

SIXTY-SIXTH ANNUAL REPORT

Agricultural Experiment Station
University of Minnesota

JULY 1, 1958 TO JUNE 30, 1959



UNIVERSITY OF MINNESOTA

ST. PAUL CAMPUS

LETTERS OF TRANSMITTAL

University of Minnesota, Minneapolis, Minn.

July 1, 1959

*To His Excellency, Orville Freeman,
Governor of Minnesota.*

Sir: I have the honor to transmit to you herewith the report of the Agricultural Experiment Station of the University of Minnesota for the fiscal year ending June 30, 1959.

Respectfully transmitted,

J. L. MORRILL,
President of the Board of Regents

University of Minnesota, Minneapolis, Minn.

July 1, 1959

*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, 1959.

Respectfully transmitted,

J. L. MORRILL,
President of the University of Minnesota

University of Minnesota, St. Paul

July 1, 1959

*J. 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, 1959.

Respectfully transmitted,

H. J. SLOAN, *Director*

SIXTY-SIXTH ANNUAL REPORT

July 1, 1958 to June 30, 1959

H. J. Sloan, Director

M. F. Kernkamp, Assistant Director

FOREWORD

THE EXPERIMENT STATION continues to readjust its program in accordance with the changing needs in agriculture and the facilities provided from time to time. Some projects have been terminated and a few new projects initiated. The physical plant now includes new buildings and a number have been remodeled. The new buildings provided by the 1957 Legislature are discussed for the most part in the Annual Report for 1957-58. The Department of Soils moved into the new Soils Science building in September, 1958.

A significant change for soils and crops research came through the actual purchase of land near Lamberton, Minnesota, for the establishment of a soils and crops station. This farm consists of 240 acres, about 3 miles from Lamberton, and was chosen after a careful survey of a number of farms that were representative of the soil and climatic conditions in the southwestern fourteen counties of the state. It is expected that research work will begin in the fall of 1959.

Another significant addition was the purchase of a commercial greenhouse near the St. Paul Campus and contiguous with University property. This provides approximately 23,000 square feet of additional greenhouse space which represents an important addition for the Departments of Plant Pathology, Agronomy, Entomology, Forestry, Horticulture, and Soils. The School of Pharmacy is also occupying part of this space.

The Arboretum, near the Fruit Breeding Farm near Excelsior, was dedicated in the fall of 1958; and in the spring of 1959, the first major plantings were made. This area will be in the developmental stage for a number of years as experimental and demonstration plots are designed and established.

A new addition at the Grand Rapids Station was the construction of a Forestry Research Laboratory by the Lake States Forest Experiment Station. While this is a Federal facility, it will add

significantly to the work in forest research in the northern area of the state and the work will be in part cooperative with the Agricultural Experiment Station.

The 1957 Legislature made provision for modest salary increases beginning July 1, 1958, and these as usual were helpful in making it possible to maintain a research and teaching staff of preëminence. There was also a modest increase in the General Agricultural Research Fund and also Federal Hatch Funds, but no increase for Rosemount. The increase in General Agricultural Research Funds was hardly more than enough to take care of increased salaries paid from these funds and increased costs of materials used. The same was true for the Hatch Funds. As a consequence, the research program could not be expanded.

Short term leaves are becoming a rather common means of providing an opportunity for research personnel to broaden their experience in their respective fields. In most cases these are leaves for study in foreign research laboratories and there is ample evidence that these experiences have proved very helpful and stimulating. It is hoped that this program can be expanded.

The various station days continue to provide an important means of getting current information to the agricultural people. It is an opportunity for the farmers to see first hand the results of research projects and also an opportunity to discuss any particular problems with specialists.

The work in the various departments continues to be productive, and important information is coming from all fields of our research activity. One of the major findings in the Department of Agricultural Economics is that a large proportion of grain is now being transported by truck both within and to destinations outside the state. This has important implications so far as the marketing system for the grain-producing areas of the west is concerned. The work on the project on the possibilities of easing the surplus problem by expanding the consumption of surplus crops does not show very great possibilities. From the standpoint of human consumption, most of the products are relatively inelastic in demand, and programs which would increase food-purchasing power or increase total income did not seem to lend much hope for appreciable increase in consumption of surplus crops.

In the Department of Animal Husbandry breeding has long been an important phase of the work. In the early days, the emphasis was on the development of superior inbred lines of swine

for crossing, but recently the emphasis has been shifted to more fundamental work on how to best use various genetic combinations. In connection with feeding, there has been some evidence that the use of either fed or implanted stilbestrol, insofar as the carcasses are concerned, did result in some improvement in such things as weight, grade, fat content, marbling, and loin-eye area. Stilbestrol implants did not increase live-weight gains in lambs.

It appears from work in the Department of Biochemistry that the growth-promoting property of butterfat as compared to some other oils is due to a particular glyceride which is apparently not present in certain other types of fats or oils. The work on the utilization of carbohydrates suggests that valuable industrial products may soon be possible from the appropriate chemical treatments of certain types of plant starch. These are gums that have important industrial use.

The cooperative research in dairy cattle breeding with the United States Department of Agriculture has resulted in the transfer of the Shorthorn herd of the USDA, Beltsville, Maryland, to the Department of Dairy Husbandry at Rosemount. This will make possible a new area of research in breeding. This work will be cooperative with Animal Husbandry in measuring the carcass quality of animals from this herd and from crosses with other breeds. The work in artificial insemination is centered in the Department of Dairy Husbandry. The new interest in artificial insemination in swine is being carried on in this department. This is an example of the crossing of departmental lines to solve fundamental problems of biology, a practice which is becoming more common in our research work. The work on the transfer of ova from bred cows to those that have been artificially prepared for ova implantation by appropriate hormonal treatment has been successful.

A new dryer has been developed which improves both non-fat dry milk and the spray drier whole milk. The new process gives a whole milk of much greater dispersibility than previous methods. In working with cottage cheese, it was found that cartons with foil surfaces maintained a more even temperature and thus helped to prevent spoilage in the cottage cheese.

Work in the School of Home Economics has demonstrated that the breaking strength of the fibers in denim jeans is considerably reduced by washing. Heavier material was stronger, but the rate of weakening was about the same as in lighter weight materials. It has also been found that the protein needs of young women of

college age may be met by a level of 44 grams of protein per day. Some of this should be from animal sources. It was also found that ascorbic acid in the diet helped the utilization of calcium, but not the utilization of phosphorus.

In the Department of Poultry Husbandry, it has been found that darkening the environment prior to the conventional 15-hour lighting program will bring layers into production as early as 6 months of age. In the determination of factors affecting the maintenance of interior quality in eggs, it was found that the albumen and total nitrogen content was higher in high quality eggs than low quality eggs. However, there was great variation which makes it difficult to use this as a measure of quality. The work in the physiology of the fowl is getting well underway. The first work has to do with the response of the fowl to its environment, particularly temperature. These studies will eventually contribute to the information needed for better housing and management of birds. In the preservation of eggs in market channels it was found that the simple spraying of the large ends of the eggs as packed in the conventional flat is an effective way to preserve quality. This can be done on the farm, and thereby stop the quality loss soon after the eggs are laid.

In the College of Veterinary Medicine, the research on poultry diseases has continued to provide significant information toward the control of respiratory diseases in particular. It has been found that ornithosis is rather widespread in turkey flocks and free-flying birds such as pigeons and wild wood ducks. These species have shown positive titers to the direct complement fixation test for this disease. A technique has been developed for testing for vibriosis. This is an adaptation of the fluorescent antibody technique and has been found quite useful in identifying infected animals.

In work with pilot silos in testing for the production of nitrogen dioxide gas, poisonous to humans, it was found that oats and alfalfa treated with sodium metabisulfite as a preservative results in no production of the poisonous gas. When molasses was added, gas was produced. Corncobs and kernels produce practically no nitrogen dioxide, whereas stalks and leaves produce it in quantity. In a study of methods to find a simplified method of determining water tables, an electrical resistivity meter has been developed which determines ground level within 1 foot of the table as observed by an auger.

Studies of the nature of the resistance in wheat to the race 15B of rust indicate that the inheritance is relatively complex. A study of the segregating materials in these tests suggests that it may be possible to separate the different components of the infection. It has been found that irradiated lines may behave differently in respect to resistance to race 15B. The resistant lines that have been produced may be useful in future crosses for resistance.

Resistance may also be developed in certain plants against insects as well as disease. Some clones of sweet clover have been found in work in the Department of Entomology which are relatively resistant to sweet clover aphid. Two clones have also shown some resistance to sweet clover weevil. The first adult potato leaf-hoppers for the year were found in Minnesota in the spring of 1958. By June these had been found as far north as Roseau County. This invasion seems to accompany warm air movements from the south. This is the experience found previously. It is believed that the dry weather and cool air during the spring helped to lower the leaf-hopper populations. Important light was also shed on the problem of molds in stored grain when it was found that grain infested with grain mites becomes moldy more rapidly than the infested controls. The mites feed on the molds, but are quite selective when given molds of different types. It was shown that mites are even attracted by mold odors.

In determining the cause of deformities in jack pine lumber during seasoning, it was found that this difficulty was associated primarily with the presence of compression wood. These are zones around large knots and they are associated with "twist" and other local deformities. In other work on the study of the use of low quality aspens, it has been found that glued aspen strips when used to reinforce corrugated paper make a suitable fabrication. A lightweight glued shipping pallet of aspen, birch, or ash has also been shown to be commercially feasible.

In work on the resistance of potatoes to common and russet scab, it was found that resistance to one was not necessarily associated with resistance to the other. Several clones were apparently susceptible to the common field race of late blight, but were immune to some specialized races, a response which was not expected. The Department of Horticulture introduced two new varieties of chrysanthemums, the Tonka and the Prairie Moon, and one new variety of strawberry, the Earlimore. The revenue resulting from the introduction of new varieties under the program worked out in cooperation with the Minnesota Nurserymen's Re-

search Committee is beginning to represent considerable income. A new defoliant, ethylene dipyridylium dibromide, was found to be more effective in killing potato vines than five other defoliantes tested. It did not cause stem end discoloration of the tubers. Gibberellic acid also reduced the rest period of potatoes by 7 to 14 days, but the plants from such treated tubers were spindly with weak stems and had smaller leaves than plants from untreated tubers.

In the Department of Plant Pathology and Botany, an apparatus has been designed to study the effect of root excretions from one plant on itself or on other plants. In these studies it was found that oat root solutions reduced top growth of alfalfa by more than 35 percent while there was no inhibitory effect of alfalfa on oats. There was some effect on other combinations, but these were less striking. Nematodes have recently come into prominence as pests to agricultural crops in Minnesota. Five of the six most important genera of nematodes have been found to be more prevalent in Minnesota fields than in Maryland. One hundred and two plant varieties tested out of 132 were hosts for the most frequently occurring spiral nematode.

Studies in the Department of Soils show that in a longtime stand of alfalfa the unfertilized and phosphate-alone plots were becoming more sparse after 8 years, whereas alfalfa fertilized with phosphate and potash were much better. Spring fertilization continues to give better results. Tests on the use of potassium on corn demonstrated that the solubility of potassium phosphates was not an important factor in field plots of corn or barley grown in sand cultures in the greenhouse. In studies on soil structure and the effects of compaction, it was found that surface packing greatly reduced the yield of Early Gem and Pontiac potatoes, as well as sugar beets. There was also some decrease in wheat yields. On plots receiving high fertilizer rates the plants that emerged on the same day matured later on the plots that had been packed.

During this year all projects were reviewed, from their inception to the present. Subsequent discussions with the department heads have resulted in a more critical appraisal of the work underway, with the result that several projects were closed and several revised. These reviews will continue so that the work can be kept productive and current.

CHANGES IN STAFF

Appointments

C. E. Ahlgren, M.S., research associate, School of Forestry (Detailed by Quetico-Superior Wilderness Research), September 1, 1958.

F. A. Ahrens, D.V.M., instructor, College of Veterinary Medicine, June 16, 1959.

N. A. Anderson, M.S., instructor, Department of Plant Pathology and Botany, April 1, 1959.

A. L. Aronson, D.V.M., M.S., research fellow, College of Veterinary Medicine, November 15, 1958.

Richard Behrens, Ph.D., associate professor, Department of Agronomy and Plant Genetics, July 1, 1958.

Oswald P. Blach, M.S., research fellow, Department of Agricultural Economics, July 16, 1958.

Joan P. Cassilly, M.S., instructor, School of Home Economics, September 16, 1958.

W. F. Cates, D.V.M., instructor, College of Veterinary Medicine, September 1, 1958.

L. M. Day, Ph.D., associate professor, Department of Agricultural Economics, January 1, 1959, Agricultural Economist, USDA.

Norbert A. Dorow, M.S., instructor, Department of Agricultural Economics, August 1, 1958.

R. E. Engel, D.V.M., research fellow, College of Veterinary Medicine, October 20, 1958.

W. N. Garrett, M.S., research fellow, Department of Plant Pathology and Botany, May 1, 1959.

G. W. Gullion, M.A., research fellow, Department of Entomology and Economic Zoology, July 15, 1958.

Dale O. Gustafson, M.S., research fellow, Department of Agricultural Economics, March 1, 1959.

D. D. Hagen, D.V.M., research fellow, College of Veterinary Medicine, September 8, 1958.

Lee F. Hermsmeier, M.S., research fellow, Department of Agricultural Engineering, September, 1958, Agricultural Engineer, USDA.

C. V. Hess, Ph.D., associate professor, Department of Agricultural Economics, March 1, 1959.

Mary J. Hitchcock, M.S., assistant professor, School of Home Economics, September 1, 1958.

Paul H. Hoepner, M.S., instructor, Department of Agricultural Economics, July 1, 1958.

R. F. Holt, Ph.D., research associate, Department of Soils, July 1, 1958, Soils Scientist, USDA.

D. D. Joel, D.V.M., instructor, College of Veterinary Medicine, July 1, 1958.

J. J. Kupa, M.S., research fellow, Department of Entomology and Economic Zoology, July 1, 1958.

C. T. Larsen, D.V.M., instructor, College of Veterinary Medicine, November 16, 1958.

Lura M. Morse, Ph.D., associate professor, School of Home Economics, August 1, 1958.

Robert Mullin, M.S., research fellow, Department of Horticulture, April 16, 1959.

J. H. Ohman, M.S., research fellow, Department of Plant Pathology and Botany, October 1, 1958.

Valborg E. Rishoi, B.S., instructor, School of Home Economics, September 16, 1958.

J. V. Scaletti, Ph.D., assistant professor, Department of Animal Husbandry, July 1, 1958.

D. L. Sime, D.V.M., instructor, College of Veterinary Medicine, June 16, 1959.

D. C. Snetsinger, Ph.D., assistant professor, Department of Poultry Husbandry, March 16, 1959.

F. W. Stehr, M.S., research fellow, Department of Entomology and Economic Zoology, July 1, 1958.

A. C. Strafuss, D.V.M., M.S., research fellow, College of Veterinary Medicine, January 1, 1959.

T. W. Sudia, Ph.D., research fellow, Department of Plant Pathology and Botany, October 1, 1958.

M. L. Taylor, Ph.D., instructor, Rural Sociology, July 16, 1958.

O. C. Turnquist, Ph.D., professor, Department of Horticulture, January 1, 1959.

C. A. Van Doren, Ph.D., professor, Department of Soils, July 1, 1958, Soil Scientist, USDA.

Chi-Wu Wang, Ph.D., research associate, School of Forestry, September 1, 1958.

Promotions

R. I. Beazley, Ph.D., associate professor, School of Forestry, July 1, 1958.

B. A. Brown, Ph.D., assistant professor, School of Forestry, September 1, 1958.

R. E. Burger, Ph.D., assistant professor, Department of Poultry Husbandry, July 1, 1958.

A. M. Flikke, M.S., associate professor, Department of Agricultural Engineering, July 1, 1958.

E. F. Graham, Ph.D., associate professor, Department of Dairy Husbandry, July 1, 1958.

H. L. Hansen, Ph.D., professor, School of Forestry, July 1, 1958.

F. I. Lauer, Ph.D., assistant professor, Department of Horticulture, January 16, 1959.

M. P. Meyer, Ph.D., associate professor, School of Forestry, July 1, 1958.

Cherng-Jiann Shius, Ph.D., assistant professor, School of Forestry, July 1, 1958.

R. A. Skok, M.F., instructor, School of Forestry, July 1, 1958.

M. J. Taves, Ph.D., associate professor, Rural Sociology, July 1, 1958.

W. B. Wallin, Ph.D., assistant professor, School of Forestry, July 1, 1958.

R. E. Widmer, Ph.D., associate professor, Department of Horticulture, July 1, 1958.

Resignations

Lila M. Benrud, B.S., instructor, School of Home Economics, June 15, 1958, to reside in Oregon.

Madeline Burleigh, M.A., assistant professor, School of Home Economics, June 30, 1958, to manage School Lunch Program in Pennsylvania.

J. N. Cummings, Ph.D., associate professor, Department of Animal Husbandry, October 31, 1958, to accept position in Beirut, Lebanon.

W. H. Davis, Ph.D., research fellow, Department of Entomology and Economic Zoology, June 30, 1958, to accept position at Middlebury College, Middlebury, Vermont.

K. E. Egertson, M.S., instructor, Department of Agricultural Economics, June 30, 1958, to Agricultural Extension.

A. H. Ellingboe, Ph.D., research fellow, Department of Plant Pathology and Botany, December 31, 1958, to accept a position at Harvard University, Cambridge, Massachusetts.

R. L. Eng, Ph.D., research fellow, Department of Entomology and Economic Zoology, August 15, 1958, to accept position with Montana Fish and Game Department.

Evelyn M. Franklin, M.S., instructor, School of Home Economics, June 15, 1959, to reside in Winnipeg, Manitoba, Canada.

Lyle J. Hanson, D.V.M., B.S., instructor, College of Veterinary Medicine, September 30, 1958, to go into private practice in Windom, Minnesota.

Robert Hanson, Ph.D., instructor, West Central Experiment Station, June 1, 1959, to accept duties as Registrar and Director of Admissions at Moorhead State College, Moorhead, Minnesota.

P. E. Hunter, Ph.D., research fellow, Department of Entomology and Economic Zoology, February 14, 1959, to accept position at University of Georgia, Athens, Georgia.

P. N. Knorr, M.S., instructor, School of Forestry, May 15, 1959, to accept professorship at University of Arizona.

Helmi Koivisto, Ph.D., assistant professor, School of Home Economics, June 15, 1959, to accept a teaching position in Robbinsdale, Minnesota.

V. M. Meyer, M.S., research associate, Department of Agricultural Engineering, September 30, 1958, to accept position as Extension Engineer at Iowa State College, Ames, Iowa.

M. N. Nixon, B.S., instructor, Department of Agricultural Engineering, June 15, 1959, to accept a position in actuarial work.

Valborg E. Rishoi, B.S., instructor, School of Home Economics, June 15, 1959, unknown.

R. M. Schwartzman, D.V.M., instructor, College of Veterinary Medicine, June 30, 1959, to accept position at University of Pennsylvania.

Margaret Taulbee, M.S., instructor, School of Home Economics, June 15, 1958, to reside in Georgia.

H. D. Thurston, Ph.D., research fellow, Department of Plant Pathology and Botany, September 30, 1958, to accept a position with Rockefeller Foundation in Bogota, Colombia, South America.

J. T. Tumlin, D.V.M., M.S., instructor, College of Veterinary Medicine, September 30, 1958, to accept position as associate professor at University of Georgia, Athens, Georgia.

Leaves of Absence

R. I. Beazley, Ph.D., associate professor, School of Forestry, May 16 to September 30, 1958, on leave to serve as Forest Economist with FAO in Thailand.

S. O. Berg, Ph.D., professor and head, Department of Agricultural Economics, July 29, to September 26, 1958, on leave to visit Seoul National University, Korea, and to participate in the International Conference of Agricultural Economists at Mysore, India.

W. W. Cochrane, Ph.D., professor, Department of Agricultural Economics, September 16, 1958, to June 30, 1959, on leave to accept position as visiting professor at the University of Chicago.

S. A. Engene, Ph.D., professor, Department of Agricultural Economics, July 2 to September 27, 1958, on leave to participate in Farm Management Research Institute at University of Hokkaido, Sapporo, Japan; to attend the International Conference of Agricultural Economists at Mysore, India; and to visit universities and research institutes in the Scandinavian countries and Great Britain.

A. L. Harvey, Ph.D., professor, Department of Animal Husbandry, January 1 to March 28, 1959, on leave to observe and study performance testing of beef cattle in the southwestern states.

Robert Jenness, Ph.D., professor, Department of Agricultural Biochemistry, September 16 to December 14, 1958, on leave to do research at the Eastern Regional Research Laboratory at Philadelphia, Pennsylvania.

L. K. Lindor, M.S., assistant professor, West Central Experiment Station, September 29, 1958, to June 30, 1959, on leave to attend graduate school.

William Matalmaki, M.S., assistant professor and superintendent, North Central Experiment Station, July 1 to September 30, 1958, on leave to further his education at University of Wisconsin.

Victor Perman, D.V.M., B.S., instructor, College of Veterinary Medicine, August 1, 1958, to September 1, 1959, to do special work on radioactive isotopes and radiobiology at the Brookhaven National Laboratories, Upton, Long Island, New York.

P. M. Raup, Ph.D., professor, Department of Agricultural Economics, August 18 to October 17, 1958, to participate in the Minnesota Faculty Seminar in the USSR.

A. G. Richards, Ph.D., professor, Department of Entomology and Economic Zoology, July 1 to September 30, 1958, to participate in research at the Max Planck Institute fur Biologie in Tubingen, Germany.

A. E. Schneider, Ph.D., professor, School of Forestry, July 1, 1958 to June 30, 1959, to serve as Coordinator of the Korean Co-operative Project.

Deaths

W. B. Combs, M.A., professor, Department of Dairy Husbandry, March 7, 1959.

Louise T. Dosdall, Ph.D., assistant professor, Department of Plant Pathology and Botany, September 27, 1958.

A. W. Edson, M.S., professor and superintendent, West Central Experiment Station, September 29, 1958.

PUBLICATIONS

Agricultural Experiment Station

GENERAL BULLETIN SERIES

448. Comparative Value of Rock Phosphate and Superphosphate as Fertilizers. Roy O. Bridgford and C. O. Rost, 16 pages, 5,000.

449. Effect of Herd Size on Dairy Chore Labor. L. M. Day, H. J. Aune, and G. A. Pond, 20 pages, 6,500.

450. (NC Reg. 100). The Midwest Sweet Corn Industry. Richard A. Andrews, 16 pages, 7,000.

TECHNICAL BULLETIN SERIES

226. Inheritance in Maize of Reaction to European Corn Borer and Its Relationship to Certain Agronomic Characters. A. A. Fleming, Rameshwar Singh, H. K. Hayes, and E. L. Pinnell, 32 pages, 3,000.

230. Crop Rotation and Associated Tillage Practices for Controlling Annual Weeds in Flax and Reducing the Weed Seed Population of the Soil. R. S. Dunham, R. G. Robinson, and R. N. Andersen, 20 pages, 3,000.

231. (Interregional Publication, IRM-1). Policies for Expanding the Demand for Farm Food Products in the United States: Part I. History and Potentials. John M. Wetmore, Martin E. Abel, Elmer W. Learn, and Willard W. Cochrane, 127 pages, 7,500.

231. *Ibid.* (Reprint), 2,500.

232. (NC Reg. 95). A Study of the Sweet Corn Industry in the Midwest Farm Economy. Richard A. Andrews, 116 pages, 3,000.

MINNESOTA FARM AND HOME SCIENCE

Volume XVI, Number 1, 20 pages, 17,000.

Volume XVI, Number 2, 24 pages, 17,000.

Volume XVI, Number 3, 20 pages, 17,000.

Reprints of articles (20), 40 pages, 9,650.

REPORT SERIES

Sixty-Fifth Annual Report of the Minnesota Agricultural Experiment Station, July 1, 1957 to June 30, 1958, 54 pages, 2,500.

*Miscellaneous Report 20. Maturity Ratings for Corn Hybrids in Minnesota, 1959-60. E. H. Rinke, R. H. Peterson, N. C. Olmeim, and J. C. Sentz, 16 pages, 8,000.

*Miscellaneous Report 24. Varietal Trials of Farm Crops, R. G. Robinson, *et al.* (Agronomy and Plant Genetics Department Staff), 32 pages, 14,000.

*Miscellaneous Report 28. 1958 Minnesota Hybrid Corn Performance Trials. R. H. Peterson, E. H. Rinke, and J. C. Sentz, 40 pages, 11,000.

Miscellaneous Report 31. Heating and Adding Fat to Poultry Rations: A Study of Methods. Paul E. Waibel, Vernon M. Meyer, and Elton L. Johnson, 16 pages, 5,000.

Miscellaneous Report 32. (NC Reg. 93.) Varietal Trials of Smooth Bromegrass in the North Central Region. H. L. Thomas, Earle W. Hanson, and J. A. Jackobs, 8 pages, 17,000.

Miscellaneous Report 33. Prairie Moon and Tonka, New Chrysanthemums. R. E. Widmer and R. A. Phillips, 2 pages, 5,000.

Miscellaneous Report 34. A New Fruit Introduction for 1959: The "Earlimore" Strawberry. A. N. Wilcox, T. S. Weir, J. D. Winter, and Shirley Trantanella, 4 pages, 5,000.

Miscellaneous Report 35. 85 Years of Farming in the Northern Coniferous Forest Areas of Minnesota, Wisconsin, and Michigan. Mark J. Thompson, 58 pages, 1,500.

Agricultural Extension Service

BULLETIN SERIES

266. (Reprint) Road to Better Meetings. Charlotte Kirchner and Robert R. Pinches, 16 pages, 5,000.

268. (Reprint) Lampshades You Can Make. Charlotte Kirchner, 12 pages, 10,000.

269. (Reprint) Slipcovering Your Furniture. Charlotte Kirchner, 16 pages, 10,000.

* Revised annually.

271. (Reprint) Refinishing Your Furniture. Charlotte Kirchner, 8 pages, 10,000.
280. (Reprint) Letting Color Work for You in Home Furnishings. Myra Zabel, 16 pages, 15,000.
286. (Reprint) Planning the Home Kitchen. Elizabeth A. Rivers and Data Hochhalter, 24 pages, 15,000.
290. Fattening Western and Native Lambs. R. M. Jordan and R. E. Jacobs, 12 pages, 7,500.
290. (Reprint) Fattening Western and Native Lambs. 12 pages, 7,500.
292. Counter Tops. Elizabeth A. Rivers and Data Hochhalter, 8 pages, 12,500.
293. Outdoor Cookery for the Family. (Reprint of Michigan Extension Bulletin 354). 32 pages, 7,500.
294. Popular Ways to Serve Vegetables. Grace Brill, 16 pages, 25,000.
294. *Ibid.* (Reprint) 25,000.
295. Perennials for Minnesota. C. Gustav Hard, 36 pages, 25,000.
296. (NC Reg. Ext. Pub. 7.) Part-time Farming: Possibilities and Limitations. E. H. Hartmans, H. W. Herbison, Glen Pulver, and Buel F. Lanpher, 24 pages, 50,000.

PAMPHLET SERIES

134. (Revised) Custom Rates for Farm Operation. D. E. Erickson and T. R. Nodland, 6 pages, 3,000.
184. (Reprint) Home Fruit Spray Guide. 8 pages, 2,000.
- *194. Crop Production Guide for Minnesota, 1959. W. F. Hueg, Jr., Harley J. Otto, Curtis Overdahl, and Lowell Hanson. (3' x 2' wall chart). 5,000.
198. County Government Is Your Government. Floyd O. Flom and Luther J. Pickrel, 16 pages, 16,000.
199. You Control Your Town Government. Floyd O. Flom and Luther J. Pickrel, 16 pages, 16,000.
200. Public Schools Are Your Schools. Floyd O. Flom and Luther J. Pickrel, 16 pages, 16,000.
201. In a Democracy, Politics Is Your Job! Floyd O. Flom and Luther J. Pickrel, 16 pages, 16,000.
201. *Ibid.* (Reprint). 10,000.
- *203. Alfalfa for 1959. 4 pages, 50,000.

* Revised annually.

204. Calendar of Farm Practices. Milo J. Peterson and James Nordstrom (Editors), 23 pages, 7,500.

FOLDERS

*22. Varieties of Farm Crops, 1959. 24 pages, 30,000.

70. (Reprint) Livestock Weights and Measurements. W. E. Morris and H. G. Zavoral, 6 pages, 1,000.

106. (Reprint) Better Milk Through Improved Practices. J. H. Gholson and J. C. Olson, Jr., 10 pages, 10,000.

153. (Reprint) Longer Lasting Fence Posts with Penta. Marvin E. Smith, 6 pages, 5,000.

*154. Vegetable Varieties for Minnesota. O. C. Turnquist, 12 pages, 10,000.

*154. *Ibid.* (Reprint) 3,000.

164. (Reprint) Getting Started with Your Vegetable Garden. O. C. Turnquist, 10 pages, 10,000.

167. (Reprint) Summer Care of Vegetable Gardens. O. C. Turnquist, 10 pages, 10,000.

170. (Reprint) How to Control Wireworms. A. G. Peterson, L. K. Cutkomp, and A. A. Granovsky, 8 pages, 5,000.

172. (Reprint) Harvesting and Storing Vegetables. O. C. Turnquist, 8 pages, 7,500.

174. (Reprint) Know the Eggs You Buy. Eleanor Loomis, William H. Dankers, and Cora Cooke, 6 pages, 10,000.

177. (Reprint) Know Your Minnesota Apples. Eleanor Loomis, 8 pages, 15,000.

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|---|--------|-------|-------------|
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| Our Land | 12 | 52 | 7,980 |
| Radio Shorts | 52 | 156 | 9,980 |
| Reaching Rural People | 12 | 52 | 3,840 |
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| Club Leader Letter | 3 | 10 | 21,800 |
| Dairy Monthly Letter (DHIA) | 8 | 32 | 37,785 |
| Dairy Summary | 1 | 66 | 5,000 |
| Minnesota Florists' Letter | 6 | 58 | 3,000 |
| Nurserymen's Letter | 5 | 22 | 2,750 |
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| Potato Fact Sheet | 3 | 6 | 9,200 |
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3928. Physiologic races of *Puccinia graminis* in the United States in 1957. D. M. Stewart, R. U. Cotter, and B. J. Roberts. *Plant Disease Reporter*, 42:881-887. 1958.

3940. A study of the progeny from the self-fertilization of race 111 of *Puccinia graminis* var. *tritici*. R. D. Wilcoxson and K. D. Paharia. *Phytopathology*, 48:644-645. 1958.

3964. Reaction of *Medicago* species to certain alfalfa pathogens. B. L. Renfro, E. W. Sprague, and F. I. Frosheiser. *Report of 16th Alfalfa Improvement Conference*, pp. 43-48. July, 1958.

3981. *Uromyces trifolii* on peas. R. W. Goth and W. A. Haglund. *Phytopathology*, 49:118. 1959.

4010. Effects of water extracts of quackgrass rhizomes on damping-off and dry weight of alfalfa seedlings. (Abstract.) T. Kommedahl and J. H. Ohman. *Research Report of North Central Weed Control Conference*, 15:128. 1958.

4011. Effect of certain herbicides on yellow nutgrass. K. I. Blanchard, T. Kommedahl, and R. B. Anderson. *Ibid.*, 15:93-94. 1958.

4012. The effect of alternate wet-and-dry treatments on germination and dormancy of wild oats. (Abstract.) T. Kommedahl. *Ibid.*, 15:127. 1958.

4016. The ecological effect of a preceding crop on smartweed in flax. (Abstract.) T. Kommedahl. *Ibid.*, 15:127-128. 1958.

4018. The male of *Scutellonema brachyurum* (Steiner, 1938) Andrassy, 1958. D. P. Taylor. *Proceedings of the Helminthological Society of Washington*, 26:51-53. 1959.

4056. Nematodes associated with Minnesota crops. II. Nematodes associated with corn, barley, oats, rye, and wheat. D. P. Taylor and E. G. Schleder. *Plant Disease Reporter*, 43:329-33. 1959.

4089. Varietal response to seed piece decay. K. Knutson, R. F. Line, and C. Eide. *Ibid.*, 43:546-548. 1959.

4111. First report of *Meloidiogyne javanica* on greenhouse grown *Solanum pseudo-capsicum*. D. P. Taylor. *Ibid.*, 43:664. 1959.

POULTRY HUSBANDRY

3885. Studies on blood and meat spots in the hen's egg. 1. The fluorescent property of meat spots. N. V. L. Helbacka and M. H. Swanson. *Poultry Science*, 37:869-876. July, 1958.

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3904. Effectiveness of unknown growth factors, antibiotic, and animal fat in turkey poult rations. P. E. Waibel. *Ibid.*, 37:1144-1149. September, 1958.

3948. Effect of diet on the development in turkeys of aortic hemorrhage induced by beta-aminopropionitrile. P. E. Waibel and B. S. Pomeroy. *Ibid.*, 37:1249. September, 1958.

3951. Moisture levels in processed chicken broilers as related to thawing losses, cooking losses, and palatability scored. G. W. Froning, M. H. Swanson, and H. N. Benson. *Ibid.*, 37:1205. September, 1958.

3952. Effectiveness of shell treating eggs on day of lay as influenced by quantity of sealer and method of application. M. H. Swanson, G. W. Froning, and D. H. Hendrickson. *Ibid.*, 37:1246. September, 1958.

3966. Effect of diet on the development of beta-aminopropionitrile-induced vascular hemorrhage in turkeys. P. E. Waibel and B. S. Pomeroy. *Journal Nutrition*, 67:275-288. February, 1959.

4033. Methionine and lysine in rations for turkey poults under various dietary conditions. P. E. Waibel. *Poultry Science*, 38:712-721. May, 1959.

SOILS

3897. Studies on the free amino acid fraction. H. D. Putnam and E. L. Schmidt. *Soil Science*, 87:22-27. January, 1959.

3985. A survey of heterotrophic microorganisms that form nitrification products. O. R. Eylar, Jr., and E. L. Schmidt. *Journal of General Microbiology*, 20:473-481. May, 1959.

VETERINARY MEDICINE

3797. Bluecomb disease of turkeys. V. Preliminary studies on parental immunity and serum neutralization. J. T. Tumlin and B. S. Pomeroy. *American Journal of Veterinary Research*, 19:725-728. 1958.

3825. Some observations concerning the presence of spirillae in the fundic glands of dogs and cats. A. F. Weber, Osman Hasa, and J. H. Sautter. *Ibid.*, 19:677-680. 1958.

3826. The relationship between cholinesterase activity and the effects of succinylcholine chloride and the horse and cow. C. M. Stowe, N. R. Bieter, and M. H. Roepke. *Cornell Veterinarian*, 48:241-259. 1958.

3832. Essential fatty acid deficiency, the etiology of parakeratosis. L. J. Hanson, D. K. Sorensen, and H. C. H. Kernkamp. *American Journal of Veterinary Research*, 19:921-930. 1958.

3863. Neural mechanisms in sexual behavior. II. Gross neuro-anatomical and correlative neurophysiological studies of the ex-

ternal genitalia of the bull and ram. L. L. Larson and R. L. Kitchell. *Ibid.*, 19:853-865. 1958.

3888. A comparative study of lipid accumulation in the adrenal glands of mature non-pregnant dairy heifers, non-pregnant lactating dairy cows, and pregnant lactating dairy cows. J. T. Bell and A. F. Weber. *Ibid.*, 20:53-60. 1959.

3889. Oxygen uptake in liver homogenates taken from normal and ketotic cows. F. Sauer, W. M. Dickson, and H. H. Hoyt. *Ibid.*, 19:567-574. 1958.

3891. Studies on *myoclonia congenita*. II. Gross and microscopic pathology. L. J. Hanson, M. W. Stromberg, R. L. Kitchell, and H. C. H. Kernkamp. *Ibid.*, 19:383-387. April, 1958.

3900. The efficacy of the brucellosis ring test in certifying areas. M. H. Roepke, F. C. Stiles, Jr., and F. C. Driver. *Journal of the American Veterinary Medical Association*, 133:93-96. 1958.

3982. Studies on the reflex control of the ruminant stomach with special reference to the eructation reflex. C. E. Stevens and A. F. Sellers. *American Journal of Veterinary Research*, 20:461-482. 1959.

3990. Phlegmonous gastritis resulting from ruminatoric doses of tartar emetic. C. E. Stevens, P. B. Hammond, and N. O. Nielsen. *Journal of the American Veterinary Medical Association*, 134:423-427. 1959.

4028. Studies on *myoclonia congenita*. II. Drugs and other factors affecting severity of tremor. M. W. Stromberg. *American Journal of Veterinary Research*, 20:319-323. 1959.

4035. Infection of the bovine udder with *Candida tropicalis*. Keith I. Loken, Earl S. Thompson, Harvey Hoyt, and Roger Ball. *Journal of the American Veterinary Medical Association*, 134:401-403. May, 1959.

4036. *Stagnicola* (Hinckley) *caperata* (Say), A natural intermediate host for *Fascioloides Magna* (Bassi, 1875). H. J. Griffiths. *Journal of Parasitology*, 45:146. April, 1959.

Miscellaneous Journal Series Papers

AGRICULTURAL ENGINEERING

980. Gutter cleaner and silo unloader tests, a progress report. J. G. Hartsock and R. E. Larson. USDA, ARS, in cooperation with the Minnesota Agricultural Experiment Station, August, 1958. 4 multilithed pages.

988. Grain drying. John Strait. *Proceedings, Extension Conference Northwest Crop Improvement Association, November 11-12, 1958*. 2 pages.

990. Study of pump drainage systems in Minnesota. C. L. Larson and D. M. Manbeck. *University of Minnesota Department of Agricultural Engineering Report No. 202. December, 1958*. 20 multilithed pages.

996. The poultry house of the future. W. A. Junnila. *Poultry Tribune*, 65: 15, 32, 34, 36-37. March, 1959.

1016. Mechanical treatment of hay. John Strait, A. K. Solstad, K. J. Albrecht, and L. L. Dibley. *University of Minnesota Department of Agricultural Engineering Report No. 203. June, 1958*. 24 multilithed pages.

AGRONOMY AND PLANT GENETICS

982. Suggested literature for students in plant breeding and genetics. H. K. Hayes and C. R. Burnham. *The American Naturalist*, 93: 17-25. January-February, 1959.

984. Unfinished business. W. M. Myers. *Agronomy Journal*, 50: 719-721. December, 1958.

997. Weed situation. R. G. Robinson. *Abstract of Weed and Seed Inspectors' Short Course*, pp. 21-22. 1959.

ANIMAL HUSBANDRY

998. Fifty years of progress in swine nutrition. L. E. Hanson. *Journal of Animal Science*, 17: 1029-1057. November, 1958.

AGRICULTURAL BIOCHEMISTRY

985. The chemistry, microbiology, and physics of grain storage. W. F. Geddes. *Food Technology*, 12: 7-14. November, 1958.

ENTOMOLOGY AND ECONOMIC ZOOLOGY

968. Nature and significance of intracellular bacteroids in cockroaches. Marion A. Brooks. *Proceedings 10th International Congress of Entomology, Montreal*, 2: 311-314. December, 1956 (1958).

971. Where and how to learn beekeeping. M. H. Haydak. *Minnesota Beekeeper*, 11 (3): 9-10. 1958.

977. The composition of bird flocks. J. R. Beer. *Flicker*, 30: 78-83. September, 1958.

978. A few brief impressions of Korea. C. E. Mickel. *Sang Lock*, pp. 71-72, 115. 1958.

983. Can gardeners have mosquito control? L. K. Cutkomp. *Minnesota Horticulturist*, 86(6):85, 91, 94. August, 1958.

1001. The queen honeybee—what we know about her now. M. H. Haydak. *Gleanings in Bee Culture*, 87:327-331. 1959.

1003. Pollen substitutes—still a controversy? M. H. Haydak. *Proceedings 10th International Congress Entomology, Montreal*, 4:1053-56. 1958.

1010. Swarming and what to do about it. M. H. Haydak. *American Bee Journal*, 99:179-180. 1959.

FORESTRY

979. An index to U. S. Geological Survey Topographic Maps of Minnesota as of July 1, 1958. H. E. Wright, Jr., and M. P. Meyer. *Minnesota Forestry Notes No. 67*. July 15, 1958.

HORTICULTURE

987. Plastic greenhouse progress report. R. E. Widmer. *Minnesota State Florists' Bulletin*, pp. 1-6. October 1, 1958.

989. New information on freezer wraps and containers. J. D. Winter. *What's New in Home Economics*, 23(2):36, 37, 100, 102. February, 1959.

1002. Early planning to control lawn weeds. R. J. Stadtherr. *Minnesota Horticulturist*, 87(3):22, 31. March, 1959.

PLANT PATHOLOGY AND BOTANY

973. Nematodes and nursery crops. D. P. Taylor. *University of Minnesota Nurseryman's Newsletter*, Vol. 6, No. 5-6, pp. 1-3; No. 7-8, pp. 3-4, 1958.

991. Occurrence of stripe rust in Minnesota in 1958. J. D. Miller and J. J. Christensen. *Plant Disease Reporter*, 43:159. 1959.

1005. Gibberellic acid. T. W. Sudia and A. J. Linck. *The Minnesota Journal of Science*, Vol. 2, No. 4, pp. 11, 15. 1959.

POULTRY HUSBANDRY

981. Spray-oiling shell eggs to preserve quality. M. H. Swanson. *World's Poultry Science Journal*, 14:287-291. October-December, 1958.

VETERINARY MEDICINE

961. Symposium on chronic respiratory diseases of poultry. IV. Infectious sinusitis of turkeys. Orin H. Osborn and B. S. Pomeroy. *American Journal of Veterinary Research*, 19:469-472. 1958.

Summary of Journal Series Papers

| Department | Scientific Journal Series | | Miscellaneous Journal Series | |
|---------------------------------------|---------------------------|-----------------|------------------------------|-----------------|
| | Number issued | Number of pages | Number issued | Number of pages |
| Agricultural Biochemistry | 25 | 141 | 1 | 8 |
| Agricultural Engineering | 2 | 5 | 5 | 55 |
| Agronomy and Plant Genetics | 6 | 21 | 3 | 15 |
| Animal Husbandry | 6 | 38 | 1 | 29 |
| Dairy Husbandry | 11 | 73 | 0 | 0 |
| Entomology and Economic Zoology | 26 | 206 | 8 | 29 |
| Forestry | 16 | 45 | 1 | 2 |
| Home Economics | 5 | 24 | 0 | 0 |
| Horticulture | 22 | 58 | 3 | 12 |
| Plant Pathology and Botany | 23 | 104 | 3 | 7 |
| Poultry Husbandry | 9 | 55 | 1 | 5 |
| Soils | 2 | 15 | 0 | 0 |
| Veterinary Medicine | 14 | 111 | 1 | 4 |
| Total publications—194 | 167 | 896 | 27 | 166 |

Summary of Publications

JULY 1958-JULY 1959

| Kind of publication | Number issued | Number of pages | Number of copies |
|---------------------------------------|---------------|-----------------|------------------|
| General bulletin series | 3 | 52 | 18,500 |
| Technical bulletin series | 5 | 422 | 19,000 |
| Minnesota Farm and Home Science | 4 | 84 | 60,650 |
| Report series | 9 | 230 | 69,000 |
| Extension service | | | |
| Bulletins | 14 | 248 | 225,000 |
| Pamphlets | 10 | 122 | 141,500 |
| Folders | 26 | 280 | 289,000 |
| 4-H Club bulletins | 8 | 234 | 7,600 |
| Miscellaneous | 3 | 44 | 26,000 |
| Fact sheets | 35 | 70 | 75,000 |
| Information Service series | 20 | 40 | 15,950 |
| Communications bulletins | 10 | 20 | 6,850 |
| Newsletters | 190 | 792 | 181,875 |
| | 337 | 2,638 | 1,135,925 |

NEW EXPERIMENT STATION PROJECTS

Agricultural Economics

1135. The Economic Impact of Highway Development in Minnesota.

1136HM. An Analysis of Market Structures and the Performance of Markets in Agriculture.

Agricultural Engineering

1215R3. Scale Model Techniques for Evaluating Materials-Handling Systems.

Agronomy and Plant Genetics

1326H. Alfalfa Improvement for Minnesota.

1327. Seed Production Studies of Small Seeded Forage Legumes.

Entomology and Economic Zoology

1739H. Small Mammal Population Studies.

1740H. Studies on Morphology and Culture of Insect Tissues and Associated Microorganisms.

1741H. Mechanisms of Biological Production in Streams.

Forestry

1924HM. The Production and Marketing of Christmas Trees.

Home Economics

2018H. Blanket Qualities.

2019RH. Factors Affecting Nitrogen Utilization of Adult Human Subjects.

Poultry

2317RM. Shell Treatment as a Means of Maintaining Quality of Eggs in Market Channels.

Rural Sociology

2706H. Studies in Rural Social Organization: Social Changes in Goodhue County.

2707H. Human Factors in Rejection of Recommended Farm Practices.

SUMMARY OF PROJECTS

| Department | Active | Closed | New |
|---------------------------------------|------------|-----------|-----------|
| Agricultural Biochemistry | 16 | 1 | 0 |
| Agricultural Economics | 29 | 2 | 2 |
| Agricultural Engineering | 14 | 0 | 1 |
| Agronomy and Plant Genetics | 25 | 1 | 2 |
| Animal Husbandry | 15 | 0 | 0 |
| Dairy Husbandry | 18 | 1 | 0 |
| Entomology and Economic Zoology | 29 | 0 | 3 |
| Forestry | 17 | 2 | 1 |
| Home Economics | 11 | 4 | 2 |
| Horticulture | 23 | 0 | 0 |
| Plant Pathology and Botany | 27 | 1 | 0 |
| Poultry Husbandry | 14 | 3 | 1 |
| Rural Sociology | 3 | 1 | 2 |
| Soils | 19 | 0 | 0 |
| Veterinary Medicine | 21 | 4 | 0 |
| Total | 281 | 20 | 14 |

FINANCIAL STATEMENT

Income 1958-59

| Sources of Revenue | Branch stations | | | | | | Total |
|----------------------------------|-----------------------|---------------------|---------------------|--------------------|---------------------|---------------------|-----------------------|
| | St. Paul Campus | Crookston | Morris | Grand Rapids | Duluth | Waseca | |
| Federal appropriations | | | | | | | |
| Hatch Fund | \$ 586,625.00 | | | | | | \$ 586,625.00 |
| Regional Research Fund | 151,175.00 | | | | | | 151,175.00 |
| State appropriations | | | | | | | |
| General University support | 1,239,354.27 | \$100,802.70 | \$ 92,951.43 | \$56,425.44 | \$ 77,937.37 | \$ 67,783.11 | \$1,635,254.32 |
| Special appropriations | 623,500.00 | | | | | | 623,500.00 |
| Endowments, fellowships | 444,414.40 | | | | | | 444,414.40 |
| Fees, sales, miscellaneous | 494,406.77 | 38,493.77 | 42,680.59 | 20,710.39 | 47,520.86 | 58,054.04 | 701,866.42 |
| Total | \$3,539,475.44 | \$139,296.47 | \$135,632.02 | \$77,135.83 | \$125,458.23 | \$125,837.15 | \$4,142,835.14 |

Expenditures 1958-59

| Classification | Branch stations | | | | | | Total |
|----------------------------------|-----------------------|---------------------|---------------------|--------------------|---------------------|---------------------|-----------------------|
| | St. Paul Campus | Crookston | Morris | Grand Rapids | Duluth | Waseca | |
| Service and labor | \$2,571,658.68 | \$ 96,087.72 | \$ 97,878.16 | \$54,299.30 | \$ 67,956.90 | \$ 80,900.47 | \$2,968,781.23 |
| Travel expense | 67,583.44 | 692.72 | 702.74 | 686.82 | 304.85 | 1,363.31 | 71,333.88 |
| Transportation | 4,672.32 | 1,026.76 | 103.99 | 194.73 | 97.70 | 138.31 | 6,233.81 |
| Communication service | 20,375.78 | 1,122.85 | 950.84 | | 969.71 | 728.65 | 24,147.83 |
| Rents and utility | 50,416.33 | 3,024.85 | 2,552.51 | 3,015.77 | 5,901.11 | 6,097.55 | 71,008.12 |
| Printing and binding | 25,615.67 | | 145.12 | 100.40 | | | 25,861.19 |
| Other contractual services | 212,242.81 | 13,051.13 | 4,054.42 | 4,131.15 | 12,851.82 | 5,329.89 | 251,661.22 |
| Supplies and materials | 362,811.30 | 17,515.28 | 21,836.10 | 12,266.07 | 27,621.98 | 23,013.45 | 465,064.18 |
| Equipment | 193,963.36 | 6,775.16 | 7,408.14 | 2,441.59 | 9,754.16 | 8,265.52 | 228,607.93 |
| Land and structures | 22,694.64 | | | | | | 22,694.64 |
| Retirement | 7,341.85 | | | | | | 7,341.85 |
| Unobligated Federal Funds | | | | | | | |
| June 30, 1959 | 99.26 | | | | | | 99.26 |
| Total | \$3,539,475.44 | \$139,296.47 | \$135,632.02 | \$77,135.83 | \$125,458.23 | \$125,837.15 | \$4,142,835.14 |

EXPERIMENT STATION STAFF

The Board of Regents

| | | | | | | | |
|--|---|---|---|---|---|---|------|
| THE HON. JAMES F. BELL | - | - | - | - | - | - | 1963 |
| THE HON. EDWARD B. COSGROVE, Le Sueur | - | - | - | - | - | - | 1961 |
| THE HON. DANIEL C. GAINNEY, Owatonna | - | - | - | - | - | - | 1961 |
| THE HON. RICHARD L. GRIGGS, Duluth | - | - | - | - | - | - | 1963 |
| THE HON. MARJORIE J. HOWARD, Excelsior | - | - | - | - | - | - | 1965 |
| THE HON. A. I. JOHNSON, Benson | - | - | - | - | - | - | 1965 |
| THE HON. GEORGE W. LAWSON, St. Paul | - | - | - | - | - | - | 1963 |
| THE HON. L. A. MALKERSON, Minneapolis | - | - | - | - | - | - | 1965 |
| THE HON. CHARLES W. MAYO, Rochester | - | - | - | - | - | - | 1965 |
| THE HON. A. J. OLSON, Renville | - | - | - | - | - | - | 1961 |
| THE HON. RAY J. QUINLIVAN, St. Cloud | - | - | - | - | - | - | 1963 |
| THE HON. HERMAN J. SKYBERG, Fisher | - | - | - | - | - | - | 1961 |

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- T. H. FENSKE, D.Sc., Associate Dean, Institute of Agriculture
- H. J. SLOAN, Ph.D., Director, Agricultural Experiment Station
- M. F. KERNKAMP, Ph.D., Assistant Director, Agricultural Experiment Station
- L. R. LUNDEN, B.A., Comptroller of University and Treasurer of Station
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- S. O. BERG, Ph.D., Head, Department of Agricultural Economics
- A. J. SCHWANTES, M.S., Head, Department of Agricultural Engineering
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- C. L. COLE, Ph.D., Head, Department of Dairy Husbandry
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- LOUISE A. STEDMAN, Ph.D., Director, School of Home Economics
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- A. C. HEINE, B.S., Superintendent, Agricultural Experiment Station, Rosemount
- WILLIAM MATALAMAKI, M.S., Superintendent, North Central Experiment Station, Grand Rapids

R. S. GRANT, M.S., Superintendent, Northeast Experiment Station, Duluth
 B. E. YOUNGQUIST, Ph.D., Superintendent, Northwest Experiment Station, Crookston
 R. E. HODGSON, M.S., Superintendent, Southern Experiment Station, Waseca
¹A. W. EDSON, M.S., Professor and Superintendent, West Central Experiment Station, Morris
 H. G. CROOM, B.S., Assistant Professor and Principal, Acting Superintendent, West Central Experiment Station, Morris
 THORVALD SCHANTZ-HANSEN, Ph.D., Director, Forestry and Biological Station, Itasca Park
 H. B. SWANSON, M.S., Editor
 E. B. STANDFORD, Ph.D., Librarian
 H. D. FERRIS, M.S., Agricultural Librarian

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²ROBERT JENNESS, Ph.D., Professor
 W. O. LUNDBERG, Ph.D., Professor
 M. O. SCHULTZE, Ph.D., Professor
 FRED SMITH, Ph.D., D.Sc., Professor
 S. KIRKWOOD, Ph.D., Associate Professor
 I. E. LIENER, Ph.D., Associate Professor
 R. L. GLASS, Ph.D., Assistant Professor

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 A. A. DOWELL, Ph.D., Professor
⁵S. A. ENGENE, Ph.D., Professor
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 E. F. KOLLER, Ph.D., Professor
⁶P. M. RAUP, Ph.D., Professor
 R. P. DAHL, Ph.D., Associate Professor
⁷C. V. HESS, Ph.D., Associate Professor
 T. R. NODLAND, Ph.D., Associate Professor
 D. F. FIENUP, Ph.D., Assistant Professor
 E. W. LEARN, Ph.D., Assistant Professor
 V. F. AMANN, B.S., Instructor

¹ Deceased September 29, 1958.

² On leave September 16 to December 15, 1958.

³ On leave July 28 to September 26, 1958.

⁴ On leave September 16, 1958 to June 30, 1959.

⁵ On leave July 2 to September 27, 1958.

⁶ On leave August 18 to October 17, 1958.

⁷ Appointed March 1, 1959.

⁸NORBERT A. DOROW, M.S., Instructor
⁹K. E. EGERTSON, M.S., Instructor
 R. V. ELEFSON, B.S., Instructor
¹⁰PAUL H. HOEPNER, M.S., Instructor
 R. G. THOMPSON, B.A.A., Instructor
 E. L. FULLER, M.S., Research Fellow
 R. J. GOODMAN, M.S., Research Fellow
¹¹DALE O. GUSTAFSON, M.S., Research Fellow
 JAMES SCHWINDEN, M.S., Research Fellow
¹²L. M. DAY, Ph.D., Associate Professor, Agricultural Economist, USDA
¹³OSWALD P. BLAICH, M.S., Research Fellow, Agricultural Economist,
 USDA

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 ANDREW HUSTRULID, Ph.D., Professor
 P. W. MANSON, M.S., Professor
 C. K. OTIS, M.S., Professor
 E. R. ALLRED, M.S., Associate Professor
 C. H. CHRISTOPHERSON, M.A., Associate Professor
 A. M. FLIKKE, M.S., Associate Professor
 C. L. LARSON, M.S., Associate Professor
 JOHN STRAIT, M.S., Associate Professor
¹⁴V. M. MEYER, M.S., Research Associate
 W. J. CULMER, M.S., Instructor
 R. E. MACHMEIER, B.S., Instructor
 R. P. MARVIN, M.S., Instructor
¹⁵M. N. NIXON, B.S., Instructor
 W. L. OLSON, B.S., Instructor
 J. H. POMROY, M.S., Instructor
 A. K. SOLSTAD, M.S., Instructor
¹⁶LEE F. HERMSMEIER, M.S., Research Fellow, Agricultural Engineer,
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 W. A. JUNNILA, M.S., Agricultural Engineer, USDA
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 C. K. MUTCHLER, M.S., Agricultural Engineer, USDA
 L. A. LILJEDAHL, M.S., Assistant Agricultural Engineer, USDA

DEPARTMENT OF AGRONOMY AND PLANT GENETICS

W. M. MYERS, Ph.D., Professor and Head
 C. R. BURNHAM, Ph.D., Professor

⁸ Appointed August 1, 1958.
⁹ Resigned June 30, 1958.
¹⁰ Appointed July 1, 1958.
¹¹ Appointed March 1, 1959.
¹² Appointed January 1, 1959.
¹³ Appointed July 16, 1958.
¹⁴ Resigned September 30, 1958.
¹⁵ Resigned June 15, 1959.
¹⁶ Appointed September 1, 1958.

E. H. RINKE, Ph.D., Professor
¹⁷RICHARD BEHRENS, Ph.D., Associate Professor
 CARL BORGESON, M.S., Associate Professor
¹⁸R. A. BRIGGS, Ph.D., Associate Professor
 L. J. ELLING, Ph.D., Associate Professor
 J. W. LAMBERT, Ph.D., Associate Professor
 A. R. SCHMID, Ph.D., Associate Professor
 L. A. SNYDER, Ph.D., Associate Professor
 H. L. THOMAS, Ph.D., Associate Professor
 R. G. ROBINSON, Ph.D., Assistant Professor
 J. C. SENTZ, Ph.D., Assistant Professor
 D. R. JOHNSTON, B.S., Research Fellow
 F. K. S. KOO, Ph.D., Research Fellow
 N. A. TULEEN, B.S., Research Fellow
 E. R. AUSEMUS, Ph.D., Professor, Agronomist, USDA
 R. S. CALDECOTT, Ph.D., Associate Professor, Geneticist, USDA
 R. N. ANDERSEN, M.S., Research Agronomist, USDA
 B. H. BEARD, Ph.D., Research Agronomist, USDA
 W. M. CLEMENT, Ph.D., Research Agronomist, USDA
 V. E. COMSTOCK, M.S., Research Agronomist, USDA
 D. W. SUNDERMAN, M. S., Research Agronomist, USDA
 W. F. WEDIN, Ph.D., Research Agronomist, USDA

DEPARTMENT OF ANIMAL HUSBANDRY

L. E. HANSON, Ph.D., Professor and Head
 R. E. COMSTOCK, Ph.D., Professor
¹⁹A. L. HARVEY, Ph.D., Professor
 W. J. AUNAN, Ph.D., Associate Professor
²⁰J. N. CUMMINGS, Ph.D., Associate Professor
 R. M. JORDAN, Ph.D., Associate Professor
 R. J. MEADE, Ph.D., Associate Professor
 W. E. REMPEL, Ph.D., Associate Professor
 O. E. KOLARI, Ph.D., Assistant Professor
²¹J. V. SCALETTI, Ph.D., Assistant Professor
 J. D. MEISKE, Ph.D., Instructor

DEPARTMENT OF DAIRY HUSBANDRY

C L. COLE, Ph.D., Professor and Head
²²W. B. COMBS, M.A., Professor
 S. T. COULTER, Ph.D., Professor
 H. MACY, Ph.D., Professor
 J. C. OLSON, JR., Ph.D., Professor

¹⁷ Appointed July 1, 1958.

¹⁸ Resigned June 30, 1959.

¹⁹ On leave January 1 to March 28, 1959.

²⁰ Resigned October 31, 1958.

²¹ Appointed July 1, 1958.

²² Deceased March 7, 1959.

W. E. PETERSEN, Ph.D., Professor
J. D. DONKER, Ph.D., Associate Professor
E. F. GRAHAM, Ph.D., Associate Professor
J. J. JEZESKI, Ph.D., Associate Professor
H. A. MORRIS, Ph.D., Associate Professor
E. L. THOMAS, Ph.D., Associate Professor
J. B. WILLIAMS, Ph.D., Associate Professor
C. M. CLIFTON, Ph.D., Assistant Professor
H. J. REBHAN, M.S., Instructor
L. A. RICHARDSON, M.S.S., Instructor
ELMER GEORGE, JR., M.S., Research Fellow
V. S. PACKARD, M.S., Research Fellow
C. H. PYNE, M.S., Research Fellow
J. J. RITCHIE, M.S., Research Fellow
R. W. WEIK, M.S., Research Fellow

DEPARTMENT OF ENTOMOLOGY AND ECONOMIC ZOOLOGY

C. E. MICKEL, Ph.D., Professor and Head
A. C. HODSON, Ph.D., Professor
F. G. HOLDAWAY, Ph.D., Professor
W. H. MARSHALL, Ph.D., Professor
²³A. G. RICHARDS, Ph.D., Professor
L. L. SMITH, JR., Ph.D., Professor
J. R. BEER, Ph.D., Associate Professor
E. F. COOK, Ph.D., Associate Professor
L. K. CUTKOMP, Ph.D., Associate Professor
M. H. HAYDAK, Ph.D., Associate Professor
A. G. PETERSON, Ph.D., Associate Professor
T. F. WATERS, Ph.D., Assistant Professor
H. C. CHIANG, Ph.D., Research Associate
T. A. GOCHNAUER, Ph.D., Research Associate
MARION A. BROOKS, Ph.D., Instructor
R. D. PRICE, Ph.D., Instructor
²⁴W. H. DAVIS, Ph.D., Research Fellow
²⁵R. L. ENG, Ph.D., Research Fellow
²⁶G. W. GULLION, M.A., Research Fellow
²⁷P. E. HUNTER, Ph.D., Research Fellow
²⁸J. J. KUPA, M.S., Research Fellow
²⁹F. W. STEHR, M.S., Research Fellow
K. W. TUCKER, Ph.D., Research Fellow

²³ On leave July 1 to September 30, 1958

²⁴ Resigned June 30, 1958.

²⁵ Resigned August 15, 1958.

²⁶ Appointed July 15, 1958.

²⁷ Resigned February 14, 1959.

²⁸ Appointed July 1, 1958.

²⁹ Appointed July 1, 1958.

SCHOOL OF FORESTRY

F. H. KAUFERT, Ph.D., Professor and Head
 R. M. BROWN, M.F., Professor
 H. L. HANSEN, Ph.D., Professor
 R. L. HOSSFELD, Ph.D., Professor
 S. S. PAULEY, Ph.D., Professor
 L. W. REES, Ph.D., Professor
 T. SCHANTZ-HANSEN, Ph.D., Professor
³⁰A. E. SCHNEIDER, Ph.D., Professor
³¹R. I. BEAZLEY, Ph.D., Associate Professor
 D. P. DUNCAN, Ph.D., Associate Professor
 M. P. MEYER, Ph.D., Associate Professor
 B. A. BROWN, Ph.D., Assistant Professor
 CHERNG-JIANN SHIUE, Ph.D., Assistant Professor
 E. T. SULLIVAN, Ph.D., Assistant Professor
 W. B. WALLIN, Ph.D., Assistant Professor
 J. R. NEETZEL, M.F., Research Associate
³²CHI-WU WANG, Ph.D., Research Associate
 F. D. IRVING, M.F., Instructor
³³P. N. KNORR, M.F., Instructor
 H. SCHOLTEN, B.S., Instructor
 R. A. SKOK, M.F., Instructor
 K. E. WINSNESS, M.F., Instructor
 E. V. BAKUZIS, M.S., Research Fellow
³⁴C. E. AHLGREN, M.S., Research Associate (Detailed by Quetico-Superior
 Wilderness Research)

SCHOOL OF HOME ECONOMICS

LOUISE A. STEDMAN, Ph.D., Professor and Director
 ROXANA R. FORD, Ph.D., Professor and Assistant Director
 SUZANNE DAVISON, Ph.D., Professor
 FLORENCE EHRENKRANZ, Ph.D., Professor
 GERTRUDE ESTEROS, Ed.D., Professor
 JANE M. LEICHSENRING, Ph.D., Professor
 ISABEL NOBLE, Ph.D., Professor
 CHARLOTTE G. BAUMGARTNER, M.S., Associate Professor
 GLADYS I. BELLINGER, Ph.D., Associate Professor
 JOAN GORDON, Ph.D., Associate Professor
 AMY JEAN HOLMBLADE, Ph.D., Associate Professor
 HELEN A. LUDWIG, M.A., Associate Professor
³⁵LURA M. MORSE, Ph.D., Associate Professor
³⁶MADÉLINE BURLEIGH, M.A., Assistant Professor

³⁰ On leave year, 1958-59.

³¹ On leave May 16 to September 30, 1958.

³² Appointed September 1, 1958.

³³ Resigned May 15, 1959.

³⁴ Appointed September 1, 1958.

³⁵ Appointed August 1, 1958.

³⁶ Resigned June 30, 1958.

MARY E. CARLSON, M.A., Assistant Professor
 ETHEL R. GORHAM, M.A., Assistant Professor
 ANNETTE T. GORMICAN, M.S., Assistant Professor
³⁷MARY J. HITCHCOCK, M.S., Assistant Professor
 KATHLEEN M. JEARY, M.A., Assistant Professor
 HEDDA B. KAFKA, M.A., Assistant Professor
³⁸HELMY KOIVISTO, Ph.D., Assistant Professor
 JULIETTE MYREN, M.A., Assistant Professor
 ESTHER Y. TRAMMELL, M.A., Assistant Professor
 BETHEL R. ANDERSON, M.S., Instructor
³⁹LILA M. BENRUD, B.S., Instructor
⁴⁰JOAN P. CASSILLY, M.S., Instructor
 MARIE H. CHRISTENSON, M.S., Instructor
 ROBERT J. FORSYTH, M.A., Instructor
⁴¹EVELYN M. FRANKLIN, M.S., Instructor
 NAURINE R. HIGGINS, M.S., Instructor
 LOIS A. LUND, M.S., Instructor
⁴²VALBORG E. RISHOI, B.S., Instructor
⁴³MARGARET TAULBEE, M.S., Instructor

DEPARTMENT OF HORTICULTURE

L. C. SNYDER, Professor and Head, Superintendent of Fruit Breeding Station
 T. M. CURRENCE, Ph.D., Professor
 A. E. HUTCHINS, Ph.D., Professor
⁴⁴O. C. TURNQUIST, Ph.D., Professor
 A. N. WILCOX, Ph.D., Professor
 R. E. NYLUND, Ph.D., Associate Professor
 T. S. WEIR, M.S., Associate Professor and Assistant Superintendent of Fruit Breeding Station
 R. E. WIDMER, Ph.D., Associate Professor
 J. D. WINTER, M.S., Associate Professor
 F. I. LAUER, Ph.D., Assistant Professor
 R. A. PHILLIPS, M.S., Assistant Professor
 E. T. ANDERSEN, M.S., Instructor
 A. G. JOHNSON, B.S., Instructor
 R. J. STADTHERR, M.S., Instructor
 SHIRLEY R. TRANTANELLA, M.S., Instructor
⁴⁵ROBERT MULLIN, M.S., Research Fellow
 D. C. NELSON, B.S., Research Fellow

³⁷ Appointed September 1, 1958.

³⁸ Resigned June 15, 1959.

³⁹ Resigned June 15, 1958.

⁴⁰ Appointed September 16, 1958.

⁴¹ Resigned June 15, 1959.

⁴² Appointed September 16, 1958; resigned June 15, 1959.

⁴³ Resigned June 15, 1958.

⁴⁴ Appointed January 1, 1959.

⁴⁵ Appointed April 16, 1959.

DEPARTMENT OF PLANT PATHOLOGY AND BOTANY

J. J. CHRISTENSEN, Ph.D., Professor and Head, Colloborator, USDA
 C. M. CHRISTENSEN, Ph.D., Professor
 C. J. EIDE, Ph.D., Professor
 HELEN HART, Ph.D., Professor
 M. F. KERNKAMP, Ph.D., Professor
 T. H. KING, Ph.D., Professor
 D. W. FRENCH, Ph.D., Associate Professor
 T. KOMMEDAHL, Ph.D., Associate Professor
⁴⁶LOUISE T. DOSDALL, Ph.D., Assistant Professor
 R. D. DURBIN, Ph.D., Assistant Professor
 R. H. LANDON, Ph.D., Assistant Professor
 A. J. LINCK, Ph.D., Assistant Professor
 R. D. WILCOXSON, Ph.D., Assistant Professor
⁴⁷N. A. ANDERSON, M.S., Instructor
 K. D. FEZER, Ph.D., Instructor
 R. G. LAMBERT, M.S., Instructor
 M. B. MOORE, M.S., Instructor
 D. P. TAYLOR, M.S., Instructor
⁴⁸A. H. ELLINGBOE, Ph.D., Research Fellow
⁴⁹W. N. GARRETT, M.S., Research Fellow
 R. A. HERRETT, M.S., Research Fellow
 K. W. KNUTSON, M.S., Research Fellow
 D. L. MUMFORD, M.S., Research Fellow
⁵⁰J. H. OHMAN, M.S., Research Fellow
 B. L. RENFRO, M.S., Research Fellow
⁵¹T. W. SUDIA, Ph.D., Research Fellow
⁵²H. D. THURSTON, Ph.D., Research Fellow
 H. L. BISSONNETTE, M.S., Plant Pathologist, USDA
 R. U. COTTER, Ph.D., Plant Pathologist, USDA
 R. A. FREDERIKSEN, M.S., Plant Pathologist, USDA
 F. I. FROSHEISER, Ph.D., Plant Pathologist, USDA
 J. D. MILLER, B.S., Plant Pathologist, USDA
 B. J. ROBERTS, M.S., Plant Pathologist, USDA
 J. B. ROWELL, Ph.D., Associate Professor, Plant Physiologist, USDA
 E. C. STAKMAN, Ph.D., Collaborator, USDA
 D. M. STEWART, Ph.D., Plant Pathologist, USDA
 T. H. STEWART, B.S., Area Supervisor, USDA
 T. D. WYLLIE, M.S., Agent, Plant Pathologist, USDA
 D. M. COE, Ph.D., Director, Seed Potato Certification, State Department
 of Agriculture
 J. L. LARSON, Seed Analyst in Charge of Seed Germination, State Department
 of Agriculture

⁴⁶ Deceased September 27, 1958.

⁴⁷ Appointed April 1, 1959.

⁴⁸ Resigned December 31, 1958.

⁴⁹ Appointed May 1, 1959.

⁵⁰ Appointed October 1, 1958.

⁵¹ Appointed October 1, 1958.

⁵² Resigned September 30, 1958.

H. C. REGNIER, Chief Inspector, Office of Seed Potato Certification, State
Department of Agriculture

DEPARTMENT OF POULTRY HUSBANDRY

E. L. JOHNSON, Ph.D., Professor and Head
R. N. SHOFFNER, Ph.D., Professor
H. J. SLOAN, Ph.D., Professor
M. H. SWANSON, Ph.D., Associate Professor
P. E. WAIBEL, Ph.D., Associate Professor
R. E. BURGER, Ph.D., Assistant Professor
⁵³D. C. SNETSINGER, Ph.D., Assistant Professor
T. B. KINNEY, JR., M.S., Instructor

DEPARTMENT OF SOILS

W. P. MARTIN, Ph.D., Professor and Head
P. M. BURSON, M.S., Professor
A. C. CALDWELL, Ph.D., Professor
J. M. MACGREGOR, Ph.D., Professor
H. F. ARNEMAN, Ph.D., Associate Professor
G. R. BLAKE, Ph.D., Associate Professor
E. L. SCHMIDT, Ph.D., Associate Professor
JOHN GRAVA, Ph.D., Assistant Professor
R. H. RUST, Ph.D., Assistant Professor
R. S. FARNHAM, Ph.D., Research Associate
D. G. BAKER, Ph.D., Instructor
M. I. HARPSTEAD, M.S., Instructor
⁵⁴R. F. HOLT, Ph.D., Research Associate, Soil Scientist, USDA
A. H. PASCHALL, M.S., Soil Scientist, USDA
A. S. ROBERTSON, B.S., Soil Scientist, USDA
⁵⁵C. A. VAN DOREN, Ph.D., Professor, Soil Scientist, USDA

COLLEGE OF VETERINARY MEDICINE

W. T. S. THORP, D.V.M., M.S., Professor and Dean
C. M. STOWE, D.V.M., Ph.D., Professor and Assistant Dean
R. K. ANDERSON, D.V.M., Professor
J. P. ARNOLD, D.V.M., Ph.D., Professor
J. N. CAMPBELL, D.V.M., B.S., Professor
REUEL FENSTERMACHER, D.V.M., Professor
H. J. GRIFFITHS, D.V.M., Ph.D., Professor
H. H. HOYT, D.V.M., Ph.D., Professor
H. C. H. KERNKAMP, D.V.M., MS., Professor
R. L. KITCHELL, D.V.M., Ph.D., Professor
G. W. MATHER, D.V.M., Ph.D., Professor

⁵³ Appointed March 16, 1959.

⁵⁴ Appointed July 1, 1958.

⁵⁵ Appointed July 1, 1958.

B. S. POMEROY, D.V.M., Ph.D., Professor
 J. H. SAUTTER, D.V.M., Ph.D., Professor
 A. F. SELLERS, D.V.M., Ph.D., Professor
 A. F. WEBER, D.V.M., Ph.D., Professor
 A. L. GOOD, D.V.M., Ph.D., Associate Professor
 P. B. HAMMOND, D.V.M., Ph.D., Associate Professor
 R. K. LINDORFER, Ph.D., Associate Professor
 R. A. MERRILL, D.V.M., Associate Professor
 D. K. SORENSEN, D.V.M., Ph.D., Associate Professor
 F. A. SPURRELL, D.V.M., Ph.D., Associate Professor
 RAIMUNDS ZEMJANIS, D.V.M., Ph.D., Associate Professor
 J. M. HIGBEE, D.V.M., Assistant Professor
 M. W. STROMBERG, D.V.M., Ph.D., Assistant Professor
 E. A. USENIK, D.V.M., Ph.D., Assistant Professor
 NOBUKO MIZUNO, Ph.D., Research Associate
⁵⁶F. A. AHRENS, D.V.M., Instructor
 D. M. BARNES, D.V.M., Instructor
 W. J. BENRICK, Ph.D., Instructor
 E. N. BERGMAN, D.V.M., Ph.D., Instructor
⁵⁷W. F. CATES, D.V.M., Instructor
 D. H. CLIFFORD, D.V.M., M.Ph., Ph.D., Instructor
 R. H. DUNLOP, D.V.M., Instructor
 H. E. DZIUK, D.V.M., M.S., Instructor
 I. M. GOURLEY, D.V.M., B.S., Instructor
⁵⁸LYLE J. HANSON, D.V.M., B.S., Instructor
 S. E. HELD, D.V.M., B.S., Instructor
⁵⁹D. D. JOEL, D.V.M., Instructor
 D. W. JOHNSON, D.V.M., B.S., Instructor
⁶⁰C. T. LARSEN, D.V.M., Instructor
 N. O. NIELSEN, D.V.M., Instructor
⁶¹VICTOR PERMAN, D.V.M., B.S., Instructor
 J. C. SCHOTTHAUER, D.V.M., B.S., Instructor
⁶²R. M. SCHWARTZMAN, D.V.M., Instructor
⁶³D. L. SIME, D.V.M., Instructor
 A. W. STINSON, D.V.M., B.S., Instructor
⁶⁴J. T. TUMLIN, D.V.M., M.S., Instructor
 W. M. WASS, D.V.M., B.S., Instructor
 D. A. WILLIGAN, D.V.M., M.S., Instructor
 GRISELDA F. WOLF, D.V.M., M.S., Instructor
⁶⁵A. L. ARONSON, D.V.M., M.S., Research Fellow
 R. A. BALL, D.V.M., Research Fellow

⁵⁶ Appointed June 16, 1959.

⁵⁷ Appointed September 1, 1958.

⁵⁸ Resigned September 30, 1958.

⁵⁹ Appointed July 1, 1958.

⁶⁰ Appointed November 15, 1958.

⁶¹ On leave August 1, 1958 to September 1, 1959.

⁶² Resigned June 30, 1959.

⁶³ Appointed June 16, 1959.

⁶⁴ Resigned September 30, 1958.

⁶⁵ Appointed November 16, 1958.

HELENE BRUMFIELD, Ph.D., Research Fellow
⁶⁶R. E. ENGEL, D.V.M., Research Fellow
⁶⁷D. D. HAGEN, D.V.M., Research Fellow
 R. C. HERSCHLER, D.V.M., B.S., Research Fellow
 K. I. LOKEN, D.V.M., Ph.D., Research Fellow
 O. H. OSBORN, D.V.M., M.Ph., Research Fellow
 C. E. STEVENS, D.V.M., Ph.D., Research Fellow
⁶⁸A. C. STRAFUSS, D.V.M., M.S., Research Fellow
 P. SUBRAMANYAM, B.V.S., Research Fellow
 J. P. SULLIVAN, D.V.M., B.S., Research Fellow

RURAL SOCIOLOGY

M. J. TAVES, Ph.D., Associate Professor
 R. G. FRANCIS, Ph.D., Associate Professor
⁶⁹M. L. TAYLOR, Ph.D., Instructor

INFORMATION SERVICE

HAROLD B. SWANSON, M.S., Professor and Editor
 G. R. MCKAY, M.S., Associate Professor and Extension Visual Aids Specialist
 R. S. WOLF, B.S., Associate Professor and Extension Information Specialist
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 EARL BRIGHAM, M.A., Instructor and Agricultural Bulletin Editor
 PHILIP TICHENOR, M.S., Instructor and Extension Information Specialist
 MRS. MAXINE A. LARSON, B.A., Editorial Assistant

AGRICULTURAL EXPERIMENT STATION—ROSEMOUNT

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

NORTH CENTRAL EXPERIMENT STATION

⁷⁰WILLIAM MATALAMAKI, M.S., Assistant Professor and Superintendent
 R. B. AAKRE, B.S., Assistant Professor
 C. H. GRIFFITH, B.S., M.Ph., Assistant Professor
 R. H. ANDERSON, B.S., Instructor, Project Supervisor
 W. H. CROMELL, B.S., Instructor
 N. H. GRIMSBO, B.S., Instructor
 A. B. SALMELA, Ph.D., Instructor

⁶³ Appointed October 20, 1958.

⁶⁷ Appointed September 8, 1958.

⁶⁸ Appointed January 1, 1959.

⁶⁹ Appointed July 16, 1958.

⁷⁰ On leave July 1 to September 30, 1958.

NORTHEAST EXPERIMENT STATION

R. S. GRANT, M.S., Associate Professor and Superintendent
W. W. NELSON, Ph.D., Instructor and Assistant Superintendent

NORTHWEST EXPERIMENT STATION

B. E. YOUNGQUIST, Ph.D., Assistant Professor and Superintendent
O. C. SOINE, Ph.D., Associate Professor
B. C. BERESFORD, M.S., Assistant Professor
E. C. FREDERICK, Ph.B., Assistant Professor
E. C. MILLER, M.S., Assistant Professor
A. M. PILKEY, Assistant Professor
H. W. SODERBURG, M.S., Assistant Professor
DIEDRICH REIMER, M.S., Instructor

SOUTHERN EXPERIMENT STATION

R. E. HODGSON, M.S., Professor and Superintendent
H. C. MATSON, M.A., Assistant Professor
K. P. MILLER, Ph.D., Assistant Professor
J. R. THOMPSON, M.S., Assistant Professor
D. A. TURNER, Ph.D., Assistant Professor and Principal

WEST CENTRAL EXPERIMENT STATION

⁷¹A. W. EDSON, M.S., Professor and Superintendent
⁷²H. G. CROOM, M.A., Assistant Professor and Principal, Acting Superintendent
W. H. GRAY, M.S., Assistant Professor
⁷³L. K. LINDOR, M.S., Assistant Professor
R. E. SMITH, M.S., Assistant Professor
HARLEY HANKE, M.S., Instructor
⁷⁴ROBERT HANSON, Ph.D., Instructor
ROY THOMPSON, B.S., Instructor

⁷¹ Deceased September 29, 1958.

⁷² Acting superintendent October, 1958 to June 30, 1959.

⁷³ On leave September 29, 1958 to June 30, 1959.

⁷⁴ Resigned June 1, 1959.