87th Annual Report of the Nebraska Agricultural Experiment Station

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87th Annual Report

of

THE NEBRASKA AGRICULTURAL EXPERIMENT STATION

The Agricultural Experiment Station
University of Nebraska - Lincoln College of Agriculture
H. W. Ottoson, Director and Acting Dean
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Issued January 1974, 1500

FOREWORD

The 87th Annual Report of the Nebraska Agricultural Experiment Station contains a list of all active projects during July 1, 1972 to June 30, 1973, 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 Experiment Station Quarterly and as mimeographed departmental reports. Station bulletins 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 College of Agriculture, Lincoln, Nebraska 68503. Reprints of most journal articles may be obtained by writing directly to the authors.

Howard W. Ottoson  
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G. E. Dickerson2,5 Ph.D., Research Geneticist
S. E. Echternkamp2,5 Ph.D., Research Physiologist
H. A. Glimp2,5 Ph.D., Research Chemist
R. M. Koch2 Ph.D., Research Geneticist
D. B. Laster2,5 Ph.D., Research Physiologist
C. R. Long2,5 Ph.D., Research Geneticist
R. L. Prior2,5 Ph.D., Research Chemist
H. S. Teague2,5 Ph.D., Animal Scientist

University Field Laboratory, Mead

F. C. Hastert2 B.S., Facilities Manager

NEBRASKA AGRICULTURAL EXPERIMENT STATION
RESEARCH PROJECTS

Research projects are listed by departments. An asterisk (*) indicates that the project was discontinued in fiscal 1971.

1-001 General administration of federal grant funds research. E. F. Frolik and H. W. Ottoson.
1-004 Regional Research Coordination, North Central Region. H. W. Ottoson.
Agronomy

12-001 Corn breeding and genetics. W. A. Compton.
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 Systems of weed control. O. C. Burnside.
12-008 Improvement of forage grasses by breeding. L. C. Newell.
12-009 Sorghum breeding and genetics. W. M. Ross.
12-011 Soil mineral, chemical and physical properties as related to genesis, classification, and mapping. D. T. Lewis.
12-012 Breeding and genetics of soybeans. J. H. Williams.
12-017 Soil properties in relation to fertilization of leguminous crops. R. C. Sorensen.
12-023 Soil management investigations toward improving the productivity of irrigated soils. R. A. Olson.
12-026 Development and utilization of improved pasture techniques for the evaluation of forage grasses. E. C. Conard.
12-034 Cytogenetic studies on wheat. Rosalind Morris.
12-045 Ecological, morphological, chemical and nutritional changes occurring in Great Plains grasses. L. J. Perry.
12-050 Chemical genetics of forage plants with particular reference to sweetclover. F. A. Haskins and H. J. Gorz.
12-055 Breed and evaluate wheat varieties for Nebraska. V. A. Johnson and J. W. Schmidt.
12-057 Genetic, physiological, morphological, and anatomical studies of wheat. V. A. Johnson.
12-070 Seed production of breeding lines of insect pollinated legumes. W. R. Kehr.
Pesticide mobility and degradation in soil-water systems. T. L. Lavy.


Subsoil chemical properties in relation to nutrient requirements of field crops. G. A. Peterson.

Water and soil pollution from cattle feedlots in Nebraska. T. M. McCalla, J. R. Ellis, and L. F. Elliott.

Phytotoxic substances in plant residues and microorganisms; effects on plant growth. T. M. McCalla, J. R. Ellis, and J. W. Schmidt.

Field crop variety evaluation. A. F. Dreier.


Physiological investigations of forage plants. L. E. Moser.

Soil factors and mineral nutrient uptake by plants. R. C. Sorensen.

Utilization and disposal of waste products and pollutions in soil. Leon Chesnin.

Study of certain ecological and physiological factors and management practices in relation to pasture production. E. C. Conard and Terry J. Klopfenstein.

Forage production and utilization systems as a base for livestock production. L. J. Perry, Jr.


Improving grain sorghum, wheat, and forage crop production through improved soil fertilizer practices. Donald H. Sander.

Soil fertility investigations related to corn and soybean and to irrigated production of these crops. R. A. Wiese.


Beef carcass evaluation. V. H. Arthaud.

Breeding tests of population genetic theory. G. T. Blum.


Factors influencing the utilization of protein and energy sources by beef cattle. Stanley Farlin.

The feeding value of complete ensiled rations. T. J. Klopfenstein.

The development and improvement of laboratory methods for determining forage quality. T. J. Klopfenstein.


Evaluation of pork products and accelerated processing methods. R. W. Mandigo.

Physiological mechanisms in bovine reproduction. E. F. Ellington.

The effect of genetic variability and pre-slaughter environment on pork carcass characteristics. R. W. Mandigo.

Effect of composition, distribution and quantity of lipids on meat quality. V. H. Arthaud.


Beef cow management. John K. Ward.

Genetic improvement of efficiency in the production of quality pork. P. J. Cunningham.

Influence of hormone administration on reproductive performance in the laboratory rat. A. B. Schultze.


Dairy herd management. R. D. Appleman.

Improving large dairy herd management practices. Robert D. Appleman and Foster G. Owen.


Biochemistry and Nutrition


Harvesting, processing and evaluating alfalfa and other forage crops. R. L. Ogden.

Analytical advisory and service laboratory. R. M. Hill.

Physico-chemical properties at the molecular level of surfaces of biologically important proteins. R. M. Hill.


Metabolism and biological function of lipids. H. W. Knoche.

Chemistry and metabolism of proteins. F. W. Wagner.

Biological nitrogen fixation. R. V. Klucas.

Biochemical mechanisms of susceptibility and resistance and the causes of damage to corn from southern leaf blight. J. M. Daly and L. D. Dunkle.
Economics (Agricultural)

10-034 Economics of resource use in the Sandhills area of Nebraska. A. W. Epp.
10-043 Economic effects of alternative farm enterprises in wheat producing areas of Nebraska. G. A. Helmers and W. F. Lagrone.
10-053 Feed-livestock sector: data relevance and information service programs. James B. Hassler.
10-057 Alternative institutional arrangements in area management of ground water. Loyd K. Fischer.
10-058 Economic and institutional arrangements for viable rural communities in Nebraska. Paul Gessaman and Maurice Baker.
10-061 Systems analysis of the economics of grain marketing. Michael Turner and Paul Lytle.
10-062 Impact of changing transportation systems on local grain and farm supply firms. Dale Anderson.
10-063 Least-cost systems for harvesting, conditioning and storing high-moisture feed grains in Nebraska. Paul Lytle and Michael Turner.
10-066 Utilization and disposal of municipal, industrial, and agricultural processing wastes on land. Maurice Baker.
10-067 Acquisition and use of external capital in rural Nebraska. Thomas L. Frey and Paul Gessaman.
Editorial

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

Education (Agricultural)

24-002 The anatomy of decision-making as it relates to occupational and educational choices of rural youth. J. T. Horner.
24-011 The survey of attitudes of agricultural students. V. G. Williams and R. D. Dillon.
24-014 New clientele and programs needed for occupational education in agriculture. R. D. Dillon.

Education and Family Resources

90-007 Rehabilitation of handicapped women. Lois O. Schwab.
92-001 A teaching-learning design for specific areas of home economics in secondary school and extension programs in rural Nebraska. Shirley Kreutz.
92-002 Developing technical skills of teaching. H. M. Crain.
92-003 Relationship between a home economics curriculum designed for concept learning and transfer of knowledge. Shirley Kreutz.

Engineering (Agricultural)

11-003 Planning farmstead buildings and livestock production systems. O. E. Cross and E. A. Olson.
11-007 The integration of machine operations and cultural practices in irrigated agriculture. B. R. Sommerfield.
11-008 Engineering phases of tillage, land treatment and livestock waste disposal for resource conservation. Howard Wittmuss and Delbert Lane.
11-016 The mechanics and measurement of soil tillage. G. W. Steinbruegge.
11-025 Operator comfort, health and safety in mobile agricultural operations. G. W. Steinbruegge and Rollin Schneider.
11-027 Environmental design criteria for livestock housing. James A. DeShazer.
11-031 Utilization of livestock waste to abate pollution. O. E. Cross, A. P. Mazurak, and Leon Chesnin.
11-034 Temporary storage of high-moisture feed grains. T. L. Thompson and M. G. Boosalis.
11-035 Animal waste management with pollution control. O. E. Cross.
11-036 Grain processing and handling systems. Norman Teter, Thomas L. Thompson, and Walter Tolman.
11-038 Recharge of aquifers for purpose of irrigation withdrawal. Deane M. Manbeck.
11-039 Measuring and defining rheological properties of food and food products from engineering concepts. L. L. Bashford.
11-040 Entomology
17-007 The photosensitivity in insects. J. H. Ball.
17-008 Investigations of field bean insects with emphasis on the western bean cutworm, Laspeyresia abietidosa. A. F. Hagen.
17-010 Biology and control of human and livestock insects. C. M. Jones.
17-023 Anatomy and histopathology of Nebraska pest insects. T. J. Helms.
17-024 Biology and integrated control of the greenbug on sorghums and small grains. Robert Staples.

17-025 Studies of the European corn borer—feasibility of genetic manipulation to control the species. R. E. Hill.


**Food and Nutrition**


**91-007** Metabolic interrelationships affecting nutrient energy requirements of humans. Constance Kies.

**91-008** Nutritional status of population groups. Hazel Fox.


**91-010** Interrelationships of amino acids and vitamin utilization. Constance Kies and Hazel Fox.

**91-013** Changes in food practices for better nutrition. H. H. Fox.

**91-014** Productivity of food service operations. M. E. Knickrehm.

**Food Science and Technology**

**16-008** Microenvironment of liquid food handling equipment. R. B. Maxcy.

**16-015** Dairy plant management. T. A. Evans.

**16-017** Study and modification of milk fat by controlled lipase action for use in foods. K. M. Shahani.

**16-019** Detection and control of flavor changes of foods. R. G. Arnold.

**16-021** Effect of various processing techniques on the physicochemical properties of food proteins. L. D. Satterlee.

**16-022** The effect of processing on potentially toxic microorganisms and metabolites in foods. Lloyd Bullerman.

**16-023** Irradiation processing of foods for quality protection. R. B. Maxcy.

**16-024** Food processing influences on nutrient composition. T. E. Hartung.

**16-025** Improvement in quality of various chases and other dairy foods. T. A. Evans.

**16-026** Significance, study and use of enzymes in the food industry. K. M. Shahani.

**Horticulture and Forestry**

**20-003** Bean breeding and genetics. Dermot P. Coyne.

**20-006** Improvement of vegetable crops. D. P. Coyne and R. B. O'Keefe.

**20-010** Improvement of potatoes. R. B. O'Keefe and O. S. Malamud.

Agroclimatic parameters to define the growing season of selected vegetables in Nebraska. R. E. Neild.

Windbreak shelter effects. W. T. Bagley.

Effect of temperature extremes on growth and development of plants. E. J. Kinbacher.

Tree breeding. W. T. Bagley and D. P. Coyne.

Forest tree improvement through selection and breeding. Phase III. R. A. Read and W. T. Bagley.

Adaptation, improvement and management of turfgrasses and other ground covers for Nebraska. E. J. Kinbacher.

Collection, propagation, culture, evaluation and maintenance of plant materials for landscaping. Sotero Salac and J. O. Young.

Measure evapotranspiration and photosynthesis to evaluate techniques for improvement of water use. N. J. Rosenberg.


Factors affecting post-harvest market quality of processed potatoes. R. B. O'Keefe.


Genetics, breeding and cultural interactions of beans (Phaseolus vulgaris L.). Dermot P. Coyne.

Factors affecting patterns of living in disadvantaged families. J. C. Woodward.

Loneliness and solitude—phenomena, incidence and factorial relationships. J. C. Woodward.

Helping the disadvantaged and educationally retarded child of the Indian. V. Kalyan Mant.


The middle years: developmental changes between thirty and sixty-five. Ruby H. Gingles.
Diseases of forest and shade trees. G. W. Peterson.
Epidemiology of vegetable diseases in Nebraska. J. R. Steadman.
Physiology of fungal spore germination. J. W. Van Etten.
Epidemiology of vegetable diseases in Nebraska. J. R. Steadman.
Physiology of fungal spore germination. J. W. Van Etten.

Biological and physiological aspects of corn and sorghum diseases. Larry D. Dunkle.

Physiological and physical response of poultry to environmental variables. F. B. Mather.
Factors affecting the quality and characteristics of poultry meat products. G. W. Froning.
The role of physiological food intake regulators in poultry. E. W. Gleaves.
Factors affecting quality (physical, chemical and microbiological) in eggs and egg products. T. E. Hartung and G. W. Froning.
Physiological responses of chickens to varying environments. F. B. Mather and J. A. DeShazer.

Applications of statistics to research in agriculture. W. M. Schutz.

Factors affecting consumer satisfactions of clothing and textile purchases. Audrey Newton.
Study of perception, creativity and other factors as they relate to design. Audrey Newton.
Developmental aspects of clothing awareness. P. J. Sailor.

Veterinary Science

14-001 Animal disease diagnosis and surveillance in Nebraska. O. D. Grace.
14-004 Bionomics, etiology, and control of the parasites of Nebraska livestock. D. L. Ferguson and M. J. Twiehaus.
14-008 Disease study and control in specific pathogen free herds. M. J. Twiehaus.
14-012 Immunological properties of parasite enzymes in sheep and swine. Marvin B. Rhodes.

Northeast Station

42-001 Influence of certain housing and management regimes on confinement rearing of growing-finishing pigs. R. D. Fritschen.

North Platte Station

43-006 Relating nutrition and management to growth and development in programming pork production. D. M. Danielson.
43-008 Relation of cropping and tillage practices to crop production and maintenance of soil fertility under dryland conditions. D. E. Smika.
43-020 Animal disease surveillance in western Nebraska. R. G. White and C. M. Hibbs.
43-022 Development of ornamental plants for Nebraska as a Great Plains state. R. D. Uhlinger.
43-023 Economic analyses of irrigated grain and forage production in west central Nebraska. R. E. Perry.
43-024 Injurious insects affecting livestock in Nebraska. J. B. Campbell.
43-026 Agricultural production systems for the Nebraska Sandhills. Leo E. Lucas.

Scotts Bluff Station

44-003 Dry bean variety test. F. N. Anderson and D. S. Nuland.
44-004 Maximum production of crops under irrigation in western Nebraska. F. N. Anderson and C. L. Ashburn.
44-005 Fertilizer and manure application for production of continuous corn. F. N. Anderson.
44-007 Alfalfa variety testing and corn testing. F. N. Anderson and Lenis A. Nelson.
44-008 Effects of high rates of phosphate fertilization on the production of corn. F. N. Anderson.
44-010 Fertilizers for sugar beet production. F. N. Anderson.
44-011 Development of dryland cropping systems for western Nebraska. C. R. Fenster.
44-012 Improvement of millet production by breeding and cultural studies. Lenis A. Nelson.

South Central Station

48-001 Irrigated row crop production systems in South Central Nebraska. Kenneth D. Frank.
48-002 How cultural practices affect root and stalk rot diseases of corn and sorghum. Ben L. Doupnik, Jr.
48-003 Biology and control of crop insects in south central Nebraska. Leroy L. Peters.

United States Meat Animal Research Center

46-001 Clay Center development. K. E. Gregory.
46-002 Improvement of beef cattle through breeding methods. R. N. Koch, G. E. Dickerson and L. V. Cundiff.
46-003 Improvement of beef cattle through breeding methods. L. V. Cundiff, G. E. Dickerson and R. M. Koch.

University Field Laboratory

45-001 Field Laboratory development. Warren W. Sahs.
EXPERIMENT STATION PUBLICATIONS


Nebraska Experiment Station Quarterly, Summer, 1972 (28 pages). 12,500 copies.

Nebraska Experiment Station Quarterly, Fall, 1972 (28 pages). 12,500 copies.

Nebraska Experiment Station Quarterly, Winter, 1973 (28 pages). 10,500 copies.

Nebraska Experiment Station Quarterly, Spring, 1973 (28 pages). 10,500 copies.

Bulletins


524. Spring and Fall Freeze Probabilities in Nebraska (52 pages). R. E. Neild and Morris Webb, Jr. 3,000 copies.


526. Producing Proso in Western Nebraska (12 pages). L. A. Nelson. 3,000 copies.


Reprints (Bulletins)


Research Bulletins


Reprints (Research Bulletins)

246. Trees and Shrubs for Noise Abatement (77 pages). David I. Cook and David F. Van Haverbeke. 3,000 copies.

Tractor Test Reports

Nebraska Tractor Test Data 1973 (58 pages). 15,000 copies.

Reprints of individual tests: 895, 500 copies; 909, 500 copies; 910, 500 copies; 929, 500 copies; 938, 500 copies; 952, 500 copies; 955, 500 copies; 964, 500 copies; 965, 500 copies; 971, 500 copies; 974, 500 copies; 986, 500 copies; 987, 500 copies; 995, 500 copies; 1002, 500 copies; 1008, 500 copies; 1014, 500 copies; 1070, 500 copies; 1072, 500 copies; 1075, 500 copies; 1083, 500 copies.

Outstate Testing Circulars


Reprints (Outstate Testing Circulars)


Nebraska Experiment Station Quarterly Articles

The Scotts Bluff Station. John L. Weihing. Vox XIX (2) 4-6.
Western Nebraska Bears Fruit. Lionel Harris. Vol XIX (2) 8-10.
County Ag Agents Get Involved. Grant L. Johnson. Vol XIX (2) 22-23.
South Central Station. Marcia S. Pearson. Vol XIX (3) 4-5.
Threads for His Thoughts. Patricia Sailor. Vol XIX (3) 11-12.

Stop Lawn Leaf Spot. Louis T. Palmer, Brent Hoadley and Lynn Crandall. Vol XX (1) 2.
No Tillage Crop Production. Gail A. Wicks. Vol XX (1) 4-6.
Production Potential for Beef Cattle in Western Nebraska. Glenn A. Helmers.

Departmental Reports

Department of Agronomy

Report Number 1, A Survey of Silage Crops and Their Quality. W. J. Moline and W. S. Ball.

Department of Animal Science


Department of Agricultural Economics


Department of Agricultural Communications


Department of Agricultural Education


Department of Agricultural Engineering

Department of Horticulture and Forestry

Report Number 94, Genetic Control of the Reaction to Common Blight Bacteria (Xanthomonas phaseoli) in Relation to Stage of Plant Development and Bacterial Multiplication in Beans (Phaseolus vulgaris L.), Dermot P. Coyne.

Report Number 95, Progress in Breeding Early Maturing California Small White Type Dry Bean Adapted to Nebraska. Dermot P. Coyne.


Department of Poultry Science


Statistical Laboratory

Report Number 9, A General Factorial Analysis of Variance Program for the IBM 360.

Department of Food and Nutrition

Report Number 5, Food and Nutrition Books by the Reading Public. Dalia Restrepo, Hazel Fox and Constance Kies.

Miscellaneous Publications


1st International Winter Wheat Conference (344 pages). V. A. Johnson, coordinator. 1,000 copies.

North Central Regional Publications

Predicting Seed and Forage Yields of Alfalfa Open-Pollinated Progenies. Published at South Dakota State University.

Input Marketing Research Yesterday, Today and Tomorrow. Published at Michigan State University.

Journal Series

(technical Article and Paper Published or Submitted for Publication)


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<td>Encasing Undisturbed Soil Cores in Plastic</td>
<td>Soil Science Society of America Proceedings</td>
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<td>Weed Science</td>
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<td>3360</td>
<td>Utilization of Beef and Pork Skin Hydrolyzates as a Binder or Extender in Sausage Emulsions</td>
<td>Journal of Food Science</td>
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<td>Journal of Environmental Quality</td>
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<td>3366</td>
<td>The Effect of Age, Nutritional Factors, and Gonadal Development on the Mating Behavior of the Face Fly, Musca Autumnalis</td>
<td>Journal of Insect Physiology</td>
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<td>Phytopathology</td>
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<td>Journal of Food Science</td>
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<td>3374</td>
<td>The Effect of pH and Certain Additives on Heat Denaturation of Turkey Meat Myoglobin I, Model System</td>
<td>Poultry Science</td>
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<td>3378</td>
<td>Weed Control of Soybeans with Postemergence-Directed Herbicides</td>
<td>Journal of The Weed Science Society of America</td>
<td>v21 (1)</td>
<td>81-85</td>
<td>1973</td>
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3449. Comparison of Expressed Goals and Simulated Behavior by Food Purchasers. Laura Darnell, Constance Kies and Orlan Captain. Journal of Nutrition Education.


3475. Activity Ratios for Farm Machinery Operations Analysis. Kenneth Von Bargen and M. D. Cunney. Transactions of the ASAE.


3484. A Survey of Student and Faculty Attitudes toward Education in the College of Agriculture, University of Nebraska. Vernon Williams and Roy Dillon. National Association of Colleges and Teachers of Agriculture.


3496. Sampling of Liquid and Nonfluid Wastes. Norris P. Swanson and Conrad B. Gilbertson. Transactions of the ASAE.


3573. Use of Behavioral Objectives to Teach Soil Morphology, Classification, and Survey. David T. Lewis. Journal of Agronomic Education.


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<th>Number</th>
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<td>3621</td>
<td>Life History and Predatory Habits of Philonthus theveneti against</td>
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<td>Additional Evidence for Possible Autolytic Activity During Glutaraldehyde Fixation of Maize Dwarf Mosaic Virus Infected Corn.</td>
<td>Willem G. Langenberg and Helen F. Schroeder. Phytopathology.</td>
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3649. A Ten Year Summary of Strip Till-Planting of Row Crops. H. D. Wittmuss and D. E. Lane. Transactions of the ASAE.

Abstracts


PUBLICATIONS OF THE STAFF

Key to Abbreviations

SB--Station Bulletin
RB--Research Bulletin
DR--Departmental Report
OTC--Outstate Testing Circular
MP--Miscellaneous Publication
Q2--Summer Quarterly 1972
Q3--Fall Quarterly 1972
Q4--Winter Quarterly 1972
Q1--Spring Quarterly 1973
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THE UNIVERSITY OF NEBRASKA
AGRICULTURAL EXPERIMENT STATIONS

REPORT OF INCOME AND EXPENDITURES\(^1\)
For the Year Ended June 30, 1973

GENERAL CURRENT FUNDS

Funds Available:\(^2\)

Received from United States Government
Hatch Fund .......................... $ 876,120.00
Budgeted by the University .............. 4,090,103.21
Total ................................ $4,966,223.21

Expenditures:
Salaries, Wages, and Staff Benefits ... $4,099,682.90
Operating Expenses .................. 756,491.14
Equipment and Improvements .......... 110,049.17
Total ................................ $4,966,223.21

RESTRICTED CURRENT FUNDS

Income:
Gifts, Grants, and Contracts
From United States Government
    Agencies ........................ $1,285,595.86
    From State of Nebraska Agencies ... 140,461.47
    From Industry ..................... 295,563.82
    From Foundations & Health
        Organizations .................. 97,423.43
        From Other Sources .......... 9,513.35
Total ................................ $1,828,557.93

Expenditures:
Salaries, Wages and Staff Benefits ... $1,087,441.44
Operating Expenses .................. 633,996.91
Equipment and Improvements .......... 107,119.58
Total ................................ $1,828,557.93

\(^1\) These figures do not include capital expenditures of Station funds for Plant ("P"
Account) expenditures totaling $164,697.02

\(^2\) Includes University Research Council funds from state appropriations
and Irrigation Development Funds, Station portion

\[\begin{array}{c}
\text{University Research Council} & 10,864.45 \\
\text{Irrigation Development Funds} & 8,648.73 \\
\hline
\text{Total} & 19,513.18
\end{array}\]
### CASH REVOLVING FUND

Income:
- Sales and Services ........................................ $1,821,197.51

Expenditures:
- Salaries, Wages and Staff Benefits ........ $382,521.17
- Operating Expenses .......................... 1,244,904.45
- Equipment and Improvements .............. 193,771.89
  Total ........................................ $1,821,197.51

### AGENCY REVOLVING FUND

Income:
- Sales and Services ........................................ $1,836,587.91

Expenditures:
- Salaries, Wages and Staff Benefits ........ $1,083,386.33
- Operating Expenses .......................... 673,245.73
- Equipment and Improvements .............. 79,955.85
  Total ........................................ $1,836,587.91

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3 Includes Meat Animal Research Center, Foundation Seed and Tractor Testing.