D. H. CLIFFORD, D.V.M., Assistant in Veterinary Medicine
 *⁵⁰H. E. DZIUK, B.S., Assistant in Veterinary Medicine
 *⁵¹R. B. ENGLAND, D.V.M., B.S.A., Assistant in Veterinary Medicine
 *⁵²A. L. GOOD, D.V.M., M.S., Assistant in Veterinary Medicine
 *⁵³P. B. HAMMOND, D.V.M., Assistant in Veterinary Medicine
 *⁵⁴F. C. HENEMAN, B.A., Research Fellow
 J. F. HENRY, B.S., D.V.M., Assistant in Veterinary Medicine
 W. R. HESS, B.A., M.S., Research Fellow
 *⁵⁵F. E. HILTON, B.S., D.V.M., Assistant in Veterinary Medicine
 *⁵⁶THORKILL JENSEN, B.A., M.S., Research Fellow
 *⁵⁷L. L. LARSON, B.S., Assistant in Veterinary Medicine
 *⁵⁸R. M. LEARY, D.V.M., Assistant in Veterinary Medicine
 D. G. LOW, D.V.M., Assistant in Veterinary Medicine
 *⁵⁹A. J. LUEDKE, B.S., Assistant in Veterinary Medicine
 *⁶⁰W. A. MALMQUIST, D.V.M., Assistant in Veterinary Medicine

*⁴⁵ Retired June 30, 1952
 *⁴⁶ Resigned August 31, 1951
 *⁴⁷ Appointed November 1, 1951
 Resigned December 15, 1951
 *⁴⁸ Resigned September 30, 1951
 *⁴⁹ Appointed April 1, 1952
 *⁵⁰ Appointed July 1, 1951
 *⁵¹ Resigned October 31, 1951
 *⁵² Appointed August 1, 1951
 *⁵³ Appointed October 1, 1951
 *⁵⁴ Resigned September 15, 1951
 *⁵⁵ Appointed June 16, 1952
 *⁵⁶ Resigned June 30, 1952
 *⁵⁷ On leave July 1, 1951, to September 15, 1951
 *⁵⁸ Resigned June 30, 1952
 *⁵⁹ Appointed October 16, 1951
 Resigned June 30, 1952
 *⁶⁰ Resigned April 7, 1952

K. F. MOIST, B.S., D.V.M., Assistant in Veterinary Medicine
⁶¹J. E. MOULTON, B.S., D.V.M., Assistant in Veterinary Medicine
⁶²G. G. NAHAS, B.A., M.D., M.S., Assistant in Veterinary Medicine
 W. R. PRITCHARD, D.V.M., Assistant in Veterinary Medicine
⁶³J. E. ROSE, B.S., Research Assistant
⁶⁴H. C. ROWSELL, D.V.M., Research Fellow
⁶⁵FRANK SAUER, D.V.M., Research Assistant
 F. A. SPURRELL, D.V.M., B.S., Assistant in Veterinary Medicine
⁶⁶DAVID STANLEY, D.V.M., Assistant in Veterinary Medicine
⁶⁷C. E. STEVENS, B.S., Assistant in Veterinary Medicine
 C. M. STOWE, B.S., D.V.M., Assistant in Veterinary Medicine
⁶⁸H. L. STRANDBERG, B.S., Assistant in Veterinary Medicine
⁶⁹C. C. TURBES, D.V.M., M.S., Assistant in Veterinary Medicine
⁷⁰RAIMUNDS, ZEMJANIS, D.V.M., Assistant in Veterinary Medicine

RURAL SOCIOLOGY

LOWRY NELSON, Ph.D., Rural Sociologist
⁷¹DOUGLAS G. MARSHALL, Ph.D., Associate Rural Sociologist

AGRICULTURAL EXPERIMENT STATION—ROSEMOUNT

A. C. Heine, B.S., Superintendent

NORTH CENTRAL EXPERIMENT STATION

C. L. COLE, M.S., Superintendent
 R. B. AAKRE, B.S., Assistant Agricultural Engineer
 C. H. GRIFFITH, M.S., Assistant Agronomist
 K. P. MILLER, M.S., Assistant Animal Husbandman

NORTHEAST EXPERIMENT STATION

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

NORTHWEST EXPERIMENT STATION

T. M. McCALL, M.S., Superintendent
 O. C. SOINE, Ph.D., Associate Agronomist
⁷²O. M. KISER, M.S., Associate Animal Husbandman
 B. C. BERESFORD, M.S., Assistant Horticulturist
 A. M. FOKER, Assistant Agricultural Engineer
 H. W. SODERBURG, M.A., Assistant Agricultural Engineer
⁷³H. D. FAUSCH, M.S., Assistant in Animal Husbandry
 A. M. PILKEY, Assistant in Poultry Husbandry

⁶¹ Appointed October 1, 1951

Resigned May 31, 1952

⁶² Resigned April 1, 1952

⁶³ Appointed July 1, 1951

⁶⁴ Appointed October 1, 1951

⁶⁵ Appointed October 3, 1951

⁶⁶ Appointed March 16, 1952

Resigned June 15, 1952

⁶⁷ Appointed October 16, 1951

Resigned June 30, 1952

⁶⁸ Appointed September 16, 1951

Resigned September 30, 1951

⁷⁰ Appointed April 1, 1952

⁷¹ Resigned June 15, 1952

⁷² Resigned June 30, 1952

⁷³ On leave September 16, 1951, to June 15, 1952

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, M.S., Assistant Poultry Husbandman and Assistant Superintendent
 B. E. YOUNGQUIST, B.A., Assistant Agricultural Engineer
 L. K. LINDOR, B.S., Assistant Agricultural Engineer
 W. H. GRAY, B.S., Assistant in Horticulture

PUBLICATIONS

HAROLD B. SWANSON, M.S., Editor
 JOSEPHINE B. NELSON, M.A., Instructor and Extension Assistant Editor
 ROBERT P. RAUSTADT, B.A., Instructor and Extension Information Specialist
 MARGARET NIELSEN, B.A., Assistant to Editor, Agricultural Bulletins