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92nd

ANNUAL REPORT



JULY 1, 1977 TO
JUNE 30, 1978

The Nebraska Agricultural Experiment Station

The Agricultural Experiment Station
University of Nebraska-Lincoln
Institute of Agriculture and Natural Resources
H. W. Ottoson, Director



*Institute of Agriculture
and Natural Resources*

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Issued January 1979, 1,000

FOREWORD

The 92nd Annual Report of the Nebraska Agricultural Experiment Station contains a list of all active projects during July 1, 1977 to June 30, 1978, a list of Station publications, staff members, and a financial report. Information derived from the various research projects is published in bulletins, circulars, scientific and trade journals, in the *Nebraska Farm, Ranch and Home Quarterly* and as departmental reports. Station bulletins, circulars and the *Quarterly* may be obtained free from any county agricultural agent or by writing to the Director of the Experiment Station, University of Nebraska-Lincoln, Institute of Agriculture and Natural Resources, Lincoln, Nebraska, 68583. Reprints of most journal articles may be obtained by writing directly to the authors.

Howard W. Ottoson, Dean and Director
Agricultural Experiment Station

ADMINISTRATION AND STAFF

The Regents of the University

Robert G. Simmons, Jr., Scottsbluff
Kermit R. Hansen, Omaha
Robert R. Koefoot, Grand Island
James H. Moylan, Omaha
Robert J. Prokop, Omaha
Robert Raun, Minden
Edward Schwartzkopf, Lincoln
Kermit Wagner, Schuyler

University Administration

Ronald W. Roskens, President of the University of Nebraska
Roy A. Young, Chancellor of the University of Nebraska-Lincoln
Martin A. Massengale, Ph.D., Vice Chancellor, Institute of Agriculture and
Natural Resources

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Robert W. Kleis, Ph.D., Associate Director and Dean and Director, International
Programs
Millard W. Hall, Ph.D., Assistant Director and Director, Water Resources Center
Warren W. Sahs, Ph.D., Assistant Director and Supervisor, University Field
Laboratory
John C. Woodward, Ph.D., Assistant Director and Associate Dean, College of
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M. E. Baker^{1,2} Ph.D., Professor-Resource Economics
L. L. Bitney^{2,3} Ph.D., Professor-Farm Management
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B. B. Johnson^{1,2} Ph.D., Assistant Professor-Resource Economics
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L. H. Lutgen^{2,3} Ph.D., Assistant Professor-Marketing
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A. C. Wellman^{2,3} Ph.D., Associate Professor-Marketing

Agricultural Education

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J. T. Horner^{1,2,3} Ed.D., Professor-Methods of Instruction & Advanced Studies

1/ Teaching

2/ Station Staff

3/ Extension Staff

4/ Leave of Absence

5/ Cooperative, USDA

6/ Nebraska Forest Service

Agricultural Engineering

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 B. L. Blad^{1,2} Ph.D., Associate Professor-Agricultural Meteorology
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 P. E. Fischbach^{2,3} M.S., Professor-Irrigation Engineering
 C. B. Gilbertson^{2,5} M.S., Assistant Professor-Livestock Waste Management
 J. R. Gilley^{1,2} Ph.D., Associate Professor-Irrigation Engineering
 M. A. Hanna^{1,2} Ph.D., Assistant Professor-Food Engineering
 L. I. Leviticus² Ph.D., Professor-Tractor Testing
 G. E. Meyer^{1,2} Ph.D., Assistant Professor-Irrigation Engineering
 M. L. Mumgaard² B.S., Assistant Professor-Tractor Testing
 G. M. Petersen^{1,2} M.S., Associate Professor-Farm Structures
 N. J. Rosenberg^{1,2} Ph.D., Professor-Agricultural Meteorology
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 G. W. Steinbruegge^{1,2} M.S., Professor-Land Locomotion
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 S. B. Verma⁵ Ph.D., Assistant Professor-Agricultural Meteorology
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 H. D. Wittmuss^{1,2} Ph.D., Associate Professor-Natural Resources

Agronomy

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 O. C. Burnside^{1,2} Ph.D., Professor-Weed Science
 L. Chesnin^{1,2} Ph.D., Associate Professor-Soil Chemistry
 R. B. Clark^{2,5} Ph.D., Professor-Sorghum Physiology
 M. D. Clegg^{1,2} Ph.D., Associate Professor-Crop Physiology
 W. A. Compton^{1,2} Ph.D., Professor-Corn Breeding
 J. W. Doran^{1,2,5} Ph.D., Assistant Professor-Soil Biochemistry
 A. F. Dreier^{2,3} M.S., Professor-Crop Variety Evaluation
 J. D. Eastin^{1,2} Ph.D., Professor-Crop Physiology
 J. R. Ellis^{2,5} Ph.D., Assistant Professor-Soil Microbiology
 A. D. Flowerday^{1,2} Ph.D., Professor-Crop Production
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 C. O. Gardner^{1,2} Ph.D., Professor-Statistics, Genetics
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 L. C. Haderlie² Ph.D., Assistant Professor-Weed Physiology

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 J. W. Maranville^{1,2} Ph.D., Associate Professor-Sorghum Physiology
 A. R. Martin^{2,3} Ph.D., Associate Professor-Weed Science
 P. J. Mattern² M.A., Professor-Cereal Quality
 L. N. Mielke^{2,5} Ph.D., Assistant Professor-Soil Physics
 R. N. Mills² M.S., Associate Professor-Foundation Seed
 M. R. Morris^{1,2} Ph.D., Professor-Cytogenetics
 L. E. Moser^{1,2} Ph.D., Professor-Forage Physiology & Teaching Coordinator
 R. A. Olson^{1,2} M.S., Professor-Soil Fertility
 G. A. Peterson^{1,2} Ph.D., Professor-Soil Fertility
 W. M. Ross^{2,5} Ph.D., Professor-Sorghum Breeding
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 J. H. Williams^{1,2} Ph.D., Professor-Soybean Breeding

Animal Science

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 P. H. Cole^{2,3} M.S., Professor-Dairy Production
 P. J. Cunningham^{1,2} Ph.D., Professor-Swine Breeding
 F. E. Eldridge^{1,2} Ph.D., Professor-Dairy Breeding
 E. F. Ellington^{1,2} Ph.D., Professor-Beef Physiology
 S. D. Farlin^{1,2} Ph.D., Associate Professor-Beef Nutrition

G. W. Froning^{1,2,3} Ph.D., Professor-Poultry Products
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 B. D. Moser^{1,2,3} Ph.D., Associate Professor-Swine Nutrition
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 D. G. Olson^{1,2} Ph.D., Assistant Professor-Meats
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 J. K. Ward^{1,2} Ph.D., Professor-Beef Nutrition
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Biochemistry Laboratory

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 R. L. Borchers^{1,2} Ph.D., Professor-Nutritional Biochemistry
 R. Chollet² Ph.D., Associate Professor-Photosynthesis
 J. M. Daly^{1,2} Ph.D., Professor-Plant Intermediary Metabolism
 R. Dam^{1,2} Ph.D., Assistant Professor-Nutritional Biochemistry
 R. M. Hill^{1,2} Ph.D., Associate Professor-Protein Biochemistry
 R. V. Klucas^{1,2} B.S., Assistant Professor-Nitrogen Fixation
 R. L. Ogden² B.S., Assistant Professor-Alfalfa Processing
 F. W. Wagner^{1,2} Ph.D., Associate Professor-Enzymes

Entomology

E. A. Dickason^{1,2,3} Ph.D., Professor and Head of Department
 H. J. Ball^{1,2} Ph.D., Professor-Insect Physiology
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 R. Staples^{1,2} Ph.D., Professor-Insect Transmission of Plant Pathogens

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A. P. Handel^{1,2} Ph.D., Assistant Professor-Food Chemistry
T. E. Hartung^{1,2} Ph.D., Professor-Food Quality and Composition
R. B. Maxcy^{1,2} Ph.D., Professor-Food Microbiology
J. R. Rushing^{1,2} M.S., Assistant Instructor-Food Processing
L. D. Satterlee^{1,2} Ph.D., Professor-Food Protein Chemistry
K. M. Shahani^{1,2} Ph.D., Professor-Food Chemistry
S. E. Wallen^{2,3} Ph.D., Assistant Professor-Food Microbiology

Forestry, Fisheries and Wildlife

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W. T. Bagley^{1,2} M.S., Associate Professor-Forestry
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R. M. Case^{1,2} Ph.D., Associate Professor-Wildlife
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E. J. Peters^{1,2} Ph.D., Associate Professor-Wildlife
R. A. Read^{2,5} M.F., Associate Professor-Forestry
D. F. VanHaverbeke^{2,5} Ph.D., Associate Professor-Forestry

Horticulture

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D. P. Coyne^{1,2} Ph.D., Professor-Horticulture
E. J. Kinbacher^{1,2} Ph.D., Professor-Physiology
R. E. Neild^{1,2,3} Ph.D., Associate Professor-Horticulture
R. B. O'Keefe^{1,2,3} Ph.D., Professor-Horticulture
E. E. Pierson^{1,2} M.S., Instructor
S. S. Salac^{1,2,3} Ph.D., Assistant Professor-Ornamental Horticulture
M. L. Schuster² Ph.D., Professor-Horticulture
R. C. Shearman^{2,3} Ph.D., Assistant Professor-Turf
R. K. Sutton^{1,2} MLA, Assistant Professor-Landscape Horticulture
J. O. Young⁴ Ph.D., Professor-Horticulture

Library

W. R. Collings, B.S., BLS, Head, Agriculture Campus Library
A. McIntosh, A.D., M.S.L.S., Agriculture Campus Librarian
A. L. Smith, A.B., B.S.L.S., Agriculture Campus Librarian
E. Thomas, Dipl. Bibl., Agriculture Campus Librarian

Plant Pathology

M. G. Boosalis^{1,2,3} Ph.D., Professor and Head of Department
E. M. Ball² Ph.D., Associate Professor-Virus Diseases
M. K. Brakke^{2,5} Ph.D., Professor-Virus Diseases
L. C. Lane^{1,2} Ph.D., Assistant Professor-Virus Diseases
W. G. Langenberg^{2,5} Ph.D., Associate Professor-Virus Diseases
J. E. Partridge^{1,2} Ph.D., Assistant Professor-Corn and Sorghum Stalk Rot
G. W. Peterson^{2,5} Ph.D., Professor-Tree Diseases
J. W. Riffle^{2,5} Ph.D., Associate Professor-Tree Diseases
J. R. Steadman^{1,2} Associate Professor-Epidemiology of Vegetable Diseases
J. L. Van Etten^{1,2} Ph.D., Professor-Microbial Physiology
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R. F. Mumm^{1,2} Ph.D., Professor-Statistical Consultant
A. M. Parkhurst^{1,2} M.S., Assistant Professor-Statistical Consultant

Veterinary Science

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E. D. Erickson² D.V.M., Ph.D., Associate Professor-Microbiology
D. L. Ferguson^{1,2} Ph.D., Professor-Parasitology
M. L. Frey² Ph.D., Professor-Microbiology
O. D. Grace^{1,2} M.S., D.V.M., Professor-Diagnostic Laboratory
C. L. Kelling² Ph.D., Assistant Professor-Virology
G. A. Kennedy^{1,2} D.V.M., Ph.D., Assistant Professor-Pathology
K. C. Olson² B.S., Instructor-SPF Swine
A. S. Ramos, Jr.^{1,2} D.V.M., Ph.D., Assistant Professor-Pathologist
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 J. F. Witkowski^{2,3} Ph.D., Assistant Professor-Entomology

North Platte Station, North Platte

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 D. M. Danielson² Ph.D., Professor-Animal Science (Swine)
 P. H. Grabouski^{2,3} M.S., Assistant Professor-Agronomy
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 C. M. Hibbs² D.V.M., Ph.D., Professor-Veterinary Science
 D. B. Hudson^{2,3} B.S., D.V.M., Associate Professor-Veterinary Science
 N. L. Klocke^{2,3} Assistant Professor-Agricultural Engineering
 W. F. Kroutil^{2,3} Ph.D., Professor-Agricultural Engineering
 D. T. Lindgren^{2,3} Ph.D., Assistant Professor-Horticulture
 J. T. Nichols^{2,3} Ph.D., Professor-Agronomy (Range Management)
 P. T. Nordquist² Ph.D., Associate Professor-Agronomy (Sorghum Breeding)
 G. A. Wicks^{2,3} M.S., Professor-Agronomy (Weed Science)

Panhandle Station, Scottsbluff

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 L. A. Daigger^{2,3} M.S., Professor-Agronomy
 R. J. Edling² Ph.D., Assistant Professor-Agricultural Engineering
 C. R. Fenster^{2,3} M.S., Professor-Entomology
 A. F. Hagen^{2,3} M.S., Assistant Professor-Entomology
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 L. A. Nelson^{1,2} Ph.D., Associate Professor-Agronomy
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 R. B. O'Keefe^{2,3} Ph.D., Professor-Horticulture
 P. E. Reece^{2,3} Ph.D., Assistant Professor-Agronomy
 R.E.J. Retzlaff^{2,3} Ph.D., Assistant Professor-Agricultural Economics
 I. G. Rush^{2,3} Ph.D., Associate Professor-Animal Science
 W. L. Trimmer^{2,3} M.S., Instructor-Agricultural Engineering
 A. Weiss² Ph.D., Assistant Professor-Agricultural Meteorology
 R. G. Wilson^{2,3} Ph.D., Assistant Professor-Agronomy

South Central Station, Clay Center

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B. L. Doupnik^{2,3} Ph.D., Associate Professor-Plant Pathology
D. E. Eisenhauer^{2,3} M.S., Assistant Professor-Agricultural Engineering
K. D. Frank^{2,3} Ph.D., Associate Professor-Agronomy
L. L. Peters^{2,3} Ph.D., Associate Professor-Entomology
F. W. Roeth^{2,3} Ph.D., Associate Professor-Agronomy
L. L. Svec^{2,3} Ph.D., Associate Professor-Agronomy

U. S. Meat Animal Research Center, Clay Center

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Y. R. Chen^{2,5} Ph.D., Agricultural Engineer
J. R. Chenault⁵ Ph.D., Research Physiologist
R. K. Christenson² Ph.D., Research Physiologist
J. D. Crouse^{2,5} Ph.D., Research Food Technologist
L. V. Cundiff^{2,5} Ph.D., Research Geneticist
G. E. Dickerson^{2,5} Ph.D., Research Geneticist
S. E. Echternkamp⁵ Ph.D., Research Physiologist
R. D. Eichner^{2,5} Ph.D., Research Chemist
C. L. Ferrell⁵ Ph.D., Research Chemist
J. J. Ford^{2,5} Ph.D., Research Physiologist
S. P. Ford⁵ Ph.D., Research Physiologist
K. E. Gregory⁴ Ph.D., Research Geneticist
G. L. Hahn⁵ Ph.D., Agricultural Engineer
V. L. Harrison^{2,5} Ph.D., Agricultural Economist
A. G. Hashimoto^{2,5} Ph.D., Agricultural Engineer
T. G. Jenkins⁵ Ph.D., Research Geneticist
R. M. Koch² Ph.D., Research Geneticist
D. B. Laster^{2,5} Ph.D., Research Physiologist
K. A. Leymaster⁵ Ph.D., Research Geneticist
D. D. Lunstra⁵ Ph.D., Research Physiologist
R. R. Maurer⁵ Ph.D., Research Physiologist
J. A. Nienaber^{2,5} M.S., Agricultural Engineer
R. L. Prior^{2,5} Ph.D., Research Chemist
L. L. Richer⁵ Ph.D., Research Chemist
B. D. Schanbacher⁵ Ph.D., Research Physiologist
R. A. Scott^{2,5} Ph.D., Research Animal Scientist
G. M. Smith^{2,5} Ph.D., Research Geneticist
R. T. Stone⁵ Ph.D., Research Physiologist
V. H. Varel⁵ Ph.D., Microbiologist
L. D. Young^{2,5} Ph.D., Research Geneticist

College of Home Economics

Education and Family Resources

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E. R. Combs^{1,2} Ph.D., Assistant Professor-Consumer Economics and Housing
S. M. Kreutz^{1,2} Ed.D., Associate Professor-Development of Teaching Skills
F. Walker^{1,2} Ph.D., Associate Professor-Home Management Family Economics

Food and Nutrition

H. M. Fox^{1,2,3} Ph.D., Professor and Chairman of Department
C. Kies^{1,2} Ph.D., Professor-Nutrition
H. Kohn^{2,3} M.S., Associate Professor-Nutrition
M. E. Knickrehm^{1,2} Ph.D., Professor-Food Service Management
T. A. Shaffer^{2,3} M.S., Assistant Professor-Food Science
L. Vaughan^{1,2} Ph.D., Assistant Professor-Nutrition

Human Development and the Family

N. Stinnett^{1,2,3} Ph.D., Professor and Chairman of Department
B. Chesser^{1,2} Ph.D., Associate Professor-Rural Family Crisis
J. DeFrain^{1,2} Ph.D., Assistant Professor-Rural Family Crisis
V. Kalyan-Masih^{1,2} Ph.D., Associate Professor-Cognitive Development (Piaget)
L. O. Schwab^{1,2} Ed.D., Professor-Rehabilitation of Handicapped Women

Textiles, Clothing and Design

A. E. Newton^{1,2,3} Ph.D., Professor and Chairman of Department
J. Laughlin^{1,2} Ph.D., Associate Professor-Textiles, Clothing and Design

NEBRASKA AGRICULTURAL EXPERIMENT STATION RESEARCH PROJECTS

Research projects are listed by departments. An asterisk (*) indicates that the project was discontinued in fiscal 1977-1978.

Administration

- 1-001 General administration of federal grant funds research. H. W. Ottoson.
- 1-004 Regional research coordination, North Central Region. H. W. Ottoson.
- 2-1 Title V - Identification of alternatives for local land use decisions. M. P. Carlson, R. H. Stoddard, P. H. Gessaman.

Agricultural Communications

- 18-001 Dissemination of research information. R. J. Graham, J. P. Holman.

Agricultural Economics

- 10-001 Farm enterprise analysis. L. Bitney
- 10-034 Economics of resource use in the Sandhills area of Nebraska. G. Pfeiffer.
- *10-048 Establishment, growth and stability of Nebraska farm and ranch firms. G. A. Helmers, J. B. Hassler.
- 10-057 Alternative institutional arrangements in area management of ground water. L. K. Fischer.
- *10-058R The economics of institutional arrangements for viable rural communities in the Great Plains. M. E. Baker, P. H. Gessaman.
- *10-060 Impact of changes in world food supply-demand conditions upon selected agricultural factor markets. D. G. Anderson.
- 10-064 Impact of public policies on Nebraska's agricultural and rural development. J. G. Kendrick, L. Bitney, E. E. Peterson.
- *10-065 Marketing efficiency and growth potential of hogs-western cornbelt. R. D. Johnson, M. S. Turner, R. J. Crom.
- *10-066 Utilization and disposal of municipal, industrial, and agricultural processing wastes on land. M. E. Baker.
- *10-067 Acquisition and use of external capital in rural Nebraska. P. H. Gessaman.
- *10-069 Operational and economic efficiency of alternatively organized swine producing units. M. S. Turner, L. Bitney.
- 10-070 Economic aspects of vertical coordination between cow-calf and feedlot operators. J. G. Kendrick, J. B. Hassler, A. Wellman.
- 10-071 Evaluation of alternative rural freight transportation, storage, and distribution systems. D. G. Anderson.

- 10-072 Economic analysis of U. S. grain exporting systems. M. S. Turner.
- 10-073 Economic analysis of factors associated with financial success of farm firms. L. Bitney, R. J. Hanson, J.B. Hassler.
- 10-074 Objective decision procedures and advisory information services for economic management of swine and beef firms. J. B. Hassler, L. Bitney.
- 10-075 Economic analysis of off-farm employment and income among farm families in eastern Nebraska. R. J. Hanson, B. B. Johnson.
- 10-076 An economic evaluation of managing market risks in agriculture. G. A. Helmers, J. B. Hassler, L. H. Lutgen.
- 10-077 Reporting and analyzing farm real estate values and market developments in Nebraska. B. B. Johnson, R. J. Hanson.
- 10-078 Legal-institutional arrangements affecting water development, use, and management. J. D. Aiken.
- 10-079 Forward pricing alternatives for Nebraska livestock and grain producers. L. H. Lutgen.
- 10-080 Economics of water management options for selected areas in Nebraska. R. J. Supalla.
- 10-081 Analysis of multi-county intergovernmental units and impacts on local governments. P. H. Gessaman.

Agricultural Education

- 24-014 New clientele and programs needed for occupational education in agriculture. R. D. Dillon.
- *24-015 Approaches to occupational education and teacher preparation for rural development. J. T. Horner, R. L. Douglass.

Agricultural Engineering

- 11-001 Evaluation of performance of new tractors. M. L. Mumgaard, L. Leviticus.
- 11-003 Planning farmstead buildings and livestock production systems. E. A. Olson, J. A. DeShazer.
- 11-008 Engineering phases of tillage, land treatment and livestock waste disposal for resource conservation. H. D. Wittmuss, E. Dickey, A. Rider.
- 11-021 Operations research on mechanized systems for cutting, curing and handling hay. G. M. Petersen, K. L. VonBargen.
- 11-025 Operator safety and health protection in mobile agricultural operation. G. W. Steinbruegge, R. D. Schnieder.
- *11-027 Environmental design criteria for livestock housing. J. A. DeShazer.
- 11-030 Development and operation of irrigation systems. P. E. Fischbach, W. E. Splinter, W. W. Sahs.
- 11-033 Dynamics and energetics of the soil-plant-atmosphere continuum (SPAC) W. E. Splinter, N. A. Rosenberg, J. D. Eastin.

- 11-034 Temporary storage of high-moisture feed grains. T. L. Thompson, B. L. Doupnik.
- 11-035 Animal waste management with pollution control. C. B. Gilbertson, J. A. Nienaber.
- 11-037 Safety, reliability, and operational characteristics of electrical irrigation equipment. S. Nelson, L. E. Stetson.
- *11-038 Recharge of aquifers for purpose of irrigation withdrawal. D. M. Manbeck.
- *11-039 Measuring and defining rheological properties of food and food products from engineering concepts. L. L. Bashford.
- *11-040 Water and waste systems for countryside living. D. M. Manbeck, P. H. Gessaman.
- 11-042 Application of information on water-soil-plant relations to use and conservation of water. P. E. Fischbach, J. R. Gilley, B. R. Somerhalder, R. J. Edling.
- 11-043 Equipment and construction materials to meet environmental design criteria for livestock facilities. B. D. Moser, P. W. Lytle.
- 11-044 Improvement of thermal processes for proteinaceous foods. M. A. Hanna.
- 11-045 Determination and evaluation of energy utilization for on-farm use in production agriculture. L. L. Bashford.
- 11-047 Physical properties of agricultural materials. M. A. Hanna, K. L. VonBargen, T. L. Thompson.
- 11-049 Turbulent transport in evapotranspiration and photosynthesis. N. J. Rosenberg, S. B. Verma.
- 11-050 Remotely sensed temperature to evaluate crop moisture and heat stress conditions. B. L. Blad, N. J. Rosenberg.
- 11-051 Chemical changes in atmospheric deposition and effects on land and surface waters. S. B. Verma.

Agronomy

- 12-001 Corn breeding and genetics. W. A. Compton, L. A. Nelson, C. Y. Sullivan.
- 12-002 Improvement and evaluation of oats and barley. J. W. Schmidt.
- 12-005 Developing and applying principles of alfalfa improvement. W. R. Kehr.
- 12-006 Cultural, ecological and physiological studies with various agronomic crops. A. D. Flowerday.
- 12-007 Weed control in changing crop production systems. O. C. Burnside.
- 12-008 Improvement of forage grasses by breeding. K. P. Vogel.
- 12-009 Sorghum breeding and genetics. W. M. Ross.
- 12-011 Properties of Nebraska soils as related to soil genesis, classification, survey and land use. D. T. Lewis.
- 12-012 Soybean breeding and genetics. J. H. Williams.

- 12-023 Optimizing the productive capacity of irrigated soils through effective soil management. R. A. Olson, D. H. Sander, K. D. Frank, G. W. Rehm.
- 12-034 Cytogenetic studies on wheat. R. M. Morris, J. W. Schmidt, P. J. Mattern, V. A. Johnson.
- 12-046 Market quality in wheat. P. J. Mattern, V. A. Johnson, J. W. Schmidt.
- 12-049 Quantitative genetic investigations. C. O. Gardner.
- 12-055 Breed and evaluate wheat varieties for Nebraska. V. A. Johnson, J. W. Schmidt.
- 12-057 Genetic, physiological, morphological, and anatomical studies of wheat. V. A. Johnson.
- *12-061 Detachment of soil particles in simulated rainfall. A. P. Mazurak.
- 12-069 Physiological processes affecting growth and development of grain sorghum. J. D. Eastin, M. D. Clegg, J. W. Maranville.
- 12-070 Seed production of breeding lines of insect pollinated legumes. W. R. Kehr.
- 12-071 Environmental implications and interactions of pesticide usage. T. L. Lavy.
- 12-072 Introduction, multiplication, preservation and evaluation of new plants for industrial and agricultural utilization. W. R. Kehr, K. P. Vogel.
- 12-073 Subsoil chemical properties in relation to nutrient requirements of field crops. G. A. Peterson.
- *12-074 Water and soil pollution from beef cattle feedlots in Nebraska. T. M. McCalla, J. R. Ellis, L. N. Mielke.
- 12-076 Field crop variety evaluation. A. F. Dreier.
- 12-077 Environmental accumulation of nutrients as affected by soil and crop management. R. A. Olson, E. J. Deibert, B. R. Bock.
- 12-079 Physiological investigations of forage plants. L. E. Moser.
- 12-080 Soil factors and mineral nutrient uptake by plants grown on selected northern Nebraska soils. R. C. Sorensen.
- 12-081 Utilization and disposal of waste products and pollutants in soil. L. Chesnin.
- 12-082 Ecological and physiological factors and management practices in pasture production. J. L. Stubbendieck.
- 12-083 Forage production and utilization systems as a base for beef and dairy cattle production. L. J. Perry, Jr.
- 12-084 Evaluating plant nutrient needs and product quality. D. Knudsen.
- 12-085 Improving grain sorghum, wheat, and forage crop production through improved soil fertilizer practices. D. H. Sander.
- 12-086 Soil fertility investigations related to corn and soybean and to irrigated production of these crops. R. A. Wiese.
- 12-087 Ecology, vegetative development, and management of Nebraska range grasses. S. Waller.

- 12-088 Genetics, biochemistry, and breeding of forages. F. A. Haskins, H. J. Gorz.
- 12-089 Integrating crop culture, chemicals, and life cycles to control persistent weeds. O. C. Burnside.
- 12-090 Management and production of forage crops and range. L. E. Moser.
- 12-091 Soybean physiology in varietal improvement. J. E. Specht.
- 12-092 Weed control: weed biochemistry and physiology. L. C. Haderlie.
- * 12-093 Regulation of seed viability and seedling vigor. A. C. Leopold.
- 12-094 Pasture and rangeland weed control systems. M. K. McCarty
- 12-095 Mineral nutrition of sorghum. R. B. Clark.
- 12-096 Influence of conservation-tillage systems on soil fungi and their effects on plants and inorganic nitrogen in plants and soil. J. R. Ellis, T. M. McCalla.
- 12-097 Physiology of nutritive value in grain sorghum. J. Maranville.
- 12-098 Evaluation of chemical properties, nutrient availability, and nitrogen utilization of residue management systems. J. S. Schepers, T. M. McCalla, D. G. Hanway.
- 12-099 Conservation crop production as related to microbial and biogeochemical changes. J. W. Doran, T. M. McCalla.
- 12-100 Nitrogen metabolism of green plants. L. A. Klepper.
- 12-101 Environmental and morphological crop physiology. M. D. Clegg.
- 12-102 Crop growth and development under conservation-production systems. W. W. Wilhelm.
- 12-103 Influence of conservation-production systems on the physical character of soil and plant growth. L. N. Mielke, T. M. McCalla.
- 12-104 Breeding for physiological efficiency and adaptation in grain sorghum. C. A. Francis.
- 12-201 Foundation seed. R. N. Mills.

Animal Science

- 13-011 Utilization and requirements of protein and energy for swine. B. D. Moser.
- 13-022 Mineral requirements of swine. E. R. Peo, Jr., B. D. Moser.
- 13-023 Meat manufacturing, restructuring and processing. R. W. Mandigo.
- 13-024 Physiological mechanisms in bovine reproduction. E. J. Ellington.
- 13-029 Genetic improvement of efficiency in the production of quality pork. P. J. Cunningham.
- 13-036 Improving large dairy herd management practices. L. L. Larson, F. G. Owen.
- 13-037 Nutrition of high producing dairy cows. F. G. Owen, L. L. Larson.
- 13-038 Improving reproductive performance in cattle. L. L. Larson, E. F. Ellington, R. J. Kittok.
- 13-039 Maximizing use of forage and protein by growing beef cattle. T. J. Klopfenstein.

- 12-088 Genetics, biochemistry, and breeding of forages. F. A. Haskins, H. J. Gorz.
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- 13-038 Improving reproductive performance in cattle. L. L. Larson, E. F. Ellington, R. J. Kittok.
- 13-039 Maximizing use of forage and protein by growing beef cattle. T. J. Klopfenstein.

- 13-040 Improving utilization of energy in beef finishing rations. S. D. Farlin.
- 13-041 Cytogenetics of livestock (with special reference to fertility in dairy cattle). F. E. Eldridge.
- 13-041R Improving dairy cattle through breeding with special emphasis on selection. F. E. Eldridge.
- 13-042 Increased utilization of crop residues by beef cattle through chemical treatment. T. J. Klopfenstein.
- 13-043 Physiological and genetic aspects of ovulation rate and embryo survival in swine. D. R. Zimmerman, P. J. Cunningham, R. J. Kittok.
- 13-044 Factors affecting acidosis and feed intake of ruminants fed high energy diets. R. A. Britton.
- 13-045 The effect of level of milk production in crossbred beef cows. M. K. Nielsen.
- 13-045R Improvement of beef cattle through breeding methods. M. K. Nielsen.
- 13-047 Utilization of wheat straw and other crop residues by beef cows. J. K. Ward.
- 13-048 Physiological and management aspects of puberty and estrous activity in gilts in confinement. R. K. Christenson, D. R. Zimmerman.
- 13-050 Factors affecting texture of fresh and processed meat producers. D. A. Olson, R. W. Mandigo, F. Caporaso.
- 13-051 Food intake regulators and nutrient requirement of laying hens. E. W. Gleaves, F. B. Mather.
- 13-052 Requirements for and utilization of protein and amino acids by swine. A. J. Lewis, E. R. Peo, B. D. Moser.
- 22-005 Nutrient interrelationships, feed additives and mineral sources in poultry diets. T. W. Sullivan.
- *22-010 Factors affecting the quality and characteristics of poultry meat. G. W. Froning, T. E. Hartung.
- *22-014 A study of quality (physical, chemical and microbiological) and their control in eggs and egg products. G. W. Froning, T. E. Hartung.
- 22-017 Physiological responses of chickens to varying environments. F. B. Mather, J. A. DeShazer.
- 22-020 Physiology of energetics of egg production and egg shell formation. F. B. Mather, E. W. Gleaves, J. A. DeShazer.
- 22-021 Composition, nutritive value and stability of poultry meat and egg products. G. W. Froning, R. Dam.

Biochemistry Laboratory

- 15-004 Raw soybean growth inhibitor in raw soybeans. R. L. Borchers.
- 15-005 Harvesting, processing and evaluating alfalfa and other forage crops. R. L. Ogden.
- 15-011 Analytical advisory and service laboratory. R. M. Hill.

- 15-017 Biochemistry of plant disease. J. M. Daly.
- 15-018 Metabolism and biological functions of lipids. H. W. Knoche.
- 15-019 Chemistry and metabolism of proteins. F. W. Wagner.
- 15-020 Biological nitrogen fixation. R. V. Klucas.
- * 15-021 Biochemical mechanisms of susceptibility and resistance and the causes of damage to corn from southern leaf blight. J. M. Daly, L. D. Dunkle.
- 15-022 Cellulas photosynthetic processes and the regulation of photosynthesis. R. Chollet.
- 15-023 Associative nitrogen fixation in grasses. R. V. Klucas.

Entomology

- 17-007 Photosensitivity in insects. H. J. Ball.
- 17-024 Pest management of the greenbug and other arthropods in sorghum and small grains. R. Staples.
- 17-025 Genetics and ecology of the European corn borer. J. F. Witkowski.
- 17-026 Range and pasture insects. K. P. Pruess.
- 17-027 Injurious insects affecting forage legumes and forage and turf grasses. G. R. Manglitz, S. D. Kindler.
- 17-028 Insects affecting corn in Nebraska. Z B Mayo, R. E. Hill, H. J. Ball.
- 17-029 Modeling for insect pest management. K. P. Pruess.

Food Science and Technology

- 16-008 Microenvironment of food handling systems. R. B. Maxcy.
- * 16-022 The effect of processing on potentially toxic microorganisms and metabolites in food. L. B. Bullerman.
- 16-023 Irradiation processing of meat for quality protection. R. B. Maxcy.
- 16-024 Food processing influences on nutrient composition. T. E. Hartung.
- * 16-025 Improvement in quality of various cheese and other dairy foods. T. A. Evans.
- 16-026 Significance, study and use of enzymes in the food industry. K. M. Shahani.
- 16-027 Quality and safety of foods in households and institutions. R. B. Maxcy.
- 16-028 Use of animal and plant resources as extenders in human foods. L. D. Satterlee.
- 16-029 Occurrence, significance and control of potentially toxic molds in foods. L. B. Bullerman.
- 91-017 Influence of production and preparation practices and chemical changes on meat palatability. F. Caporaso.

Forestry, Fisheries and Wildlife

- 20-023 Windbreak shelter effects. W. T. Bagley, J. R. Brandle.
- 20-028 Tree improvement by selection and breeding. W. T. Bagley, R. A. Read, D. VanHaverbeke.
- 20-041 Vegetation selection and management for fire prevention. J. R. Brandle.
- 22-019 Interfacing of agriculture and wildlife resources. R. M. Case.
- * 22-022 A study of interactions between selected wildlife species and livestock, poultry and crops. R. M. Case.

Horticulture

- 20-010 Improvement of potatoes. R. B. O'Keefe.
- 20-014 Evaluation of varieties and cultural practices in vegetables. R. B. O'Keefe, D. P. Coyne.
- * 20-029 Adaption, improvement and management of turf grasses and other ground covers. R. C. Shearman, E. J. Kinbacher.
- 20-034 Factors affecting post-harvest market quality of processed potatoes. R. B. O'Keefe.
- 20-036 Genetics, breeding and cultural interactions of beans. D. P. Coyne.
- 20-037 Climatic resources and agroclimatic relationships. R. E. Neild.
- 20-037R The climatic resources of the North Central region. R. E. Neild.
- 20-038 Cultural and physiological studies of turf and herbaceous ground covers. R. C. Shearman, E. J. Kinbacher.
- 20-039 Improvement of native plant materials for Nebraska landscapes. S. S. Salac, R. K. Sutton.
- 20-040 Genetic improvement of beans (*Phaseolus vulgaris* L.) for yield, pest resistance and nutritional value. D. P. Coyne, M. L. Schuster, J. R. Steadman.
- 20-042 Biology and control of bacterial diseases in Nebraska. M. L. Schuster.
- 20-043 Renewable plant materials as components of horticultural potting media. S. S. Salac, E. E. Pierson, W. R. Kehr, R. C. Sorensen.

Plant Pathology

- 21-001 Plant disease survey and special investigations. Plant Pathology Staff.
- 21-003 Identification and control of plant viruses. L. C. Lane.
- 21-005 Fundamental studies on root diseases of plants. M. G. Boosalis.
- 21-006 Diseases of forest and shade trees. M. G. Boosalis, G. W. Peterson, J. W. Riffle.
- 21-010 Plant Pathology outstate testing. D. W. Wysong, L. T. Palmer, M. G. Boosalis.

- 21-012 Electron microscopy in agricultural research. W. G. Langenberg, M. K. Brakke, E. M. Ball.
- 21-015 Epidemiology of vegetable diseases in Nebraska. J. R. Steadman.
- 21-017 Physiology of fungal spore germination. J. W. VanEtten.
- *21-020 Biological and physiological aspects of corn and sorghum diseases. L. D. Dunkle.
- 21-021 Isolation, purification and characterization of bacterial plant pathogens, their viruses and bacteriocins. A. K. Vidaver.
- 21-022 Development of root disease control technology with emphasis on biological control in corn and soybeans and other crops with common pathogens. M. G. Boosalis, B. L. Doupnik, L. D. Dunkle.
- 21-023 Detection, survival and control of plant pathogenic bacteria on seeds and plant propagative material. A. K. Vidaver.
- *21-024 The protein crystal toxin of *Bacillus thuringiensis*. M. G. Boosalis, K. W. Nickerson, T. J. Helms.
- 21-025 Bacteriocins and competitive interactions of *Rhizobium japonicum* as factors in effective N₂ fixation. A. K. Vidaver, R. N. Klucas, J. Williams.

Biometrics & Information Systems Center

- 23-001 Application of statistics to research in agriculture. W. M. Schutz.

Veterinary Science

- 14-001 Animal disease diagnosis and surveillance in Nebraska. O. D. Grace, L. McGill.
- 14-002 Diseases of young pigs. N. R. Underdahl.
- 14-004 Bionomics, etiology, and control of the parasites of Nebraska livestock. D. L. Ferguson.
- 14-009 Prevention and control of enteric diseases of swine. N. R. Underdahl, L. D. McGill.
- 14-012 Immunological properties of parasite enzymes in sheep and swine. M. B. Rhodes.
- 14-014 Bovine respiratory diseases. M. L. Frey, M. B. Rhodes.
- *14-015 Biological control of internal parasites in livestock. M. B. Rhodes, D. L. Ferguson, C. A. Mebus.
- *14-016 Agalactia syndrome of sows. A. Torres-Medina, A. Hogg, L. D. McGill.
- 14-017 Pathophysiology of acute fluid and electrolyte imbalances in baby pigs. C. L. Kelling, G. A. Kennedy.
- 14-018 Protection of livestock against internal parasites by management methods. M. B. Rhodes, D. L. Ferguson, E. O. Dickinson.

Regional Stations

Northeast Station

- 42-001 Influence of housing and management on confinement rearing of growing-finishing pigs. R. D. Fritschen, J. DeShazer, N. Underdahl.
- 42-002 Growing and finishing beef cattle using feedstuffs in northeast Nebraska. V. Krause.
- 42-003 Biology and control of the European corn borer and other selected insects in northeast Nebraska. J. F. Witkowski.

North Platte Station

- 43-002 Principles and practices of weed control for west central Nebraska. G. A. Wicks.
- 43-006 Relating nutrition and management of growth and development in programming pork production. D. M. Danielson.
- 43-007 Culture and improvement of agronomic crops in central and western Nebraska. P. T. Nordquist.
- 43-020 Animal disease surveillance in western Nebraska. R. G. White, C. M. Hibbs.
- *43-021 Determining nutritive value of forages with beef cattle. D. C. Clanton.
- 43-022 Development of ornamental plants for Nebraska as a Great Plains state. R. D. Uhlinger.
- 43-024 Injurious insects affecting livestock in Nebraska. J. B. Campbell.
- 43-025 Irrigated pasture investigations. J. T. Nichols, D. C. Clanton, B. R. Somerhalder.
- 43-026 Agricultural production systems for the Nebraska Sandhills. R. G. White.
- 43-027 Optimum utilization and integration of range and complementary forages for beef. D. C. Clanton, J. T. Nichols.
- 43-028 Development and culture of herbaceous ornamental plants. D. T. Lindgren.
- 43-029 Development and demonstration of planting systems for water, soil and energy conservation. N. L. Klocke.

Panhandle Station

- 40-004 Engineering systems for water control in crop production. R. J. Edling.
- 44-002 Dry bean variety test and date of planting test. F. N. Anderson, D. S. Nuland.
- 44-004 Fertilizer and manure application for production of continuous corn. F. N. Anderson.
- 44-005 Small grain investigations. L. A. Daigger, L. A. Nelson.
- 44-006 Alfalfa variety testing and corn testing. F. N. Anderson, L. A. Nelson.

- 44-011 Development of dryland cropping systems for western Nebraska. C. R. Fenster.
- 44-012 Improvement of millet production by breeding and cultural practices. L. A. Nelson.
- 44-013 Biology and control of insect pests of western Nebraska. A. F. Hagen.
- 44-014 Wheat production costs and returns in relation to farm size, Southwest and Panhandle areas of Nebraska. R. E. J. Retzlaff.
- 44-015 Cultural and nutrient investigations for irrigated crops in western Nebraska. F. N. Anderson.
- 44-016 Weed control for western Nebraska crops and conditions. R. G. Wilson, Jr.
- 44-017 Investigation of irrigation management in western Nebraska. W. L. Trimmer.
- 44-018 Surveillance of animal diseases in western Nebraska. D. A. Darling.
- 44-019 Soil fertility investigations in the Nebraska Panhandle. L. A. Daigger.
- 44-020 Design and use of irrigation systems. R. J. Edling, L. A. Daigger, R. E. J. Retzlaff.
- 44-021 Micrometeorology of sprinkler irrigation. A. Weiss.
- 44-022 Varietal evaluation of irrigated crops in western Nebraska. F. N. Anderson, D. S. Nuland, A. F. Dreier.

South Central Station

- *48-001 Irrigated row crop production systems in south central Nebraska. K. D. Frank.
- 48-002 How cultural practices affect root and stalk rot diseases of corn and sorghum. B. J. Doupnik.
- 48-003 Biology and control of crop insects in south central Nebraska. L. L. Peters.
- 48-004 Occurrence and effects of mycotoxins in feeds and foods. B. L. Doupnik, T. L. Thompson.
- 48-005 Biology and control of troublesome weeds - south central Nebraska. F. W. Roeth.

United States Meat Animal Research Center

- 46-001 Development and operation of the U.S. Meat Animal Research Center. R. R. Oltjen.
- 46-002 Improvement of beef cattle through breeding methods. R. M. Koch, G. E. Dickerson, L. V. Cundiff.
- *46-003 Improvement of beef cattle through breeding methods. L. V. Cundiff, G. E. Dickerson, R. M. Koch.
- 46-004 Improvement of beef cattle through breeding methods. D. B. Lancaster, K. E. Gregory, G. M. Smith.
- 46-005 Increase reproductive efficiency of swine, sheep and cattle. R. K. Christenson, D. B. Laster, H. S. Teague.

- 46-006 Improvement of beef cattle through breeding methods - (*Heterosis retention*), R. M. Koch, D. B. Laster.

University Field Laboratory

- 45-001 Field Laboratory development. W. W. Sahs.

College of Home Economics

Education and Family Resources

- *92-003 Relationship between a home economics curriculum designed for concept learning and transfer of knowledge. S. M. Kreutz.
- *92-004 Consumer's commitment to achieve goals associated with purchases of moderate to expensive products. F. Walker.
- 92-005 Quality of life as influenced by area of residence. F. Walker, D. Olsen.
- 92-006 Rules for selecting and organizing home economics objectives for an educational goal. S. M. Kreutz.

Food and Nutrition

- 91-007 Metabolic interrelationships affecting nutrient and energy requirements of humans. C. Kies, H. M. Fox.
- *91-008 Factors affecting dietary practices, food habits and nutritional status of various population groups. H. M. Fox, C. Kies.
- 91-012 Nutritional impact of fat-altered diets. C. Kies, H. M. Fox.
- *91-013 Changes in food practices for better nutrition. H. M. Fox.
- 91-014 Productivity of food service operations. M. E. Knickrehm.
- 91-015 Nutrition improvement in northeast region. C. Kies, H. M. Fox.
- 91-018 Communication strategies to improve nutritional practices of families. H. M. Fox, L. Vaughan.
- 91-020 Nutrient Bioavailability - a key to human nutrition. C. Kies, H. M. Fox, L. Vaughan.

Human Development and the Family

- 93-012 A life span analysis of rural children's mental and social development. V. Kalyan-Masih.
- 93-013 Rehabilitation of persons in homemaking and independent living. L. O. Schwab.
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Key to Abbreviations

SB-----Station Bulletin	Q3-----Fall Quarterly 1977
RB-----Research Bulletin	Q4-----Winter Quarterly 1978
DR-----Departmental Report	Q1-----Spring Quarterly 1978
OTC-----Outstate Testing Circular	J-----Journal Series
Q2-----Summer Quarterly 1977	A-----Journal Abstracts
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Received from United States Government	
Hatch Fund	\$1,375,726.00
Budgeted by the University	7,636,692.66
Total	\$9,012,418.66

Expenditures:

Salaries, Wages, & Staff Benefits . . .	\$7,080,188.83
Operating Expenses	1,330,995.07
Equipment and Improvements	601,234.76
Total	\$9,012,418.66

RESTRICTED CURRENT FUNDS

Income:

From United States Government	
Agencies	\$2,498,258.84
From State of Nebraska Agencies	230,978.21
From Industry	459,874.42
From Foundations & Health	
Organizations	1,625.92
From Other Sources	28,850.10
Total	\$3,219,488.49

Expenditures:

Salaries, Wages &	
Staff Benefits	\$1,818,328.26
Operating Expenses	1,091,532.77
Equipment and Improvements	309,627.46
Total	\$3,219,488.49

CASH REVOLVING FUNDS

Income:	
Sales and Services	\$2,260,318.89
Expenditures:	
Salaries, Wages & Staff Benefits	\$ 618,724.36
Operating Expenses	1,415,971.18
Equipment and Improvements	225,623.35
Total	\$2,260,318.89

AGENCY REVOLVING FUND³

Income:	
Sales and Services	\$3,568,099.36
Expenditures:	
Salaries, Wages & Staff Benefits	\$2,191,119.85
Operating Expenses	1,079,020.82
Equipment and Improvements	297,958.69
Total	\$3,568,099.36

^{1/}These figures do not include capital construction expenditures totaling \$978,861.28

^{2/}Includes University Research Council funds from state appropriations 7,467.77

^{3/}Includes Meat Animal Research Center, Foundation Seed, Tractor Testing, and the Basic Seed Potato Program.