

UNIVERSITY OF MINNESOTA

Sent 7/22/99 slw

Twin Cities Campus

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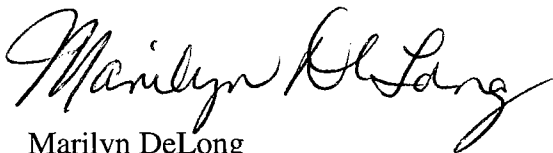
Dr. George Cooper,  
Deputy Administrator  
Partnerships  
Cooperative State Research, Education, and Extension Service  
U.S. Department of Agriculture  
Washington, D.C. 20250

Dear Dr. Cooper:

Enclosed is the University of Minnesota AREERA Plan of Work document that you requested. It includes a plan and programs for each of the five national goals.

Please contact Dr. Phil Larsen if you have questions.

Sincerely,



Marilyn DeLong  
MAES Deputy Director

**University of Minnesota  
Implementation of Plan of Work for Research  
in the Agricultural Experiment Station  
Federal Fiscal Years 2000-2004**

**A. Background**

The Agricultural Research, Extension, and Education Reform Act of 1998 (AREERA) requires that each Agricultural Experiment Station (AES) develop a Plan of Work (POW), in addition to the system of Hatch and regional projects.

The University of Minnesota Agricultural Experiment Station (MAES) is comprised of research contributions from five colleges as follows: College of Agricultural, Food, and Environmental Sciences (COAFES), College of Natural Resources (CNR), College of Human Ecology (CHE), College of Veterinary Medicine (CVM), and College of Biological Sciences (CBS). Research funding is distributed among these five colleges based upon their research activity. Management of research is decentralized to each collegiate Dean who also serves as Associate or Assistant Director of the Agricultural Experiment Station. The Dean of COAFES serves as Director of the AES, the Deans of CNR and CHE have the title of Associate Directors of MAES, and the Deans of CVM and CBS have the title of Assistant Directors.

The contact for the Minnesota Agricultural Experiment Station is the Director:

Dr. Phil Larsen, Interim Director  
University of Minnesota Agricultural Experiment Station  
190 Coffey Hall  
1420 Eckles Avenue  
St Paul, MN 55108

**B. Operating Philosophy**

The shared missions of the Agricultural Experiment Station and the University of Minnesota Extension Service include serving the people of our state based upon three parameters: economic viability; environmental sustainability; and quality of life. We are committed to serve all sectors of the population and to that end view diversity in ideas and people as a strength. We believe the roles of participants within our programs should be structured to promote collaborations and an arena for change.

Five pervasive values for our projects and programs in each of the five goals of GPRA include:

1. to integrate research, education and outreach efforts in a comprehensive program;
2. to engage in research and educational practices that do not deplete our nonrenewable resources nor negate quality of life;
3. to derive synergy from multidisciplinary research and collaborative learning partnerships;
4. to support and encourage experiential knowledge and the co-learning role of citizens;
5. to encourage diversity of ideas and people within a learning environment.

### Stakeholder Input:

Continuous stakeholder input is sought from key constituents and stakeholders appropriate to each research goal. These include groups such as the following: peers, advisory councils, commodity groups, racial and ethnic minorities, i.e. citizens within tribal colleges. Input from such groups is sought yearly and research and outreach programs are planned based upon their responses. In addition, a system of Regional Partners is being developed throughout Minnesota to address and engage in research critical to their region (3 were developed in 1999 and additional regional partners will be formed as funding from the State Legislature is secured). (See Appendix 1 for operating principles for Regional Partnerships.)

In addition every three years, stakeholder input for the research program as a whole will be sought. The Directors and Associate Directors of AES (representing all 5 colleges listed above) plan to visit six regions within the state of Minnesota to present and receive feedback for their research programs to all who wish to attend. Publicity will include media announcements (radio, e-mail, and posters in designated public spaces such as local libraries, and Research and Outreach Centers located within each region).

### Equal Opportunity

We adopt by reference the University of Minnesota's Affirmative Action Program for procedures for reporting Civil Rights compliance and Equal Employment Opportunity requirements (See Appendix 2) .

### Funding Resources

Funding resources include federal funding (Hatch) and state contributions to research at the approximate ratio of 1:9 . Thus the state contributes far more than the match required to receive federal funding. In addition, special state research initiatives address critical issues such as wheat scab, avian respiratory disease, rural economic viability. The Rapid Response fund is a source of funding from a recent state legislative initiative set up to address ongoing and evolving critical issues in Minnesota. To receive funding from Rapid Response involves a competitive process of proposal submission and review. (See Appendix 3 for guidelines for proposals for Rapid Response).

Other funding comes from commodity check-offs in such agricultural products as canola, wild rice, barley, milk and beef. Considerable funding for research derives from federal funding agencies i.e., NSF, NIH as well as national and local industry, i.e., Cargill. For example, NSF funding helps to support state-of-the-art instrumentation in the Mass Spectrometry Center.

### Scientific Merit and Peer Review Process

Minnesota engages in a scientific merit and peer review process for all projects. Peer review involves both reviewers internal and external to the University (See Appendix 3 for review process for the Rapid Response fund and Appendix 4 for reviewer form for AES projects).

At the University of Minnesota each College engages in a strategic planning process on a yearly basis. The result is a "Compact" for each College that serves as a basis for strategic planning and negotiations with central administration. (See Appendix 5 for examples of Compacts for Colleges with AES funding).

### Identification of multi-state, multi-disciplinary research programs.

Minnesota engages in multi-state projects through the regional research programs as well as an extensive program with adjacent states (See Appendix 6). An important criterion for Minnesota to engage in multi-state research is that projects be multi-disciplinary as well. The University of Minnesota also engages in multi-state research with adjacent states. For example the University of Minnesota has joint projects and faculty appointments with North Dakota State University that involve collaborating on sugarbeet management and production, potatoes management and production, and cropping systems, with the University of

Wisconsin, Madison on dairy research, with Iowa State University on use of wetlands, with VPI on avian research.

Identification of research integrated with extension outreach programs:

Appendix 7 indicates the extensive listing of University of Minnesota faculty with joint appointments including both research and outreach components. This listing exceeds the federal requirement for integration and will serve to provide evidence of the integrative efforts for federal funding at the University of Minnesota.

In addition to meeting funding requirements there are many other evidences of programs initiating research and carrying through to dissemination through outreach. MN IMPACTS is a joint research and outreach database for reporting research and outreach impacts within the state of Minnesota (See Appendix 8 for an example of a research accountability report from an AES project. Access the web site for additional examples at [www3.extension.umn.edu/mn\\_impacts](http://www3.extension.umn.edu/mn_impacts)).

**C. Plan of Work**

The Minnesota POW is organized around the five national REE goals and the following information is reported under each goal for each program:

- Statement of Issues
- Performance Goals: Output and Outcome Indicators
- Key Program Components
- Internal and External Linkages
- Target Audiences
- Program Duration

**Allocation of resources**

Appendix 9 includes the allocation of funding resources for each Goal and specific Hatch projects within each College.

**Goal 1: Through research and education, empower the agricultural system with knowledge that will improve competitiveness in domestic production, processing, and marketing. (An agricultural system that is highly competitive in the global economy.)**

**Goal 1-Program 1: Agricultural Production and Farm Business Management**

**Statement of Issue:**

The 1996 Farm Act quickly and dramatically changed the decision-making environment for farmland operators, owners, and managers. The emergence of the Farm Act with its production flexibility contract payments (PFCs) and its almost complete elimination of planting restrictions jolted many engaged in agriculture. Some of the primary issues Minnesota agricultural producers will need to address as a result of the changes in the agricultural industry and policy include: strategic positioning, transferring management capabilities, frequent performance monitoring, evaluating information technologies, marketing options, monitoring external factors, managing information, and accountability.

The Center for Farm Financial Management within the College of Agricultural, Food and Environmental Sciences was established to conduct research and develop educational tools for farmers, agricultural lenders and educators to apply the principles and concepts of farm planning, financing and analysis in a practical manner. These educational tools are usually in the form of computer software that we develop and support to help improve the decision-making ability of farmers. To remain competitive in agriculture, Minnesota producers and agriculture businesses must be better able to develop sound production and business management plans, and access educational and informational technologies.

**Output/Outcome Indicators:**

- CRIS Reports
- MN IMPACTS
- Number of refereed journal articles and other peer review publications
- Industry applications of findings

**Performance Goals:** will vary with research project.

**Key Program Components:**

- Conduct research to support improved decision making and risk management in farm planning and financing for farmers and lenders.
- Conduct research to support improved decision making in financing for agricultural business owners.

**Internal and External Linkages:**

- Internal collaborations to accomplish program and objectives

- Agronomic and animal related departments, and technical communications in the College of Agricultural, Food, and Environmental Sciences (COAFES)

- USDA/ARS

- University of Minnesota Extension Service

- **External Collaborations:**

- Farm Lenders

- Farm Credit Institutions

- Farm Service Agency

**Target Audiences:**

- Farmers and ranchers

- Extension educators

- University/Technical college educators

- Agricultural lenders

- Veterinarians

- Other public agencies

- Private businesses and consultants

**Program Duration:**

Five years

**Goal 1-Program 2: Agricultural Marketing and Distribution**

**Statement of Issue:**

The livestock industry is a high value economic enterprise in Minnesota's agricultural economy. Improvements in economic efficiency affect many people involved in production, distribution and marketing of livestock and meat products -- impacts are likely to be long-term in nature (10-20 years). The greatest economic value is likely derived from the price risk management. Improved price risk management can result in substantially improved profitability in any given year.

The production and distribution of food and fiber in Minnesota have changed dramatically during the last decade. Food in the supermarket and restaurant is as likely to come from another state or continent as it is from Minnesota, thereby creating a disconnect between producer and consumer.

**Output/Outcome Indicators:**

- CRIS Reports

- MN IMPACTS

- Number of refereed journal articles and other peer review publications

- Industry applications of findings

**Performance Goals:** will vary with research project.

**Key Program Components:**

- Conduct research to support improved decision making in farm planning and financing for farmers and lenders.

- Conduct research to support improved decision making in financing for agricultural business owners.

**Internal and External Linkages:**

- **Internal collaborations to accomplish program and objectives:**

- Agronomic and animal related departments in the College of Agricultural, Food, and Environmental Sciences (COAFES); Veterinary Medicine

- USDA/ARS

- University of Minnesota Extension Service

- **External Collaborations:**

- Farm Lenders

- Farm Credit Institutions

- Farm Service Agency

**Target Audiences:**

- Farmers and ranchers

- Extension educators

- University/Technical college educators

- Agricultural lenders

- Veterinarians

- Other public agencies

- Private businesses and consultants

**Program Duration:**

- Five years

**Goal 1-Program 3: International Economic Competitiveness**

**Statement of Issue:**

Minnesota agriculture has become much more affected by global conditions. Economic decline in Southeast Asia affects the ability to market



commodities in that part of the world. Growing conditions in Brazil and Canada affect the price of Minnesota products. And, trade agreements affect what can be bought and sold in countries around the world.

The Center for International Food and Agricultural Policy in the College of Agricultural, Food, and Environmental Sciences was established to analyze the forces that underlie international trade restrictions; describe the dynamic interdependence of farmers' production and investment decisions and governments' agricultural and trade policy decisions; and look at the economic effects of policy decisions in other countries on agriculture in Minnesota and the U.S. With its interdisciplinary approach, the center uses its research and education activities to increase international understanding about food, agriculture, nutrition, natural and human resources, and the environment, and to positively impact the policies of both developed and developing countries

**Output/Outcome Indicators:**

- CRIS Reports
- MN IMPACTS
- Number of refereed journal articles and other peer review publications
- Industry applications of findings

**Performance Goals:** will vary with research project.

**Key Program Components:**

- Conduct research on the economic interrelationships in both the domestic and foreign food and agricultural industries.
- Develop and maintain an analytical support system that facilitates research and analysis on food, agricultural and trade policy issues.
- Evaluate supply, demand and policy factors in the United States and abroad that influence both short-term and long-term trade prospects and patterns.
- Provide information to help public policy participants and decision-makers evaluate trade and policy issues and increase public understanding of these issues.
- Provide access to information technologies and training materials and continue research on the use of educational technologies.

**Internal and External Linkages:**

- **Internal collaborations to accomplish program and objectives:**

- Research and extension faculty in the departments of Food Science and Nutrition; Applied Economics; Rhetoric; Soil, Water, and Climate, (COAFES)
- Hubert H. Humphrey Institute of Public Affairs (UM)
- Economics Department (UM)
- College of Natural Resources (UM)
- Law School (UM)
- Carlson School of Management (UM)
- Political Science department
- University of Minnesota Extension Service.

• **External Collaborations:**

- 30 international affiliates in countries such as Poland, Germany, Italy, and Argentina

**Target Audiences:**

- State legislatures
- Farmers
- Extension educators
- University/Technical college educators
- Agricultural lenders
- Private businesses and consultants

**Program Duration:**

Five years

**Goal 1-Program 4: Physiological Processes Impacting  
Production and Quality Traits in Agricultural Animals**

**Statement of Issue:**

Increasing the profitability of producing food from animals is a primary concern for Minnesota livestock producers. Research is needed to increase the understanding of the physiologic mechanisms affecting reproduction, growth and performance. These understandings will be vital for production efficiency and promotion of a healthy and competitive livestock industry in Minnesota. Reproduction is of major economic importance to producers of ruminant animals because it greatly impacts overall production efficiency. A better understanding of their reproductive and growth mechanisms will give rise to strategies and technologies to enhance production

For Minnesota animal producers industries to remain viable, it is necessary to produce animals which provide consumers with the quality meat, milk

and poultry products they desire at an affordable cost. High production efficiency and lean growth will be in greater demand for expanding national and international markets, along with being environmentally responsible.

**Output/Outcome Indicators:**

- CRIS Reports
- MN IMPACTS
- Number of refereed journal articles and other peer review publications
- Industry applications of findings

**Performance Goals:** will vary with research project.

**Key Program Components:**

- Improve production profitability through reproductive strategies and research.
- Increase research on lean growth and alternative animal products for consumer driven markets.

**Internal and External Linkages:**

• **Internal collaborations to accomplish program and objectives:**

- Research and extension faculty in the departments of Animal Science; Food Science and Nutrition; Applied Economics; Agronomy and Plant Genetics
- Center for Alternative Plant and Animal Products (COAFES)
- USDA/ARS
- College of Veterinary Medicine
- University of Minnesota Extension Service

• **External Collaborations:**

- MN Cattleman's Association
- MN Turkey Growers Association
- National Turkey Federation
- MN Pork Producers
- National Pork Producers Association
- U.S. and MN Feed Industry
- Minnesota Milk Producer's Association

**Target Audiences:**

- Farmers
- Extension educators

- University/Technical college educators
- MN feed industry
- Veterinarians
- Private businesses and consultants

**Program Duration:**

Five years

**Goal 1-Program 5: Animal Production and Management Strategies**

**Statement of Issue:**

Minnesota livestock producers are challenged with integrating knowledge from diverse disciplines into production practices suitable for their individual operation. Research on animal production systems must address the interactions among nutrition, genetics, reproduction, physiology, microbiology, immunology, and molecular biology, and also related effects on animal health, farm management, productivity, and impacts to the environment.

In Minnesota, large amounts of land (including two million acres of conservation reserve land) are suited for beef cow/calf, sheep and dairy operations, but the cost of production is high due to feed costs and inefficient use of available forage. Research is needed to develop grazing and forage systems to reduce feed costs and improve profitability.

Research leading to applications in production efficiency, sustainability, animal and environmental well-being, and high quality products are imperative if Minnesota animal agriculture is to remain economically viable.

**Output/Outcome Indicators:**

- CRIS Reports
- MN IMPACTS
- Number of refereed journal articles and other peer review publications
- Industry applications of findings

**Performance Goals:** will vary with research project.

**Key Program Components:**

- Nutrition and management factors affecting the biologic and economic efficiency of animal production systems.
- Evaluation of alternative feeds and feeding and management strategies to improve economic efficiency.
- Determination of nutrient requirements to enhance economic and environmentally sustainable animal production.
- Improved definition of dietary nutrient needs for food animals.
- Provide information on improved sources of nutrients.
- Production systems research to optimize system parameters that result in sound environmental and profitable production strategies.

**Internal and External Linkages:**

• **Internal collaborations to accomplish program and objectives:**

- Research and extension faculty in the departments of Animal Science; Food Science and Nutrition; Applied Economics; Soil, Water, and Climate; Biosystems & Agricultural Engineering; Agronomy and Plant Genetics (COAFES)
- Center for Alternative Plant and Animal Products (COAFES)
- MN Institute for Sustainable Agriculture
- USDA/ARS
- College of Veterinary Medicine
- University of Minnesota Extension Service.

• **External Collaborations:**

- MN Cattleman's Association
- MN Turkey Growers Association
- Nation Turkey Federation
- MN Pork Producers
- MN Soybean Growers Association
- National Pork Producers Association
- U.S. and MN Feed Industry
- MN Milk Producers Association

**Target Audiences:**

- Farmers
- Extension educators
- University/Technical college educators
- MN feed industry
- Other public agencies
- Private businesses and consultants

**Program Duration:**

Five years

## **Goal 1-Program 6: Genetic enhancements in animal systems**

### **Statement of Issue:**

Minnesota meat producers currently face the challenge of minimizing their production costs while supplying leaner, more visually appealing meats to various consumer markets. Research is currently being conducted to identify genetic differences in animals which impact economically important traits, detection of genes involved in disease resistance, or inherited diseases related to that industry. The results of this research would assist producers in their efforts to accelerate the genetic improvement of meat-bearing animals.

Meat producers are interested in increasing their competitiveness by offering leaner, juicier meats. With new genetic technology, the end-product quality improves in relation to costs involved with raising the animals, as producers realize an average daily gain of weight with better feed efficiency. Previous research has indicated as much as a 25% increase in this efficiency.

Additionally, the use of genetic maps and markers will result in products that maintain a generally higher visual appeal to the consumer. For producers and packers, this is where much of the end value comes from, so they can cater towards different global markets, according to specific consumer preferences. While the overall economic impact is still difficult to determine, our goal is to make Minnesota producers more competitive. If we can transfer technology effectively to producers, it will naturally have an improved job effect on both family businesses and corporations. As such, producers will be able to get contracts with packing plants that guarantee higher prices based on quality. While this process does not directly affect consumer prices, the packers will eventually be able to offer better prices as quality becomes more consistent.

### **Output/Outcome Indicators:**

- CRIS Reports
- MN IMPACTS
- Number of refereed journal articles and other peer review publications
- Industry applications of findings

**Performance Goals:** will vary with research project.

### **Key Program Components:**

- Identify major animal genes that affect growth and development, reproductive performances, lactation, and disease resistance or susceptibility characteristics.
- Identify genetic differences in animals that impact economically important traits or inherited diseases.
- Identify biotechnology that would assist producers in their efforts to accelerate the genetic improvement of meat-bearing animals.
- Construct linkage maps of the animal genomes (total nuclear DNA) through the application of highly informative markers called micro-satellites. By analyzing the segregation patterns of these markers in various reference families and clinical cases, we will help define those areas of the genome where genetic differences affect observable traits and diseases. Markers of specific regions, which have a major impact on economic traits or genetic diseases, can then be incorporated into marker-assisted selective breeding programs.

**Internal and External Linkages:**

• **Internal collaborations:**

- Researchers and extension faculty in the departments of Animal Science; and Food Science and Nutrition (COAFES)
- University of Minnesota Extension Service
- USDA-ARS
- College of Veterinary Medicine.

• **External Collaborations:**

- MN Cattleman's Association
- MN Turkey Growers Association
- National Turkey Federation
- MN Pork Producers
- National Pork Producers Association
- U.S. and MN Feed Industry
- MN Milk Producers Association

**Target Audiences:**

- Livestock producers
- Veterinarians
- Consumers
- Researchers

**Program Duration:**

Five years

**Goal 1-Program 7: Understanding physiological processes impacting production and quality traits in cropping systems**

**Statement of Issue:**

Increasing efficiencies of producing crop plants is a primary concern for Minnesota producers. Research is needed to increase the understanding of component biological responses that determine crop yield and quality parameters at a range of levels from the biochemical to the physiological. Emphasis will need to be placed on the bases of adaptability to stresses caused by high temperature, adaptability of a range of current and alternative crops, water storage, malnutrition and competition from weeds, pests and diseases. The intention is to learn how to manipulate these responses through genetic and agronomic means.

**Output/Outcome Indicators:**

- CRIS Reports
- MN IMPACTS
- Number of refereed journal articles and other peer review publications
- Industry applications of findings

**Performance Goals:** will vary with research project.

**Key Program Components:**

- Increase knowledge of biological components of crop yield.
- Adaptability of crop plants to environmental stresses.
- Understanding of the role of genetics in production and quality traits.

**Internal and External Linkages:**

- **Internal collaborations to accomplish program and objectives:**
  - Research and extension faculty in the departments of Agronomy and Plant Genetics; Soil, Water, and Climate; Horticultural Science; Entomology; Plant Biology; and Plant Pathology; Biosystems & Agricultural Engineering (COAFES).
  - University of Minnesota Extension Service
  - Center for Alternative Plant and Animal Products (COAFES)
  - USDA/ARS
  - Minnesota Institute for Sustainable Agriculture



• **External Collaborations:**

- Minnesota Department of Agriculture
- MN Wheat and Barley Growers
- MN Soybean Growers Association
- MN Corn Growers Association
- MN Wild Rice Growers Association
- MN Valley Alfalfa Producers
- MN Potato Growers Association;
- Midwest Food Processors Association

**Target Audiences:**

- Producers
- Extension Educators
- Crop consultants
- Seed industry

**Program Duration:**

Five years

**Goal 1-Program 8: Genetic enhancement in plant production systems**

**Statement of Issue:**

Germplasm is the key element of successful plant breeding programs. Germplasm development involves research to improve the yield, adaptability, disease resistance, resistance to environmental stress, and product quality. Evaluation, development, and enhancement require long-term commitments to develop superior germplasm sources.

New sources of genetic variation to improve the germplasm resource base of Minnesota's agricultural crops and new information on the inheritance of commercially important traits is essential. Research in the program is linked directly to conventional breeding programs undertaken by the Minnesota Agricultural Experiment Station.

More effective procedures for manipulating germplasm via marker-assisted selection, elucidating genetic bases of traits with complex inheritances, identifying and characterizing novel heterotic groups and quantitative trait loci, identifying optimal germplasm for specific breeding programs, and applying knowledge in production between breeding and

programs will be needed to insure genetic diversity of Minnesota's plant production systems.

**Output/Outcome Indicators:**

- CRIS Reports
- MN IMPACTS
- Number of refereed journal articles and other peer review publications
- Industry applications of findings

**Performance Goals:** will vary with research project.

**Key Components:**

- Germplasm development, genetic transformation and the development and application of molecular markers.
- Crop improvement for the introduction of new genes to increase resistance to pests and diseases; and improve both productivity and crop quality.
- Development of new technologies to develop more rapid and efficient methods of identifying useful properties of genes and for manipulating genetic material.
- Develop new approaches in the characterization and classification of genetic material and in the application of new biotechnologies will support the development of new crops.
- Development of new approaches for breeding and genetic improvement utilizing molecular technologies.

**Internal and External Linkages:**

• **Internal collaborations to accomplish program and objectives:**

- Research and extension faculty in the departments of Agronomy and Plant Genetics; Soil, Water, and Climate; Horticultural Science; Entomology; Plant Biology; and Plant Pathology.
- University of Minnesota Extension Service
- Center of Alternative Plant and Animal Products (COAFES)
- USDA/ARS

• **External Collaborations:**

- Minnesota Department of Agriculture
- MN Wheat and Barley Growers
- MN Soybean Growers Association, Forage, Turf Organizations
- MN Corn Growers Association
- MN River Valley Potato Growers; Area II Potato Growers

- MN Wild Rice Growers Association
- MCIA

**Target Audiences:**

- Producers
- Extension Educators
- Crop consultants
- Seed industry

**Program Duration:**

Five years

**Goal 1-Program 9: Crop Production and Management Strategies**

**Statement of Issue:**

Production capacity, production efficiency, and crop protection are major factors supporting Minnesota crop productivity. Minnesota agriculture is relatively diverse with production in corn, soybean, spring wheat, barley, alfalfa, sugarbeets, and sunflower ranking in the top 4 nationally.

Minnesota producers are seeking ways to minimize their inputs in the areas of pesticides and fertilizers with the adoption of new crop technologies, diversifying their crops, minimizing soil erosion with less tillage operations, and taking advantage of new alternative crop markets.

New technologies, including plant transformation, genomics, and computer assisted biology will help provide the necessary tools needed understand and later modify plants for improved production characteristics.

Production of high quality food is an important industry in Minnesota, and sustaining this high level of production and quality is imperative. However, to remain viable in an increasingly global and competitive agriculture market, Minnesota producers must have access to novel approaches that reduce production risks while protecting the natural resource base of the state.

**Output/Outcome Indicators:**

- CRIS Reports
- MN IMPACTS
- Number of refereed journal articles and other peer review publications
- Industry applications of findings

**Performance Goals:** will vary with research project.

**Key Components:**

- Farming systems that maximize profitability while protecting the natural resource base.
- Research to identify and overcome constraints to crop production.
- Research focuses on soil health, tillage systems, crop rotations, pest management, and decision support systems that will accelerate the adoption of research results on farms by demonstrating the benefits of research in terms of the whole farm.
- Development and subsequent transfer to customers of efficient crop production and sustainable cropping systems. Overall challenges are to substantially increase the knowledge base of, and sustainable technology for crop production and cropping systems; to improve the delivery of technologies generated; and to promote the use of these systems.

**Internal and External Linkages:**

- **Internal collaborations to accomplish program and objectives:**
  - Research and extension faculty in the Departments of Agronomy and Plant Genetics; Soil, Water, and Climate; Horticultural Science; Entomology; Plant Biology; Plant Pathology; Biosystems & Agricultural Engineering.
  - University of Minnesota Extension Service
  - Center for Alternative Plant and Animal Products (COAFES)
  - USDA/ARS
  - MN Institute for Sustainable Agriculture
- **External Collaborations:**
  - Minnesota Department of Agriculture
  - MN Wheat and Barley Growers
  - MN Soybean Growers Association; MN Canola Growers
  - MN Corn Growers Association; Turf, Forage Growers
  - MN Wild Rice Growers Association
  - MN Potato Growers Association

**Target Audiences:**

- Producers
- Extension Educators
- Crop consultants

**Program Duration:**

Five years

## **Goal 1-Program 10: Value Added Agriculture**

### **Statement of issue:**

Minnesota agriculture faces increasing, intense competition in the global marketplace. Worldwide, agricultural production has increased faster than demand in many areas, resulting in current commodity surpluses, low prices, and unreliable profitability. Recent shifts in U.S. farm policy to remove price supports emphasize the need for Minnesota producers to move beyond production of ever-larger quantities of ever-cheaper commodities. Producers must be able and willing to produce higher-quality products that can be differentiated from lower-value commodities; commodities and co-products must be converted into useful value-added food and nonfood products; and products must be protected from contamination or loss of quality after harvest to ensure marketability. These applications could include traditional uses such as foods and feeds, or nontraditional applications in nonfood products such as adhesives, plastics, composite products, fuels, and lubricants. Other uses could include nutraceuticals, pharmaceuticals, biopesticides, or other high-value uses.

### **Output/Outcome Indicators:**

- CRIS Reports
- MN IMPACTS
- Number of refereed journal articles and other peer review publications
- Industry applications of findings

**Performance Goals:** will vary with research project.

### **Key Components:**

- Research to develop knowledge and technology for crop and animal product quality measurement and maintenance or enhancement during processing and marketing.
- Commodity and co-product processing into value-added materials; and new specialty products from crops and animals.
- Research to identify the role of product composition, molecular structure, and physical state in determining end-use quality.
- Applied research will develop new processes to maintain or enhance product quality during harvest, storage, transport, and marketing.
- Innovative processes for the extraction and purification, or manufacture, superior products from agricultural commodities.

- Application of these innovative technologies will expand the range and value of agricultural products and reduce the cost of their production.
- Identify alternate sources and create technology leading to an expanded, diverse range of value-added food and nonfood products from commodities and undervalued byproducts of agriculture.
- Development of high-value, "designer" crops

**Internal and External Linkages:**

- **Internal collaborations to accomplish program and objectives:**
  - Research and extension faculty in the departments of Agronomy and Plant Genetics; Soil, Water, and Climate; Horticulture; Entomology; Plant Biology; Plant Pathology; Biosystems and Agricultural Engineering; Animal Science; and Food Science and Nutrition. University of Minnesota Extension Service
  - Center for Alternative Plant and Animal Products (COAFES)
  - USDA/ARS
  - MN Institute for Sustainable Agriculture
  
- **External Collaborations:**
  - Minnesota Department of Agriculture
  - MN Wheat and Barley Growers
  - MN Soybean Growers Association
  - MN Corn Growers Association
  - MN Wild Rice Growers Association
  - MN Pork Producers
  - MN Beef Producers
  - MN Turkey Growers Association
  - MN Milk Producers Association

**Target Audiences:**

- Producers
- Extension Educators
- Crop consultants

**Program Duration:**

Five years

**Goal 1-Program 11: Green Industry**

**Statement of Issue:**

The green industry is one of the fastest growing segments of Minnesota agriculture economy. The Green Industry is defined as firms involved in the production, design, installation, maintenance and sale of seed and plant products to enhance human environments, i.e. sports fields, parks, golf courses, home lawns. As such, the industry consists of three major components: landscape services, nursery/greenhouse production and distribution, and florists. Within landscape services, there are three basic activities: design, installation and maintenance. Within the nursery sector, there are also three basic activities: production of plant materials, wholesale distribution and retail distribution of nursery products. Production of plant materials includes field production, specialized rose and sod farms, and container and greenhouse production of plants. In the industry, production and wholesaling often go hand in hand.

The Green Industry's growth is closely tied to increases in population and subsequent increases in construction. Consequently, the Industry grew at a phenomenal rate during the 1970's and 1980's. Corporate outsourcing of landscape services also fueled part of the growth in the 1980's. Between 1974 and 1987, the industry increased fourfold in employment and eightfold in nominal payroll. Between 1987 and 1994, employment in the industry increased by 30% and payroll increased by 22%.

Research is needed to develop new technologies and strategies that increase profitability while minimizing the environmental impact from urban agriculture. The aesthetic, functional and economic impact of ornamental plants in our working and living environment has a profound positive impact on the quality of life.

**Output/Outcome Indicators:**

- CRIS Reports
- MN IMPACTS
- Number of refereed journal articles and other peer review publications
- Industry applications of findings

**Performance Goals:** will vary with research project.

**Key Components**

- Development of nursery products which will enhance the ethical and economic progress of the industry.
- Improve nursery products and techniques.
- Research is needed to develop new technologies and strategies that increase profitability while minimizing the environmental impact from urban agriculture.

production is relatively diverse with production in sweet corn, processing peas, apples and potatoes, that rank among the top nationally.

To remain competitive in our rapidly changing global economy, these commercial food crop producers must adopt new cultivars/rootstocks that are more tolerant to environmental stresses affecting plants, cultural systems that improve production efficiency and promote sustainability, and post harvest handling practices that improve crop utilization and product safety. Before new cultivars, production systems, or post harvest practices can be recommended, they must be thoroughly evaluated under Minnesota environmental conditions.

**Output/Outcome Indicators:**

- CRIS Reports
- MN IMPACTS
- Number of refereed journal articles and other peer review publications
- Industry applications of findings

**Performance Goals:** will vary with research project.

**Key Components**

- Research assists commercial food crop producers in the adoption of new cultivars/rootstocks that are more tolerant to environmental stresses.
- Research cultural systems that improve production efficiency and promote sustainability.
- Research on post harvest handling practices that improve crop utilization and product safety..

**Internal and External Linkages:**

• **Internal collaborations to accomplish program and objectives:**

- Research and extension faculty in the departments of Horticultural Science; Agronomy and Plant Genetics; Soil, Water, and Climate; Entomology; Plant Biology; Plant Pathology; Biosystems & Agricultural Engineering.
- University of Minnesota Extension Service
- Center for Alternative Plant and Animal Products (COAFES)
- USDA/ARS Fruit Lab
- MN Landscape Arboretum

• **External Collaborations:**