

SIXTY-NINTH ANNUAL REPORT

Agricultural Experiment Station
University of Minnesota

JULY 1, 1961 TO JUNE 30, 1962



UNIVERSITY OF MINNESOTA

ST. PAUL CAMPUS



LETTERS OF TRANSMITTAL

University of Minnesota, Minneapolis, Minn.
July 1, 1962

*To His Excellency, Elmer L. Andersen,
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, 1962.

Respectfully transmitted,

O. MEREDITH WILSON,
President of the Board of Regents

University of Minnesota, Minneapolis, Minn.
July 1, 1962

*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, 1962.

Respectfully transmitted,

O. MEREDITH WILSON,
President of the University of Minnesota

University of Minnesota, St. Paul, Minn.
July 1, 1962

*O. Meredith Wilson,
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, 1962.

Respectfully transmitted,

H. J. SLOAN,
Director of the Agricultural Experiment Station

SIXTY-NINTH ANNUAL REPORT

July 1, 1961 to June 30, 1962

H. J. Sloan, Director

William F. Hueg, Jr., Assistant Director

FOREWORD

A SIGNIFICANT CHANGE WAS MADE in the Experiment Station this year. M. F. Kernkamp, who served as the assistant director since 1956, was appointed head of the Department of Plant Pathology and Botany on July 1, 1961. On May 16, 1962, William F. Hueg, Jr. became the assistant director. He brings a wide background of experience in animal and plant science in research, teaching, and extension. He was an extension agronomist since 1957. He now assists generally with Station activities, but has special responsibility for coordinating research between the branch stations and the St. Paul Campus.

The Supreme Court decision to enforce the constitutional provision for limitation of borrowing halted development of the physical facilities aspect of our program. However, the passage of Amendment 2 in November 1962 makes it possible for us to plan on facilities approved by the 1961 Legislature.

A new Federal installation materialized this past year—the Federal Forest Research Laboratory at the Grand Rapids Station. Land was also made available on the St. Paul Campus for construction of a building for the Lake States Forest Experiment Station. This is scheduled for completion in 1963. Space in Green Hall will then be released to the School of Forestry for expansion of its teaching and research program.

The past year saw initiation of some major programs. One concerns soybean research made possible by an appropriation of \$50,000 per year. The work originally was started in the Departments of Plant Pathology and Botany and Agronomy and Plant Genetics. The research presently centers around development of a suitable bean for export.

Another new effort is research in the economics of consumption. A joint position was created between the School of Home Economics and the Department of Agricultural Economics.

A third development is in family relations. A new position was created jointly by the School of Home Economics and the Department of Sociology.

For the first time there was a specific designation for use of Hatch funds in 1961-62. One third of the increase in the Hatch appropriation was designated for expansion of weed research. Studies in agronomy now emphasize cultural and chemical control; in plant pathology, physiology of herbicides in plants; and in soils, the problem of effect on soil micro-organisms.

Generally, increases in both Federal and State funds this past year hardly met increased costs of research. The National Science Foundation

estimates indicate that such costs increase approximately 6 to 7 percent per year. So new programs started in the departments were developed through internal readjustment of departmental programs. There was a slight increase in grant funds.

New varieties continue to appear. Three new field crop varieties were added to the recommended list: Goodfield oats, Lindarin soybeans, and Gold Top sweet clover. In the Department of Horticulture the new additions are the Minn-Autumn chrysanthemum and the Prairie Flower rose.

While no important new buildings were added to the campus, the Crops Research Building provided by the 1959 Legislature was opened in April 1962 for the crop science group. This building provides new opportunities for research because of the specialized research facilities included. A major change in the location of units was the move of the statistical group to the basement of North Hall.

A change was made at the West Central Station with the appointment of Ralph Smith as superintendent.

Director Sloan was granted a 3 months' leave (July, August, and September) to study agricultural problems in 15 African countries. He found a strong sense of urgency for the development of status by these newly independent countries. That great agricultural development is needed is obvious. Agriculture is their principal resource but more research is necessary. And they need more scientific personnel than can presently be provided by the countries themselves.

Their first goal seems to be food self-sufficiency. Variety must be provided in the diets including marked increases in protein foods. While there is great food production potential geographically, the technology, transportation, training, and literacy necessary for rapid development are not now present. These countries could become important competitors in respect to certain crops: cotton, sugar, tobacco, peanuts, and rice. Increasing research attention is being placed on these export crops.

In the Station's active research program the total number of active projects increased. The new projects show an increase for the year and the number of projects closed remains about the same. This increase results in part from additional appropriations and in part from the increase in grant funds. These figures demonstrate that the program is not inelastic and that readjustments continue to be made to keep research current.

The apparent decline in the total number of publications and number of copies represents a normal fluctuation. In certain years certain types of activities are stressed. In some years radio and TV may be given primary attention, depending on the nature of the extension program.

The analysis of the sources of funds for agricultural research does not show any appreciable change from year to year. However, in the last 7 years funds coming from such sources as the National Science Foundation, the National Institute of Health, and the Atomic Energy Commission markedly increased. In the fiscal year 1955 about 4 percent of our total expenditures came from the above sources. In fiscal year 1962 this figure increased to approximately 13 percent. This represents primarily an increase in funds for basic research. Further analysis of our total program demonstrates that there is an increasing emphasis on funds for basic research. Excluding the work at the branch stations, about 40 percent of the program is directed toward fundamental research.

CHANGES IN STAFF

Appointments

L. E. Ahlrichs, M.S., instructor, Southern School and Experiment Station, August 1, 1961.

R. R. Allmaras, Ph.D., research associate, Department of Soil Science, August 16, 1961.

R. N. Andersen, Ph.D., assistant professor, Department of Agronomy and Plant Genetics, July 1, 1961.

D. J. Anderson, B.A., instructor, Northwest School and Experiment Station, September 16, 1961.

L. C. Ayres, M.S., research fellow, Department of Horticulture, March 1, 1962.

Marguerite C. Burk, Ph.D., professor, joint appointment with Department of Agricultural Economics and School of Home Economics, July 1, 1961.

W. C. Burrows, Ph.D., research associate, Department of Soil Science, August 16, 1961.

W. O. Caster, D.V.M., assistant professor, College of Veterinary Medicine, September 16, 1961.

C. E. Clapp, Jr., Ph.D., research associate, Department of Soil Science, July 1, 1961.

J. B. K. Clark, M.S., research fellow, Department of Dairy Husbandry, August 16, 1961.

W. M. Clement, Ph.D., assistant professor, Department of Agronomy and Plant Genetics, July 1, 1961.

V. E. Comstock, Ph.D., assistant professor, Department of Agronomy and Plant Genetics, July 1, 1961.

R. L. Cooper, Ph.D., research associate, Department of Agronomy and Plant Genetics, December 16, 1961.

R. P. Covey, Ph.D., research fellow, Department of Plant Pathology and Botany, January 1, 1962.

Margaret D. Doyle, Ph.D., assistant professor, School of Home Economics, September 16, 1961.

H. E. Dziuk, D.V.M., Ph.D., assistant professor, College of Veterinary Medicine, August 16, 1961.

R. J. Farnsworth, D.V.M., instructor, College of Veterinary Medicine, June 15, 1962.

D. R. Finco, D.V.M., research fellow, College of Veterinary Medicine, July 1, 1961.

Natalie S. Gallagher, M.S., assistant professor, School of Home Economics, September 16, 1961.

H. J. Hopen, Ph.D., assistant professor and assistant superintendent, Northeast Experiment Station, January 16, 1962.

J. P. Houck, Jr., M.S., instructor, Department of Agricultural Economics, March 16, 1962.

E. F. Jankus, D.V.M., instructor, College of Veterinary Medicine, July 1, 1961.

H. H. John, M.S., instructor, School of Forestry, July 1, 1961.

L. G. Kahn, M.A., research associate, Department of Agricultural Economics, April 2, 1962.

M. F. Kernkamp, Ph.D., professor and head, Department of Plant Pathology and Botany, July 1, 1961.

P. C. Kersavage, M.S., instructor, School of Forestry, August 16, 1961.

R. J. Kunze, Ph.D., research associate, Department of Soil Science, May 1, 1962.

C. H. Kvamme, B.S., instructor, Northwest School and Experiment Station, October 1, 1961.

J. P. Mazzitelli, B.A., instructor, Northwest School and Experiment Station, September 16, 1961.

W. D. McFarland, Jr., D.V.M., instructor, College of Veterinary Medicine, June 15, 1962.

William Merrill, Jr., M.S., instructor, Department of Plant Pathology and Botany, July 1, 1961.

G. H. Nelson, D.V.M., assistant professor, College of Veterinary Medicine, September 1, 1961.

R. A. Schultz, D.V.M., research fellow, Department of Dairy Husbandry, July 1, 1961.

R. J. Sirny, Ph.D., professor, School of Home Economics, August 1, 1961.

M. A. Straus, Ph.D., professor, School of Home Economics, August 16, 1961.

Marcella M. Strobel, B.S., instructor, Northwest School and Experiment Station, September 1, 1961.

T. W. Sudia, Ph.D., assistant professor, Department of Plant Pathology and Botany, October 1, 1961.

Aileen M. Swansburg, M.S., instructor, School of Home Economics, September 16, 1961.

D. B. Thorud, M.S., instructor, School of Forestry, September 11, 1961.

R. R. Weyrick, M.F., instructor, School of Forestry, July 1, 1961.

D. B. White, Ph.D., assistant professor, Department of Horticulture, July 1, 1961.

L. G. Wilken, B.S., instructor, West Central School and Experiment Station, September 16, 1961.

Gloria M. Williams, M.A., instructor, School of Home Economics, September 16, 1961.

D. L. Winkelmann, M.S., research fellow, Department of Agricultural Economics, October 2, 1961.

Promotions

R. E. Anderson, M.S., research fellow, Department of Agronomy and Plant Genetics, July 1, 1961.

D. C. Baker, Ph.D., assistant professor, Department of Soil Science, July 1, 1961.

E. V. Bakuzis, Ph.D., assistant professor, School of Forestry, July 1, 1961.

G. R. Blake, Ph.D., professor, Department of Soil Science, July 1, 1961.

H. C. Chiang, Ph.D., professor, Department of Entomology, Fisheries, and Wildlife, July 1, 1961.

Marie H. Christenson, M.S., assistant professor, School of Home Economics, September 16, 1961.

E. C. Frederick, Ph.D., associate professor, Northwest School and Experiment Station, July 1, 1961.

A. L. Good, V.M.D., Ph.D., professor, College of Veterinary Medicine, July 1, 1961.

E. F. Graham, Ph.D., professor, Department of Dairy Husbandry, July 1, 1961.

R. S. Grant, M.S., professor and superintendent, Northeast Experiment Station, July 1, 1961.

P. B. Hammond, D.V.M., Ph.D., professor, College of Veterinary Medicine, July 1, 1961.

C. V. Hess, Ph.D., professor, Department of Agricultural Economics, July 1, 1961.

J. M. Higbee, D.V.M., professor and head, Veterinary Diagnostic Laboratories, College of Veterinary Medicine, July 1, 1961.

K. J. Kasha, M.S., research fellow, Department of Agronomy and Plant Genetics, July 1, 1961.

O. E. Kolari, Ph.D., associate professor, Department of Animal Husbandry, July 1, 1961.

A. J. Linck, Ph.D., professor, Department of Plant Pathology and Botany, July 1, 1961.

D. G. Low, D.V.M., Ph.D., professor, College of Veterinary Medicine, July 1, 1961.

Josephine B. Nelson, M.A., associate professor and extension assistant editor, Information Service, July 1, 1961.

T. R. Nodland, Ph.D., professor, Department of Agricultural Economics, July 1, 1961.

D. C. Rasmusson, Ph.D., assistant professor, Department of Agronomy and Plant Genetics, July 1, 1961.

R. H. Rust, Ph.D., associate professor, Department of Soil Science, July 1, 1961.

R. E. Smith, M.S., assistant professor and acting superintendent, West Central School and Experiment Station, July 1, 1961; and to assistant professor and superintendent, West Central School and Experiment Station, December 1, 1961.

L. A. Snyder, Ph.D., professor, Department of Agronomy and Plant Genetics, July 1, 1961.

M. J. Taves, Ph.D., professor, Department of Rural Sociology, July 1, 1961.

J. R. Tester, Ph.D., assistant professor, Department of Entomology, Fisheries, and Wildlife, July 1, 1961.

E. L. Thomas, Ph.D., professor, Department of Dairy Industries, July 1, 1961.

W. M. Wass, D.V.M., Ph.D., assistant professor, College of Veterinary Medicine, July 1, 1961.

T. F. Waters, Ph.D., associate professor, Department of Entomology, Fisheries, and Wildlife, July 1, 1961.

L. M. Wax, M.S., research fellow, Department of Agronomy and Plant Genetics, April 1, 1962.

R. D. Wilcoxson, Ph.D., associate professor, Department of Plant Pathology and Botany, July 1, 1961.

J. B. Williams, Ph.D., professor, Department of Dairy Husbandry, July 1, 1961.

Resignations

V. F. Amann, Ph.D., instructor, Department of Agricultural Economics, February 15, 1962, to accept position as assistant professor, Oklahoma State University, Stillwater, working at the Imperial Ethiopian College of Agricultural and Mechanical Arts, Dire Dawa, Ethiopia.

D. E. Baker, Ph.D., assistant professor and assistant superintendent, Northeast Experiment Station, August 8, 1961, to accept position as assistant professor, Pennsylvania State University, University Park.

H. N. Benson, Ph.D., research fellow, College of Veterinary Medicine, September 15, 1961, to accept position with Federal government in Ames, Iowa.

Margaret S. Collins, Ph.D., research fellow, Department of Entomology, Fisheries, and Wildlife, September 15, 1961, to return to her position as professor, Florida A and M University, Tallahassee.

Robert Dornquast, B.A., instructor, Northwest School and Experiment Station, July 18, 1961, to take graduate work at the University of North Dakota, Grand Forks.

E. I. Fuller, M.S., instructor, Department of Agricultural Economics, August 31, 1961, to accept position as assistant professor, University of Massachusetts, Amherst.

R. J. Goodman, M.S., research fellow, Department of Agricultural Economics, August 31, 1961, to accept position as extension economist, North Dakota State University, Fargo.

G. D. Hansen, M.A., research fellow, Department of Rural Sociology, June 30, 1962, to accept position with State of Michigan Commission on Aging, Lansing.

B. L. Johnson, D.V.M., instructor, College of Veterinary Medicine, June 30, 1962, to enter private practice.

F. K. S. Koo, Ph.D., research fellow, Department of Agronomy and Plant Genetics, July 15, 1961, to accept position at Nuclear Center, College Station, Mayaguez, Puerto Rico.

Margaret E. Larsen, M.A., instructor, Northwest School and Experiment Station, September 6, 1961, to accept position at Virginia Junior College, Virginia, Minn.

R. E. Meisenholder, B.A., instructor, Northwest School and Experiment Station, July 18, 1961, to accept work outside of the teaching profession.

J. C. Murphy, D.V.M., instructor, College of Veterinary Medicine, June 30, 1962, after completing his residency at the Veterinary Clinic, to do graduate work in the Department of Pathology, Colorado State University, Fort Collins.

D. C. Nelson, Ph.D., research fellow, Department of Horticulture, September 30, 1961, to accept position as assistant professor at North Dakota State University, Fargo.

J. D. Olsen, D.V.M., instructor, College of Veterinary Medicine, June 30, 1962, after completing his residency at the Veterinary Clinic, to work

in the Department of Pathology, Animal Disease Eradication, USDA, Iowa State University, Ames.

W. A. Olson, M.S., research fellow, Department of Dairy Husbandry, January 31, 1962, to accept position as research nutritionist at Pfizer Co., Terre Haute, Ind.

Marcella M. Strobel, B.S., instructor, Northwest School and Experiment Station, June 30, 1962, to accept other work.

C. A. Tervola, D.V.M., research fellow, College of Veterinary Medicine, October 15, 1961, to enter private practice in Hastings, Minn.

J. C. Theurer, Ph.D., research fellow, Department of Agronomy and Plant Genetics, May 15, 1962, to accept position as research agronomist, USDA Sugar Beet Investigations, Utah State University, Logan.

R. G. Thompson, M.S., instructor, Department of Agricultural Economics, August 31, 1961, to accept position as assistant professor, Texas A and M College, College Station.

C. D. Whiting, B.A., instructor, Northwest School and Experiment Station, July 18, 1961, to accept teaching position at Central High School, Crookston, Minn.

Retirements

W. B. Barron, instructor, Northwest School and Experiment Station, April 16, 1962.

A. M. Pilkey, assistant professor, Northwest School and Experiment Station, November 30, 1961.

Leaves of Absence

D. M. Barnes, D.V.M., instructor, College of Veterinary Medicine, July 1, 1961 to June 30, 1962, to carry on special work dealing with anaerobic organisms at Montana State College, Bozeman, under direction of Dr. Lewis Smith, Department of Bacteriology.

C. R. Burnham, Ph.D., professor, Department of Agronomy and Plant Genetics, October 1, 1961 to December 31, 1961, to be a guest professor at Department of Agronomy, Purdue University, Lafayette, Ind.

R. S. Caldecott, Ph.D., associate professor, Department of Agronomy and Plant Genetics, June 1, 1961 to July 31, 1963, to head Biology Branch, Atomic Energy Commission, Washington, D.C., as geneticist in biology.

W. W. Cochrane, Ph.D., professor, Department of Agricultural Economics, July 1, 1961 to June 30, 1962, to serve as Director of Agricultural Economics, USDA, Washington, D.C.

D. F. Fienup, Ph.D., associate professor, Department of Agricultural Economics, July 1, 1961 to August 30, 1961, to conduct a study on effects of Federal grading on the market structure and pricing of lambs. Study was made at the request of Congress and by direction of the Secretary of Agriculture.

Robert Jenness, Ph.D., professor, Department of Biochemistry, September 16, 1961 to June 30, 1962, to study at the Netherlands Institute for Dairy Research, Ede.

D. R. Johnston, B.S., research fellow, Department of Agronomy and Plant Genetics, September 11-24, 1961, to perform active duty for training in U. S. Naval Station.

Thor Kommedahl, Ph.D., associate professor, Department of Plant Pathology and Botany, September 1, 1961 to August 31, 1962, to study and do research at the Waite Agricultural Institute, Adelaide, Australia.

E. W. Learn, Ph.D., associate professor, Department of Agricultural Economics, April 2, 1962 to June 30, 1962, to assume responsibilities with the Federal Reserve Bank of Minneapolis regarding the Upper Midwest Economic Study.

G. W. Mather, D.V.M., Ph.D., professor, College of Veterinary Medicine, August 1, 1961 to June 30, 1962, to carry out special work in the use of radioactive isotopes and radiobiology, Brookhaven National Laboratories, Upton, Long Island, N.Y.

M. P. Meyer, Ph.D., associate professor, School of Forestry, September 1, 1961 to June 1, 1962, to go on a Fulbright Lectureship, School of Forestry, Agricultural College of Norway, Vollebakk.

M. B. Moore, M.S., instructor, Department of Plant Pathology and Botany, February 1, 1962 to August 31, 1962, to serve as consultant to the Alaska Agricultural Experiment Station, Palmer.

H. A. Morris, Ph.D., professor, Department of Dairy Industries, August 20, 1961 to September 2, 1961, to perform military reserve duty at Fort Lee, Vir.

J. C. Olson, Jr., Ph.D., professor, Department of Dairy Industries, November 26, 1961 to December 9, 1961, to perform military reserve duty at the office of the Chief of Research and Development, Department of Army, Washington, D.C.

P. M. Raup, Ph.D., professor, Department of Agricultural Economics, July 1, 1961 to August 31, 1961, to study land value and land use changes associated with rapid urban growth and industrial expansion in Europe and the United Kingdom.

R. N. Shoffner, Ph.D., professor, Department of Poultry Science, February 16, 1962 to February 1, 1963, to serve as a Fulbright lecturer, University of Queensland, Brisbane, Australia.

H. J. Sloan, Ph.D., director, Agricultural Experiment Station and professor, Department of Poultry Science, July 1, 1961 to September 30, 1961, to study research in Africa.

L. A. Snyder, Ph.D., professor, Department of Agronomy and Plant Genetics, July 1, 1961 to June 30, 1962, to do research at the Institute of Animal Genetics, Edinburgh, Scotland.

J. R. Thompson, M.S., assistant professor, Southern Experiment Station, December 1, 1961 to May 31, 1962 to pursue graduate study at Iowa State University, Ames.

P. J. Tichenor, M.S., instructor, Information Service, July 1, 1961 to June 30, 1962, to attend Stanford University, Stanford, Calif.

Deaths

J. B. Fitch, M.S., professor emeritus, Department of Dairy Husbandry, February 10, 1962.

T. W. Gullickson, Ph.D., professor emeritus, Department of Dairy Husbandry, September 30, 1961.

A. M. Pilkey, assistant professor, Northwest School and Experiment Station, January 26, 1962.

PUBLICATIONS

Agricultural Experiment Station

General Bulletin Series

457. *Alternative Dairy Chore Systems in Loose Housing*. E. I. Fuller and H. R. Jensen, 40 pages, 7,500.

459. *Profitable Adjustments in Farming in East Central Minnesota*. L. M. Day, H. R. Jensen, and W. B. Sundquist, 28 pages, 6,000.

460. *Profitable Adjustments in Farming in Central Minnesota*. W. B. Sundquist, L. M. Day, and H. R. Jensen, 32 pages, 6,000.

461. *Incorporating the Family Farm Business*. R. H. Beck and P. M. Raup, 36 pages, 7,500.

Minnesota Farm and Home Science

Volume XIX, Number 1, 24 pages, 17,500.

Volume XIX, Number 2, 24 pages, 17,600.

Volume XIX, Number 3, 24 pages, 17,900.

Reprints of articles (29), 66 pages, 11,030.

Report Series

Sixty-Eighth Annual Report of the Minnesota Agricultural Experiment Station, July 1, 1960 to June 30, 1961. 52 pages, 2,500.

*Miscellaneous Report 24. *Varietal Trials of Farm Crops*. R. G. Robinson and Agronomy Department, 36 pages, 20,000.

*Miscellaneous Report 28. *1961 Minnesota Hybrid Corn Performance Trials*. R. H. Peterson, E. H. Rinke, and J. C. Sentz, 44 pages, 11,000.

Miscellaneous Report 47. *Minn-Autumn—1962 Chrysanthemum Introduction*. R. E. Widmer and R. A. Phillips, 2 pages, 5,000.

Miscellaneous Report 48. *The University of Minnesota Landscape Arboretum—A Progress Report*. L. C. Snyder, 24 pages, 5,500.

Miscellaneous Report 49. *Viking Queen—A New University of Minnesota Rose for 1963*. R. A. Phillips, 2 pages, 5,000.

Agricultural Extension Service

Bulletin Series

134. (Revised) *Soybeans for Minnesota*. W. F. Hueg, Jr., H. J. Otto, J. W. Lambert, A. C. Caldwell, and B. W. Kennedy, 20 pages, 20,000.

* Revised annually

204. (Revised) *Beekeeping in Minnesota*. M. H. Haydak, 40 pages, 7,500.
255. (Revised) *The Home Fruit Planting*. E. T. Andersen, 28 pages, 10,000.
266. (Reprint) *Road to Better Meetings*. Charlotte Kirchner and R. R. Pinches, 16 pages, 5,000.
267. (Reprint) *Woody Plants for Minnesota*. C. G. Hard and M. E. Smith, 36 pages, 10,000.
291. (Reprint) *Smooth Surface Floor Coverings*. Myra Zabel, 8 pages, 25,000.
293. (Reprint) *Outdoor Cookery for the Family*. Reprint from Michigan State University, 32 pages, 15,000.
295. (Reprint) *Perennials for Minnesota*. C. G. Hard, 36 pages, 5,000 and 10,000.
297. (Reprint) *How to Choose . . . How to Cook . . . Beef*. Verna Mikesh, 16 pages, 15,000.
300. *Field Peas for Seed and Forage*. R. G. Robinson and O. C. Soine, 12 pages, 5,000.
301. *Blankets for Warmth—Buying and Care*. Suzanne Davison and Myra Zabel, 8 pages, 17,000.
302. *Millet, Annual Canarygrass, and Buckwheat Production in Minnesota*. R. G. Robinson, 16 pages, 5,000.

Pamphlet Series

184. (Revised) *Home Fruit Spray Guide*. J. A. Lofgren, H. G. Johnson, and O. C. Turnquist, 8 pages, 5,000.
184. (Reprint) *Home Fruit Spray Guide*. J. A. Lofgren, H. G. Johnson, and O. C. Turnquist, 8 pages, 10,000.
- *194. (Revised) *1962 Crop Production Guide for Minnesota*. W. F. Huog, Jr., H. J. Otto, C. J. Overdahl, L. D. Hanson, and M. V. Halverson, 2 pages, 5,000.
206. (Reprint) *How Much Are Your Cows Paying You?* R. W. Wayne, C. L. Wilcox, and J. W. Mudge, 4 pages, 26,000.

Folder Series

120. (Revised) *Making Lard At Home*. P. A. Anderson, 4 pages, 10,000.
- *154. (Revised) *Vegetable Varieties for Minnesota—1962*. O. C. Turnquist, 12 pages, 10,000.
- *154. (Reprint) *Vegetable Varieties for Minnesota—1962*. O. C. Turnquist, 12 pages, 5,000.
161. (Reprint) *Pruning Fruit Trees*. T. S. Weir and L. C. Snyder, 10 pages, 10,000.
164. (Reprint) *Getting Started with Your Vegetable Garden*. O. C. Turnquist, 10 pages, 7,500.
167. (Revised) *Summer Care of Vegetable Gardens*. O. C. Turnquist, 10 pages, 10,000.

* Revised annually

182. (Revised) *Forage Mixtures*. Department of Agronomy and Plant Genetics, 8 pages, 10,000.
192. (Revised) *Fly Control for Livestock*. L. K. Cutkomp and J. A. Lofgren, 8 pages, 10,000.
200. (Reprint) *Barbecuing Poultry*. M. H. Swanson, 10 pages, 5,000.
211. (Reprint) *The Dutch Elm Disease*. D. W. French and A. C. Hodson, 8 pages, 10,000.
212. (Revised) *Cultural and Chemical Weed Control in Field Crops*. Richard Behrens, W. F. Hueg, Jr., H. J. Otto, and R. G. Robinson, 28 pages, 20,000.
218. *Today's Fibers*. Extension Clothing Specialist, 8 pages, 15,000.
219. *Genetics in Dairy Cattle Breeding*. C. L. Wilcox, J. W. Mudge, and R. W. Wayne, 8 pages, 10,000.

4-H Club Bulletin Series

9. (Revised) *The 4-H Dairy Project*. C. L. Wilcox, J. W. Mudge, and R. W. Wayne, 16 pages, 20,000.
31. (Revised) *4-H Beginner's Clothing*. Athelene Scheid, 32 pages, 20,000.
31. (Reprint) *4-H Beginner's Clothing*. Athelene Scheid, 32 pages, 12,000.
36. (Revised) *4-H Beginner's Home Improvement-Family Living*. Adapted, 20 pages, 20,000.
27. (Reprint) *4-H Electric Project*. A. M. Flikke and D. W. Bates, 24 pages, 5,000.

Newsletters

Name of publication	Issues	Pages	Circulation
<i>Best Buys</i>	24	96	48,400
<i>DHIA Newsletter</i>	5	20	29,875
<i>Dairy Products Newsletter</i>	2	8	1,930
<i>Farm Business Notes</i>	12	48	26,260
<i>Garden Fact Sheet</i>	7	21	1,400
<i>Hardwood Forest Products Newsletter</i> ..	3	8	3,900
<i>Helps for Home Agents</i>	17	65	2,295
<i>Home Agent Newsletter</i>	2	31	225
<i>Home Garden Tips</i>	4	12	2,580
<i>Minnesota Feed Service</i>	4	26	5,950
<i>Minnesota Florists' Newsletter</i>	6	74	3,000
<i>Nurserymen's Newsletter</i>	5	18	2,650
<i>Our Land</i>	11	49	7,315
<i>Radio Shorts</i>	52	162	11,940
<i>Reaching Rural People</i>	12	24	16,620
<i>Soil Fertility Notes</i>	2	8	5,100
<i>Visual Aids Tip Sheet</i>	12	24	8,400
<i>Yard 'n Garden</i>	4	15	1,080
Total	184	709	178,920

41. (Revised) *Quick Meals*. Grace Brill and Verna Mikesh, 20 pages, 10,000.
48. (Revised) *Picnics and Suppers—4-H Beginner's Foods*. Verna Mikesh, 32 pages, 8,000.
49. (Revised) *4-H Career Exploration for the Member*. Lois Ross and E. S. Bergerud, 26 pages, 1,000.
52. *4-H Junior Home Improvement-Family Living*. Adapted, 28 pages, 20,000.
53. *4-H Junior Leadership*. R. W. Bath, 12 pages, 20,000.
54. *4-H Dairy Herd Management Analysis Project*. R. W. Wayne, J. W. Mudge, and C. L. Wilcox, 14 pages, 1,000.
55. *4-H Demonstrations*. Delphia Dirks, 8 pages, 20,000.

Miscellaneous

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Veterinary Medicine

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4601. The clinical incidence of genital abnormalities in the cow. Raimunds Zemjanis, L. L. Larson, and R. P. S. Bhalla. *Journal of the American Veterinary Medical Association* 139(9):1015-1018. November 1, 1961.

4637. A clinical evaluation of the surgical removal of adult heartworms (*Dirofilaria immitis*) in the canine. I. M. G. Gourley. *Journal of the American Veterinary Medical Association* 139(6):684-690. September 15, 1961.

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4677. Feline dirofilariasis—a case report. H. J. Griffiths, J. C. Schlottbauer, and F. W. Gehrman. *Journal of the American Veterinary Medical Association* 140(1):61. January 1, 1962.

4681. Fascioloidiasis of cattle, sheep and deer in northern Minnesota. H. J. Griffiths. *Journal of the American Veterinary Medical Association* 140(4):342-347. February 1962.

4763. The characterization of staphylococcal toxins: I. The electrophoretic migration of the alpha hemolytic, dermonecrotic, lethal and leucocidal activities of crude toxin. Surendra Kumar and R. K. Lindorfer. *Journal of Experimental Medicine* 115(6):1095-1106. June 1, 1962.

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4782. A note on the occurrence of screwworm (*C. hominivorax*) in Minnesota. H. J. Griffiths and E. F. Cook. *Journal of the American Veterinary Medical Association* 140(12):1313. June 15, 1962.

Miscellaneous Journal Series Papers

Agricultural Economics

1077. Some price discrimination aspects in bank farm loan interest rates. R. P. Dahl. *Journal of Farm Economics* 44:126-140. February 1962.

Agronomy and Plant Genetics

1078. Rye—Elk, Caribou, Adams. R. G. Robinson and W. M. Myers. *Minnesota Seed Grower* 34(4):3-4. August 1961.

1104. Progress and problems in sugar beet weed control. R. N. Andersen. *Crystal-ized Facts About Sugar Beets* 16(1):13-20. Spring 1962.

1110. Moving corn-belt germ-plasm northward. E. H. Rinke and J. C. Sentz. *Proceedings of Annual Hybrid Corn Industry-Research Conference (Sixteenth)* December 6-7, 1961. pp. 53-56. 1961.

Animal Husbandry

1081. Boar prices and performance records. F. D. Enfield. *Minnesota Farm and Home Science* 19(1):6, 24. Fall 1961.

1082. Effects of virginiamycin on suckling and fattening lambs. R. M. Jordan. (Abstract) *Journal of Animal Science* 20:938. November 1961.

1083. Liothyronine and iodinated-casein treatment of lactating ewes. R. M. Jordan. (Abstract) *Journal of Animal Science* 20:974. November 1961.

1085. Profit with 16-cent lambs? R. M. Jordan. *The National Wool Grower* 51(10):14-15. October 1961.

1091. High-grain rations for pregnant ewes. R. M. Jordan. *Feedstuffs* 33(52):44-45. December 16, 1961.

1093. Minnesota beef cattle research reports. O. E. Kolari. *Feedstuffs* (46):66-68, 70. November 18, 1961.

1102. Greatest profit per lamb realized in drylot. R. M. Jordan and H. E. Hanke. *Feedlot* 4(3):52, 56-57. March 1962.

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Dairy Husbandry

1080. Cellulose digestion in the young calf. W. A. Olson. *Farm and Home Science* 19(1):3. Fall 1961.

1086. New ideas in freezing semen. E. F. Graham. *Proceedings of the Fourteenth Annual Convention of the National Association of Artificial Breeders Annual Meeting*, pp. 59-62. August 20-23, 1961.

1099. Feeding dairy cows for high production. C. L. Cole. *Guernsey Breeders' Journal* 109(8):638, 654. April 23, 1962.

1107. Our opportunities. C. L. Cole. *Milking Shorthorn Journal* 43(5): 6, 41. May 1962.

1115. Summer feeding of dairy cattle. J. D. Donker and G. C. Marten. *Minnesota Feed Service* pp. 4-5. May 1962.

Entomology, Fisheries, and Wildlife

1065. Überwinterring (In Ukrainian). M. H. Haydak. *Bienenwelt*, 3(10):221-223. 1961.

1094. Management of colonies for the main honey flow. M. H. Haydak. *Gleanings in Bee Culture* 90:202-204. 1962.

1111. Bees, too, need a balanced diet. M. H. Haydak. *Minnesota Farm and Home Science* 19(3):11, 21. Spring 1962.

School of Forestry

1076. Minnesota tree growth tax law. R. A. Skok. *Minnesota Forestry Notes* No. 107. July 1961.

Horticulture

1088. Progress report on plastic greenhouses, 1961. R. E. Widmer. *Minnesota State Florists Bulletin*. October 1961.

1103. Weed control in annual flowers. R. E. Widmer. *Minnesota State Florists Bulletin*. February 1962.

1105. A slow release fertilizer. R. E. Widmer. *Minnesota State Florists Bulletin*. February 1962.

1109. Short poinsettias with CCC. R. E. Widmer. *Minnesota State Florists Bulletin*. April 1962.

Plant Pathology and Botany

1089. Method for autoradiography using individually packaged X-ray film. A. J. Linck and T. W. Sudia. *International Journal of Applied Radiation and Isotopes* 10:55. 1961.

1090. Moisture content, storage molds, and spoilage of stored grains. C. M. Christensen. Multilith release at the meetings of the American Society of Agricultural Engineers, pp. 1-2. December 1961.

1095. Cytospora canker in Minnesota. D. W. French. *National Shade Tree Conference Report*, pp. 126-128. 1962.

1096. More problems for strawberry growers. B. W. Kennedy and T. H. King. *Minnesota Farm and Home Science* 19(2):3. Winter 1962.

1100. Deterioration of stored grains by fungi (Die Beziehung zwischen dem Pilzbefall wahred der Lagerung und der Qualitat des gelagerten Getreides). C. M. Christensen. Multilithed and distributed at the meeting of German Cereal Chemists Society in Detmold, Germany, pp. 108-134. May 15, 1962.

College of Veterinary Medicine

1070. Pregnancy diagnosis in the mare. Raimunds Zemjanis. *Journal of the American Veterinary Medical Association* 139(5):543-547. September 1, 1961.

Summary of Journal Series Papers

Department	Scientific journal series		Miscellaneous journal series	
	Number issued	Number of pages	Number issued	Number of pages
Agricultural Economics	0	0	1	15
Agricultural Engineering	3	13	0	0
Agronomy and Plant Genetics	7	22	3	14
Animal Husbandry	14	50	9	19
Biochemistry	4	28	0	0
Dairy Husbandry	12	13	5	26
Dairy Industries	1	3	0	0
Entomology, Fisheries, and Wildlife	24	196	3	8
Forestry	15	117	1	2
Home Economics	0	0	0	0
Horticulture	7	11	4	17
Plant Pathology and Botany	45	173	5	34
Poultry Science	18	73	0	0
Soil Science	7	43	0	0
College of Veterinary Medicine	23	129	1	5
	<hr/>	<hr/>	<hr/>	<hr/>
Total publications—212	180	871	32	140

Summary of Publications
July 1961-June 1962

Kind of publication	Number issued	Number of pages	Number of copies
General bulletin series	4	136	27,000
<i>Minnesota Farm and Home Science</i>	3	72	53,000
Report series	6	160	49,000
Agricultural Extension Service			
Bulletins	12	268	149,500
Pamphlets	4	22	46,000
Folders	13	136	132,500
4-H Club bulletins	12	264	157,000
Miscellaneous	4	48	19,500
Fact sheets	76	152	256,000
Information Service series	11	22	11,500
Communications bulletins	10	20	3,100
Newsletters	16	74	42,270
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	171	1,374	946,370

NEW EXPERIMENT STATION PROJECTS**Administration**

2816. Milk and butterfat secretion models.

Agricultural Economics

- 1146H. Production adjustments and supply response for hog and beef cattle production in Minnesota.
1147. The impact of alternative methods of taxation on Minnesota farmers.
1148H. Coordinated egg production and marketing programs in Minnesota.
1149R. Impact of changing conditions on grain marketing institutions and the structure of grain markets.
1150R. Tenure arrangements for low equity tenants.

Agricultural Engineering

1220. Agricultural engineering research at Rosemount.
1221. Studies of the design criteria for farmstead wiring as influenced by higher voltages, three-phase power supply, and the area concept of wiring.
1222H. Studies on the improvement of potato harvesting, handling, and storage equipment.

Agronomy and Plant Genetics

1330. Crop improvement and weed control at Rosemount.
1331H. Genetic control of physiological processes in plants.
1332H. The influence of environment on herbicides in plants and soils.

Animal Husbandry

1434. Animal husbandry research at Rosemount.
1435. Effects of linkage in finite cross-fertilizing organisms.

Biochemistry

1524. Modification of starch for industrial uses.

Dairy Husbandry

1625. Dairy cattle housing, management, and breeding at Rosemount.
1626. Physiology of the rumen.

Dairy Industries

1812. A study of the origin and control of hydrogen sulfide defect in cheddar cheese.

1813. Factors affecting the activity of bacteriophage specific for starter organisms.

Entomology, Fisheries, and Wildlife

1745H. The biology and control of insects which are related to plant diseases.

1746. Insecticidal action and stress in insects.

1747H. Resistance of plants to insect attack.

1748. The ecology and control of the eastern pocket gopher.

School of Forestry

1928. Farm woodlots, shelterbelts, and effective use of wood on farms at Rosemount.

1929H. Improving and increasing the utilization of aspen for fiber and particle products.

School of Home Economics

2025. Studies on congenital defects in folic acid deficiency.

2026. Study of food consumption of individuals related to economic and social factors.

2027. The measurement of family interaction.

Horticulture

2131H. Cold injury and hardiness in horticultural plants.

Plant Pathology and Botany

2233. The development of disease-resistant varieties of field crops at Rosemount.

2234H. Deterioration of wood and wood products.

2235H. Factors affecting the phytotoxicity of herbicides and the nature of their action.

Poultry Science

2326. Poultry breeding.

2327H. Maintenance of egg quality in market channels.

2328H. Composition and physical-chemical properties of the albumen and yolks of shell egg.

2329. Environmental factors influencing turkey reproduction.

Rural Sociology

2711. East Central Regional Library study.
 2712H. Characteristics of Minnesota's population.
 2713H. Origins of entrepreneurial orientation among high school boys.
 2714H. Spatial and socio-cultural change in rural church organization.

Soil Science

2527. Soil and grassland management at Rosemount.
 2528H. Soil factors influencing the fate and activity of selected herbicides in Minnesota soils.
 2529H. Trace element studies in Minnesota soils.

College of Veterinary Medicine

- 2638H. Studies on bovine infertility.

Summary of Projects

Department	Active	Closed	New
Administration	8	0	1
Agricultural Economics	32	6	5
Agricultural Engineering	15	3	3
Agronomy and Plant Genetics	28	1	3
Animal Husbandry	19	0	2
Biochemistry	14	0	1
Dairy Husbandry	13	0	2
Dairy Industries	13	0	2
Entomology, Fisheries, and Wildlife ...	28	6	4
Forestry	20	0	2
Home Economics	15	0	3
Horticulture	20	1	1
Plant Pathology and Botany	31	0	3
Poultry Science	19	3	4
Soil Science	25	0	3
College of Veterinary Medicine	21	3	1
Rural Sociology	9	0	4
Total	330	23	44

FINANCIAL STATEMENT

Income 1961-62

Sources of revenue	Branch stations									Total
	St. Paul Campus	Crookston	Morris	Grand Rapids	Itasca	Duluth	Waseca	Cloquet	Lamberton	
Federal appropriations										
Hatch Fund	\$ 658,466.00									\$ 658,466.00
Regional Research Fund	153,275.00									153,275.00
State appropriations										
General University support	1,185,360.14	116,391.11	63,100.03	63,805.17	3,289.84	82,703.31	74,604.02	19,170.49	38,258.68	1,646,682.79
Special appropriations	832,785.00									832,785.00
Endowments, fellowships, etc.	546,334.24									546,334.24
Fees, sales, miscellaneous	554,853.48	36,750.03	30,520.34	19,942.56	1,641.94	42,355.71	72,520.87	6,319.61	6,546.07	771,450.61
Total	\$3,931,073.86	\$153,141.14	\$ 93,620.37	\$83,747.73	\$4,931.78	\$125,059.02	\$147,124.89	\$25,490.10	\$44,804.75	\$4,608,993.64

Expenditures by Station 1961-62

Classification	Branch stations									Total
	St. Paul Campus	Crookston	Morris	Grand Rapids	Itasca	Duluth	Waseca	Cloquet	Lamberton	
Service and labor	\$2,867,714.25	\$110,690.71	\$ 66,980.02	\$61,618.20	\$2,426.09	\$ 70,778.23	\$ 86,108.95	\$16,264.50	\$28,531.71	\$3,311,112.66
Travel expense	59,726.91	3,795.98	2.52	229.08	46.58	465.94			154.65	64,421.66
Equipment	291,003.73	1,198.22	5,273.65	2,018.44	335.05	3,950.58	12,702.59	3,488.71	1,192.73	321,163.70
Lands	15,707.00	588.00	317.42	761.27	404.36		840.35		2,931.68	21,550.08
Personal benefits	32,426.66	3.20	13.33	73.33						32,516.52
Supplies and materials	409,400.19	18,565.69	13,421.75	11,668.28	957.04	30,081.17	29,752.19	1,791.26	4,576.82	520,214.39
Other services	255,095.12	18,299.34	7,611.68	7,379.13	762.66	19,783.10	17,720.81	3,945.63	7,417.16	338,014.63
Total	\$3,931,073.86	\$153,141.14	\$ 93,620.37	\$83,747.73	\$4,931.78	\$125,059.02	\$147,124.89	\$25,490.10	\$44,804.75	\$4,608,993.64

Expenditures by Fund 1961-62

Classification	Hatch Fund	Regional Research Fund	Nonfederal	Total
12 Services and labor	\$495,364.09	\$111,909.41	\$2,692,141.75	\$3,299,415.25
Administration	11,697.41	11,697.41
21 Travel	16,009.68	9,565.94	38,846.04	64,421.66
31 Equipment	59,537.98	6,633.83	254,991.89	321,163.70
32 Lands	500.00	21,050.08	21,550.08
41 Personal benefits	7,811.90	2,710.52	21,994.10	32,516.52
42 Supplies	43,474.73	15,959.25	460,780.41	520,214.39
43 All other	24,070.21	6,496.05	307,448.37	338,014.63
Total	\$658,466.00	\$153,275.00	\$3,797,252.64	\$4,608,993.64

EXPERIMENT STATION STAFF**The Board of Regents**

THE HON. DANIEL C. GAINEY, Owatonna	- - - - -	1967
THE HON. RICHARD L. CRIGGS, Duluth	- - - - -	1963
THE HON. BJARNE E. GROTTUM, Jackson	- - - - -	1967
THE HON. ROBERT E. HESS, St. Paul	- - - - -	1967
THE HON. MARJORIE J. HOWARD, Excelsior	- - - - -	1965
THE HON. FRED J. HUGHES, St. Cloud	- - - - -	1963
THE HON. A. I. JOHNSON, Benson	- - - - -	1965
THE HON. LESTER A. MALKERSON, Minneapolis	- - - - -	1965
THE HON. CHARLES W. MAYO, Rochester	- - - - -	1965
THE HON. A. J. OLSON, Renville	- - - - -	1967
THE HON. OTTO A. SILHA, Minneapolis	- - - - -	1963
THE HON. HERMAN F. SKYBERG, Fisher	- - - - -	1967

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- R. E. SMITH, M.S., superintendent, West Central Experiment Station, Morris
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 R. E. LARSON, M.S., agricultural engineer, USDA

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 V. E. COMSTOCK, Ph.D., assistant professor and research agronomist, USDA
 J. H. FORD, M.S., research agronomist, USDA
 G. C. MARTEN, Ph.D., research agronomist, USDA

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Agricultural Research

Nearly every farm in Minnesota today shows some practical result of the work done by the Agricultural Experiment Station. This unit of the Institute of Agriculture of the University of Minnesota carries on research in many widely varied fields. On the one hand, it seeks to develop new and better farm or home practices, crops, and animals. On the other, it seeks to increase our basic knowledge of nature, an end invaluable in itself.

The Experiment Station has about 300 research projects, ranging from improved diets for the family to better use of the products of our forests, and from a study of disease in plants or animals to the discovery of new markets for agricultural products. Results of this research are made available to the public through resident teaching facilities on campus, or through the off-campus work of the Agricultural Extension Service and its county agent organization.

The research is carried on at many places in the state. Some of it takes place in the laboratories and fields of the University's St. Paul Campus. Some is conducted at the Agricultural Experiment Station at Rosemount, or at the branch experiment stations—Crookston, Duluth, Grand Rapids, Lamber-ton, Morris, and Waseca.

Specialized research is carried on at the Fruit Breeding Farm and Arboretum, Excelsior; at the Potato Breeding Farm, Castle Danger; at the Forest Research Center, Cloquet; at the Hormel Institute, Austin; and at the Biological and Forestry Station, Lake Itasca. In addition, hundreds of Minnesota farmers each year cooperate with the Station in experiments on their own farms, either as individuals or in groups that may represent several counties.

Agricultural research in Minnesota has a broad scope. And its results underlie every major advance we make in modern agricultural knowledge or practice.

This publication is one of the many research reports issued by the University of Minnesota Agricultural Experiment Station. These reports—some more technical in nature—are distributed through your County Extension Agent or the Bulletin Room, University of Minnesota, Institute of Agriculture, St. Paul 1.
