PLAN OF WORK REPORT OF ACCOMPLISHMENT

University of Nebraska Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln

Submitted
March 31, 2006

Federal Fiscal Years
2000 to 2006

2005 Annual Report
PLAN OF WORK
University of Nebraska Agricultural Research Division

INTRODUCTION

A. PROGRAMS (5 FEDERAL GOAL AREAS)

B. STAKEHOLDER INPUT PROCESS

C. PROGRAM REVIEW PROCESS

D. EVALUATION OF THE SUCCESS OF MULTI AND JOINT ACTIVITIES

E. MULTISTATE EXTENSION ACTIVITIES (NOT APPLICABLE)

F. INTEGRATED RESEARCH AND EXTENSION ACTIVITIES

Annual Report
University of Nebraska
Agricultural Research Division

I. INTRODUCTION:

The University of Nebraska Agricultural Research Division is a division of the University of Nebraska Institute of Agriculture and Natural Resources (IANR). Other divisions include the Cooperative Extension Division and the College of Agricultural Sciences and Natural Resources.

This annual report describes the Agricultural Research Division program impacts and accomplishments for fiscal year 2005 as required by the Agricultural Research, Extension, and Education Reform Act of 1998. It includes the elements identified in the USDA document, "Guidelines for Land Grant Institution - Annual Report." This federal annual report is based on the implementation of the current Strategic Plan of the Institute of Agriculture and Natural Resources and on emerging issues identified through stakeholder input in anticipation of beginning the next revision of the IANR Strategic Plan. This federal annual report is for the University of Nebraska Agricultural Research Division only, but was developed in conjunction with University of Nebraska Cooperative Extension Division's annual report.

In FY 2005, Agricultural Research Division expenditures in support of the programs described in this plan totaled $76,430,551. Of this amount, Federal Formula Funds provided $3,474,721 or 4.5% of the total funds expended.

Point of Contact:

All correspondence regarding this Annual Report should be directed to:
The Dean and Director
University of Nebraska, Agricultural Research Division
207 Agricultural Hall
Lincoln, Nebraska 68583-0704

Voice: 402-472-2045
Fax: 402-472-9071
E-mail: **gcunningham2@unl.edu**

_____

Gary Cunningham, Dean and Director
Agricultural Research Division

2005 Agricultural Research Division
Plan of Work
Annual Report

A. Planned Programs

Federal Goal I. To achieve an agricultural production system that is highly competitive in the global economy.

Overview - Research Results Related to Goal 1

Under this goal area, research programs relate to the production, marketing and processing of the major livestock species, traditional field crops, specialty crops such as dry edible beans and turf. The research also relates to new crops, increased instate production and processing and development of new products and services. There were a number of significant outputs from the research programs. Impact statements are enclosed at the end of this section providing more detail.

University of Nebraska-Lincoln agricultural researchers are exploring a wide range of biofuels-related research to help expand Nebraska's role in this growing industry. For example, Institute of Agriculture and Natural Resources researchers analyzed diverse aspects of Nebraska's ethanol production – from feedlot and corn price economics to the impact of ethanol expansion on the state's agriculture and Nebraska's comparative advantage in ethanol production. Studied the feasibility of producing biodiesel in Nebraska. An earlier study identified the best soy biodiesel and ethanol blends for combining with petroleum diesel to create E-B-diesel when using both renewable fuels. University of Nebraska-Lincoln agricultural research and extension efforts are providing scientific, technical and economic information to help turn Nebraska's crops into biofuels, which expand markets for crops and create jobs. Nebraska businesses, agricultural producers and decision-makers are tapping IANR findings and expertise to make biofuels-related crop management, economic development, investment and public policy decisions.

UNL meat scientists teamed with University of Florida colleagues on comprehensive research to analyze 5,500 muscle samples from the beef chuck and round. They identified promising higher value uses for numerous under-used muscles. Their findings were the scientific basis for efforts by the National Cattlemen's Beef Association and the meat industry to develop new beef products such as the now well-known flat iron steak. These new products have increased demand for beef and added $50 to $70 in value per head over the past seven years. With more than 26 million cattle fed and marketed in the U.S. each year, that represents $1.3 billion to $1.8 billion in added

value annually. More than 20,000 restaurants nationwide now sell the new cuts and industry experts expected 10 million pounds of flat iron steaks would be sold in 2005.

University of Nebraska-Lincoln and USDA developed wheat varieties that are widely grown in Nebraska and beyond. UNL's highly regarded wheat breeding program focuses on both agronomic and end-use characteristics. UNL researchers are collaborating with scientists in 17 states on research to implement new molecular technologies, called Marker Assisted Selection, that will improve U.S. wheat quality and disease resistance. Nebraska-developed hard red winter wheat varieties are planted on about 62 percent of the state's wheat acres. These improved varieties have helped boost Nebraska's annual yields by 9.5 million bushels since the 1960s. These improved varieties are worth roughly $30 to $35 million annually to Nebraska producers based on increased yield alone. Consumers benefit, too. Yield improvement in these varieties means Nebraska wheat growers can feed nearly 3.8 million more people a year than they did on the same acreage in the 1960s. Current research to develop new genetic technologies will make future UNL wheat breeding faster and more precise.

University of Nebraska animal scientists found significant feed efficiency differences among seven corn hybrids. This research demonstrated that selecting hybrids with favorable chemical and physical traits could dramatically improve feed efficiency. Researchers hope hybrids eventually will be labeled as hard or soft endosperm content. Feeders could use that information to select corn that is best for cattle. Corn growers could target the feed market niche with specialized hybrids.

University of Nebraska agronomists developed a user-friendly computer program that simulates corn growth and performance under different conditions. This software, lets users combine field-specific information with current and historical weather data. This tool allows corn growers to more precisely adjust irrigation, nitrogen and other factors to boost profits, conserve limited water during drought and protect the environment by matching chemicals and fertilizer to crop needs.

University of Nebraska veterinary scientists developed a calving system to reduce calf scours on ranches in Nebraska's Sandhills. In field tests, the system drastically reduced calf illness and treatment costs and eliminated calf deaths from scours on two Sandhills ranches under different calving schemes. For example, one 900-head ranch that lost 7 percent to 14 percent of its calves to scours before adopting the system had no scours deaths since. The owner of the 900-head ranch estimates saving up to $50,000 annually since adopting the calving system because of improved calf performance, greatly reduced treatment costs and having more calves to sell.

A University of Nebraska textiles scientist has found a way to turn cornhusks into textiles. He has developed a process that efficiently and inexpensively converts cellulose in cornhusks into textile

fibers that can be made into fabric. Initial research shows cornhusks produce a high-quality textile with good performance characteristics using this process. The United States produces about 20 million tons of cornhusks annually. If all of that were used to produce textiles, it could make at least 2 million tons of fibers worth about $4 billion annually.

Examples of accomplishments are included in the attached impact statements. These offer evidence of the impact that the Agricultural Research Division outputs are making towards the specific Nebraska ARD goals under Federal Goal I. The Nebraska goals are:

1. Enhance plant and animal production systems to be more profitable and sustainable.
2. Support agribusiness and economic development, including marketing and value-added processing of agricultural commodities.
3. Increase public/consumer understanding of food systems.

Goal I Resources

Source of Funds	Federal*	State	All Other	Total
FY 2005 Expenditures ($ x 1,000)	$2,034	19,500	$23,214	$44,748

Faculty SYs in FY 2005 - 113.7

* Includes Hatch, Multistate, McIntire-Stennis and Animal Health funds

Impact Statements Related to Federal Goal I – Identified by Key Themes

Category: **Competitive Agricultural Systems in a Global Economy**
Key Theme: *Biofuels*

Impact Statement: Biofuels producing ethanol and biodiesel from Nebraska's corn and soybeans provides renewable fuel that reduces demand for foreign oil and expands markets for the state's corn and soybeans.
(Relates to Nebraska Subgoal 1&2, Output Indicators 1,2&4 , and Outcome Indicator 2,3,& 4)

Issue:
Nebraska needs research-based information to capitalize on the growing bioenergy industry.

What has been done:
University of Nebraska-Lincoln agricultural researchers are exploring a wide range of biofuels-related research to help expand Nebraska's role in this growing industry. For example, Institute of Agriculture and Natural Resources researchers analyzed diverse aspects of Nebraska's ethanol production – from feedlot and corn price economics to the impact of ethanol expansion on the state's agriculture and Nebraska's comparative advantage in ethanol production. They reported their findings at legislative briefings. The university's Industrial Agricultural Products Center worked with the Nebraska Soybean Association to study the feasibility of producing biodiesel in Nebraska. An earlier study by the center identified the best soy biodiesel and ethanol blends for combining with petroleum diesel to create E-B-diesel when using both renewable fuels. A UNL agronomist spearheaded a workshop in 2005 that shared ideas for developing the state's biofuels industry. This workshop drew about 200 people and information from discussions is being used to establish plans for enhancing the state's bioenergy industry.

Impact:
University of Nebraska-Lincoln agricultural research and extension efforts are providing scientific, technical and economic information to help turn Nebraska's crops into biofuels, which expands markets for crops and creates jobs. Nebraska businesses, agricultural producers and decision-makers are tapping IANR findings and expertise to make biofuels-related crop management, economic development, investment and public policy decisions.

Funding:
UNL Agricultural Research Division
Hatch Act
Nebraska Soybean Association
USDA Rural Development
Nebraska Corn Board
Nebraska Ethanol Board
Nebraska Energy Office

Scope of Impact: National

Summary:
Producing biofuels from Nebraska's crops provides renewable fuel that reduces demand for foreign oil and expands markets for the state's corn and soybeans. UNL agricultural research and extension efforts are providing scientific, technical and economic information to help Nebraskans capitalize on the growing bioenergy industry, which should create new markets for crops and jobs for Nebraskans. For example, IANR researchers analyzed diverse aspects of Nebraska's ethanol production – from feedlot and corn price economics to the impact of ethanol expansion on the state's agriculture and Nebraska's comparative advantage in ethanol production. They reported their findings at legislative briefings. The Industrial Agricultural Products Center worked with the Nebraska Soybean Association to study the feasibility of producing biodiesel in Nebraska. An earlier center study identified the best soy biodiesel and ethanol blends for combining with petroleum diesel to create E-B-diesel when using both renewable fuels. A UNL agronomist spearheaded a workshop in 2005 that drew about 200 people to share ideas for developing the state's biofuels industry.

Category: **Competitive Agricultural Systems in a Global Economy**
Key Theme: *New uses for agricultural products*

Impact Statement: **Beef Muscle Research results in new products**
(Relates to Nebraska Subgoal 1 & 2 , Output Indicators 4, and Outcome Indicator 2, 3& 4)

Issue:
Not all beef cuts are created equal. Traditionally, some bring top dollar while the chuck and round are relegated to lower value products like roasts and ground beef. University of Nebraska-Lincoln meat science research is helping change that tradition and it’s paying off for consumers and the beef industry.

What has been done:
UNL meat scientists teamed with University of Florida colleagues on comprehensive research to analyze 5,500 muscle samples from the beef chuck and round. They identified promising higher value uses for numerous under-used muscles. Researchers developed extensive information to help the meat industry and chefs use these muscles in new ways. This research has changed industry thinking about how to cut and use beef muscles. Their findings were the scientific basis for efforts by the National Cattlemen's Beef Association and the meat industry to develop new beef products such as the now well-known flat iron steak. These innovations increased the value of these cuts and gave consumers new, value-priced beef products. This worldwide impact of this research was demonstrated when the research team was awarded the International Meat Secretariat's Prize for Meat Science and Technology in 2004.

Impact:
These new products have increased demand for beef and added $50 to $70 in value per head over the past seven years. With more than 26 million cattle fed and marketed in the U.S. each year, that

represents $1.3 billion to $1.8 billion in added value annually. More than 20,000 restaurants nationwide now sell the new cuts and industry experts expected 10 million pounds of flat iron steaks would be sold in 2005.

Funding:
Cattlemen's Beef Board
Nebraska Beef Council
UNL Agricultural Research Division
Hatch Act

Scope of Impact: National

Summary:
Payoffs from UNL muscle profiling research continue to add up for the nation's beef industry. IANR meat scientists teamed with University of Florida colleagues on extensive studies that identified promising higher value uses for under-used muscles in the chuck and round. The National Cattlemen's Beef Association and industry developed several new beef products, including the well-known flat iron steak, based on this research. These new products have increased demand for beef and added $50 to $70 in value per head over the past seven years. With more than 26 million cattle fed and marketed in the U.S. each year, that represents $1.3 billion to $1.8 billion in added value annually. More than 20,000 restaurants nationwide now sell the new cuts and industry experts expected 10 million pounds of flat iron steaks would be sold in 2005.

Category: **Competitive Agricultural Systems in a Global Economy**
Key Theme: *Agricultural profitability*
Plant production efficiency

Impact Statement: Wheat Breeding efforts result in varieties that do well in a variety of conditions and meet production and end use demands.
(Relates to Nebraska Subgoal 1 & 2 , Output Indicators 2 & 4 , and Outcome Indicator 1,2,3,4&5)

Issue:
To be competitive, growers need wheat varieties that perform well in Nebraska's unique, sometimes extreme growing conditions.

What has been done:
University of Nebraska-Lincoln wheat breeders have long teamed with USDA-Agricultural Research Service scientists based at UNL on research and breeding to develop varieties that are widely grown in Nebraska and beyond. UNL's highly regarded wheat breeding program focuses on both agronomic and end-use characteristics. UNL researchers are collaborating with scientists in 17 states on research to implement new molecular technologies, called Marker Assisted Selection, that will improve U.S. wheat quality and disease resistance. Researchers are working to identify genetic markers and associated genes for complex genetic traits, such as yield, that growers and industry have identified as top priorities.

Impact:
Nebraska-developed hard red winter wheat varieties are planted on about 62 percent of the state's wheat acres. These improved varieties have helped boost Nebraska's annual yields by 9.5 million bushels since the 1960s. These improved varieties are worth roughly $30 to $35 million annually to Nebraska producers based on increased yield alone. Consumers benefit, too. Yield improvement in these varieties means Nebraska wheat growers can feed nearly 3.8 million more people a year than they did on the same acreage in the 1960s. Current research to develop new genetic technologies will make future UNL wheat breeding faster and more precise.

Funding:
USDA-Agricultural Research Service
Nebraska Wheat Board
Hatch Act
UNL Agricultural Research Division

Scope of Impact: Regional

Summary:
Varieties developed through the University of Nebraska-Lincoln's wheat breeding program provide Nebraska growers with improved wheats that perform well in the field and offer the quality characteristics millers and bakers demand. Nebraska-developed hard red winter wheat varieties are planted on about 62 percent of the state's wheat acres. These improved varieties have helped boost Nebraska's annual yields by 9.5 million bushels since the 1960s. These improved varieties are worth roughly $30 to $35 million annually to Nebraska producers based on increased yield alone. Yield improvement in these varieties means Nebraska wheat growers can feed nearly 3.8 million more people a year than they did on the same acreage in the 1960s. Nebraska wheat breeders now are collaborating with scientists in 17 states on research to implement new molecular technologies, called Marker Assisted Selection, that will improve U.S. wheat quality and disease resistance.

Category: **Competitive Agricultural Systems in a Global Economy**
Key Theme: *Agricultural Profitability*

Impact Statement: Feed performance differences among corn hybrids could help cattle feeders reduce largest single cost.
(Relates to Nebraska Subgoal 1, Output Indicator 2 & 5, and Outcome Indicator 3&5)

Issue:
Nebraska is among the nation's top cattle feeding states, and feed is the largest single cost for the state's beef industry. Anything that improves feed efficiency helps bolster producers' profits.

What has been done:
University of Nebraska animal scientists studied the nutritional value of seven commercial corn hybrids to identify what specific characteristics provide the best bang for the buck as cattle feed. Feedlot trials revealed significant feed efficiency differences among the hybrids. Researchers found larger, softer

kernels with a greater proportion of soft starch content produced the best feeding performance. There was a 9 percent difference in feed efficiency – how effectively an animal converts feed into gain – between the best and worst performing hybrids. Feeders historically have preferred harder corn because of its higher test weight, but this research showed test weight is a poor indicator for animal performance.

Impact:
This research demonstrated that selecting hybrids with favorable chemical and physical traits could dramatically improve feed efficiency. Researchers hope hybrids eventually will be labeled as hard or soft endosperm content. Feeders could use that information to select corn that is best for cattle. Corn growers could target the feed market niche with specialized hybrids.

Funding:
University of Nebraska Agricultural Research Division
Hatch Act
Nebraska Corn Board
J.C. Robinson Seed Co.

Scope of Impact: National

Summary:
When it comes to corn and cattle feed efficiency, what's inside the kernel could significantly reduce feed costs, IANR animal science research shows. Research comparing the feed performance of seven different commercial hybrids revealed that larger, softer kernels with a greater proportion of soft starch content produced the best feed performance. Feeders historically have preferred harder corn with a higher test weight, but this research demonstrates that test weight is not a good indicator for feed performance. Researchers found that selecting hybrids with favorable chemical and physical traits could dramatically improve feed efficiency. Since feed is the largest single cost for feedlots and Nebraska is among the nation's top cattle feeding states, these findings eventually could add up to major savings.

Category: Competitive Agricultural Systems in a Global Economy; Greater Harmony between Agriculture and the Environment

Key Theme: Agriculture profitability
Nutrient management

Impact Statement: Hybrid-Maize Software provides user-friendly corn growth simulation software to help farmers more precisely match management to yearly variations in conditions.
(Relates to Nebraska Subgoal 1 , Output Indicators 2 & 3 , and Outcome Indicator 3 & 5)

Issue:
Each year, farmers face complex decisions about how best to match corn management decisions with that season's unique growing conditions. Hard-to-predict variables such as weather, precipitation, availability of irrigation water or planting dates all affect corn performance and management.

What has been done:
To help farmers make more informed decisions, University of Nebraska agronomists developed a user-friendly computer program that simulates corn growth and performance under different conditions. This software, called Hybrid-Maize, lets users combine field-specific information with current and historical weather data. Users can manipulate variables including planting dates, rainfall or irrigation, fertilizer rates, soil types, hybrid selection and plant density to see how weather or management choices influence yields. The software lets users assess risk factors and evaluate for themselves a wide range of crop management options.

Impact:
This powerful new tool became available to farmers and crop consultants in 2004 from the university. It allows corn growers to more precisely adjust irrigation, nitrogen and other factors to boost profits, conserve limited water during drought and protect the environment by matching chemicals and fertilizer to crop needs.

Funding:
University of Nebraska Agricultural Research Division
Nebraska Corn Board
Fluid Fertilizer Foundation
USDA Consortium for Agricultural Soil Mitigation of Greenhouse Gases
Phosphate and Potash Institute
Foundation for Agronomic Research
High Plains Regional Climate Center
Hatch Act

Scope of Impact: National

Summary:
A new user-friendly computer program that simulates corn growth and yields is now available to help farmers make complex corn management decisions. IANR scientists developed this software, called Hybrid-Maize, which is available on CD or the Web. This software combines field-specific information with current and historical weather data to predict corn yields under different conditions. Users can change variables to see how weather or management changes influence crop performance. This software helps growers fine-tune management practices to reduce costs and maximize production while protecting the environment and conserving irrigation water.

Category: **Competitive Agricultural Systems in a Global Economy**
Key Theme: *Animal Health*
Animal Production Efficiency

Impact Statement: New Sandhills Calving System significantly reduces calf deaths and sickness and associated costs.
(Relates to Nebraska Subgoal 1 & 2 , Output Indicators 1 & 2 , and Outcome Indicator 5)

Issue:
Diarrhea is a leading cause of illness and death in beef calves. In some herds, nearly all young calves get diarrhea and 5 percent to 10 percent die of related illnesses. Treatment and performance and death losses can cost individual ranchers thousands of dollars annually.

What has been done:
University of Nebraska veterinary scientists developed a calving system to reduce calf scours on ranches in Nebraska's Sandhills. The system manages cow herds during calving season to prevent transmission of diarrhea-causing germs. In field tests, the system drastically reduced calf illness and treatment costs and eliminated calf deaths from scours on two Sandhills ranches under different calving schemes. For example, one 900-head ranch that lost 7 percent to 14 percent of its calves to scours before adopting the system had no scours deaths since. Because few calves developed scours, ranchers also greatly reduced use of medications needed to treat sick calves. This scours prevention system can be adapted to a variety of calving situations in the Sandhills and beyond. The team is teaching veterinarians and ranchers how to adopt this strategy.

Impact:
Ranchers who have adopted this system report significantly reducing calf sickness, death and antibiotic use. The system also aids labor efficiency during busy calving season. The owner of the 900-head ranch estimates saving up to $50,000 annually since adopting the calving system because of improved calf performance, greatly reduced treatment costs and having more calves to sell. As a result of knowledge gained through extension education on how to adopt this system, 80 percent of participants said they either would or probably would use the system in the future. This represents a major change in calving management practices.

Funding:
University of Nebraska Agricultural Research Division
University of Nebraska Cooperative Extension
Hatch Act
Pfizer Animal Health
Sandhills Veterinary Hospital
Smith-Lever 3(b) & ©)

Scope of Impact: Regional

Summary:
Diarrhea is a leading cause of death and sickness in beef calves but ranchers have a new tool to combat this costly threat. University of Nebraska Institute of Agriculture and Natural Resources veterinary scientists designed and successfully tested a calving system that greatly reduces scours outbreaks by managing cow-calf pairs and pregnant cows to minimize calf contact with diarrhea-causing germs. Since few calves get sick, this system also greatly reduces the need for antibiotics. It also greatly reduces labor needed to treat sick calves. The owner of a 900-head herd estimates savings of up to $50,000 annually since implementing the calving system because of improved calf performance, greatly reduced treatment costs and having more calves to sell. The team is training ranchers and veterinarians how to adopt the system.

Category: Competitive Agricultural Systems in a Global Economy; Enhance Economic Opportunities for Agricultural Producers
Key Theme: New uses for Agricultural Products

Impact Statement: Turning Cornhusks into Textiles could significantly boost value of corn crop.
(Relates to Nebraska Subgoal 2 , Output Indicators 4 , and Outcome Indicator 4)

Issue:
Developing new uses and markets for corn, Nebraska's leading crop, is a true pocketbook issue for farmers and rural economies.

What has been done:
A University of Nebraska textiles scientist has found a way to turn cornhusks into textiles. He has developed a process that efficiently, inexpensively converts cellulose in cornhusks into textile fibers that can be made into fabric. The university is patenting his invention. Initial research shows cornhusks produce a high-quality textile with good performance characteristics using this process. Natural off-white cornhusk fiber is attractive, more comfortable than many synthetics and easy to dye. More work is needed, but the Nebraska team already has made a sweater from cornhusk yarn – dyed Husker red, of course – to demonstrate the cornhusk textile's potential.

Impact:
Corn is Nebraska's largest crop. The economic impact of turning husks, which now blow out the back of combines, into textiles could be significant for the state and nation. The United States produces about 20 million tons of cornhusks annually. If all of that were used to produce textiles, it could make at least 2 million tons of fibers worth about $4 billion annually. And the textiles industry is huge so there's a ready market for new, functional natural products. The environment might benefit, too, because corn requires fewer chemicals to grow than cotton or linen plants, the primary sources of U.S. fabric fibers.

Funding:
University of Nebraska Agricultural Research Division
UNL College of Education and Human Sciences
Hatch Act
Nebraska Corn Board

Scope of Impact: National

Summary:
Turning cornhusks into textiles might someday create a new, higher-value market for Nebraska's leading crop. A University of Nebraska textiles scientist has developed a process that efficiently, inexpensively converts cellulose in cornhusks into textile fibers that can be made into fabric. The university is patenting his invention. Initial research shows cornhusks produce a high quality textile with good performance characteristics using this process. There's much more work to do before cornhusk fabric becomes available but the economic potential is impressive. The nation produces about 20 million tons of cornhusks annually, which could produce at least 2 million tons of fibers worth about $4 billion annually.

Federal Goal II. A Safe, Secure Food and Fiber System

Food animal production and food processing are major components of the Nebraska economy. The Nebraska Agricultural Research Division maintains a significant food safety research effort. Research faculty work closely with the food industry and regulatory agencies to focus research efforts of pre-harvest food safety areas, in particular, working with livestock producers.

The Nebraska goals under this federal goal are:

1. Animal and plant production systems and food processing and production systems to be enhanced to improve food safety and quality.
2. Research based information will increase awareness of consumers, producers, food processors, food handlers and extension personnel on food safety issues and technologies.

University of Nebraska food scientists collaborated with physicians to test 30 refined soybean oils from around the world on soy allergic people in North America and South Africa. This study found that refined soybean oil does not trigger reactions in soy-sensitive people. These findings expand the safe food choices for soy allergic people. Food manufacturers are using these findings to ensure their products are safe for soy-allergic consumers.

A University of Nebraska-Lincoln agricultural economist analyzed the impact of grain handling disruptions at the Port of New Orleans, which handles up to three-quarters of U.S. corn exports. It is part of ongoing multi-state research quantifying economic ramifications of a terrorist attack on the nation's grain marketing system. Researchers projected economic impacts of reducing the port's corn export volume by 10 percent, 15 percent and 25 percent for a year. This study found that a moderate disruption at this critical port would cost the U.S. $600 million to $900 million in annual export losses. It also found that world demand for corn probably could not be met if U.S. exports dropped more than 25 percent. Findings provide information for national security officials who must plan for possible terrorist attacks. They also offered insights into the potential economic losses caused by Hurricane Katrina's disruption of grain exports at the port.

Goal II Resources

Source of Funds	Federal*	State	All Other	Total
FY 2005 Expenditures ($ x 1,000)	$206	$1,972	$2,348	$4,526
Faculty SYs in FY 2005 - 11.5				

* Includes Hatch, Multistate, McIntire-Stennis and Animal Health funds

Impact Statements Related to Federal Goal II - Identified by Key Themes

Category: **A Safe, Secure Food and fiber System**
Key Theme: *Food Safety*

Impact Statement: Soy Oil allergenicity research showing that refined soy oil does not cause allergic reaction helps expand safe food choices for soy allergic consumers.
(Relates to Nebraska Subgoal 2 , Output Indicators 1 & 3 , and Outcome Indicator 3)

Issue:
People who are allergic to soybeans have to carefully check food ingredients and face limited food choices because soy is used extensively in foods worldwide.

What has been done:
University of Nebraska food scientists collaborated with physicians to test 30 refined soybean oils from around the world on soy allergic people in North America and South Africa. This study by the university's Food Allergy Research and Resource Program found that refined soybean oil does not trigger reactions in soy-sensitive people. The vast majority of soy oils are refined. Findings don't apply to cold-pressed soy oil, which contains more protein and can cause reactions. Researchers said allergic people don't react because refined oil contains only minuscule amounts of protein, the culprit in allergic reactions.

Impact:
These findings expand the safe food choices for soy allergic people. If refined oil is the only soybean ingredient in a food product, allergic consumers now know it's safe to eat.
Food manufacturers are using these findings to ensure their products are safe for soy-allergic consumers.

Funding:
United Soybean Board
Private food companies
University of Nebraska Agricultural Research Division
Hatch Act

Scope of Impact: National

Summary:
Refined soybean oil does not trigger reactions in soy-sensitive people, IANR research shows. That's welcome news for allergic consumers and food processors since soy oil is used extensively in foods worldwide and soy is among the most common food allergens. IANR food scientists studied 30 refined soy oils from around the world and tested soy sensitive people internationally to determine refined oil doesn't cause problems. These findings expand the safe food choices for soy allergic people since most soy oil used in food manufacturing and cooking oil is refined. If it's the only soy ingredient in a food product, sensitive people now know it's safe to eat. Findings also are helping food manufacturers ensure products are safe for soy-allergic consumers.

Category: **A Safe, Secure Food and fiber System**
Key Theme: *Food security*

Impact Statement: **Terrorism's Impact on U.S. Grain System could mean major losses in U.S. grain exports.**
(Relates to Nebraska Subgoal 1 , Output Indicators 1, and Outcome Indicator 1)

Issue:
A terrorist attack on the nation's grain marketing infrastructure could mean major losses in U.S. grain exports. Quantifying the potential economic damage is important to homeland security efforts.

What has been done:
A University of Nebraska-Lincoln agricultural economist analyzed the impact of grain handling disruptions at the Port of New Orleans, which handles up to three-quarters of U.S. corn exports. It is part of ongoing multi-state research quantifying economic ramifications of a terrorist attack on the nation's grain marketing system. Researchers projected economic impacts of reducing the port's corn export volume by 10 percent, 15 percent and 25 percent for a year.

Impact:
This Institute of Agriculture and Natural Resources study found that a moderate disruption at this critical port would cost the U.S. $600 million to $900 million in annual export losses. It also found that world demand for corn probably could not be met if U.S. exports dropped more than 25 percent. Findings provide information for national security officials who must plan for possible terrorist attacks. They also offered insights into the potential economic losses caused by Hurricane Katrina's disruption of grain exports at the port.

Funding:
USDA-CSREES multistate project
UNL Agricultural Research Division
Hatch Act

Scope of Impact: National

Summary:
A terrorist attack on the nation's grain marketing infrastructure could mean major losses in U.S. grain exports. Quantifying that economic damage is important to homeland security planning. An IANR agricultural economist's study shows that a moderate disruption at the critical Port of New Orleans would cost the U.S. $600 million to $900 million in annual export losses. It is part of ongoing multi-state research quantifying economic ramifications of a terrorist attack on the nation's grain marketing system. This research assessed the economic impacts of reducing corn export volume by 10 percent, 15 percent and 25 percent for a year at the port. Findings provide information for national security officials who must plan for possible terrorist attacks. They also offered insights into the potential economic losses caused by Hurricane Katrina's disruption of grain exports at the port.

Federal Goal III. A Healthy Well-Nourished Population

Enhancing the quality of life of individuals and families through healthy lifestyles including better nutrition and reduction of high risk activity is the Nebraska goal in this area. Particular areas of research emphasis include lipid metabolism, bioavailability of nutrients, eating behaviors and disorders, biochemistry of cardiac illnesses and functions of health care and family support systems. In addition to being incorporated in Cooperative Extension programs, research results are also used by a broad range of health care professionals, educators, and marketers and consumers of all ages.

University of Nebraska plant scientists are using biotechnology to modify the soybean DNA to develop plants with improved nutritional characteristics, such as abundant omega-3 fatty acids in the bean. Researchers identified genes from other plants, inserted these genes in soybean cells and produced plants high in gamma-linolenic acid and stearidonic acid, the building blocks for omega-3. Next they'll transfer genes from a harmless plant fungus into cells from these soybeans cells to induce production of omega-3. Eventually it should lead to soybeans high in omega-3 that could be fed to farm-raised fish or poultry to boost the omega-3 content of their meat.

University of Nebraska animal scientists are studying the genes that predispose some people to obesity, which is a complex genetic trait. They've found early clues to this complex puzzle. For example, they know the genes they're seeking are involved in energy regulation – the balance between calories consumed and calories burned. Better understanding the genetic underpinnings of obesity predisposition someday should lead to new tools to diagnose and manage obesity. Livestock production also should benefit. Identifying key genes could lay the foundation for producing leaner animals.

A University of Nebraska nutrition scientist has developed a promising new cholesterol-fighting compound using homegrown ingredients. He developed a way to combine stearic acid from beef tallow with plant sterols from soybeans. The result is a potent cholesterol-lowering compound that could be used as a dietary supplement or a food additive. Medical experts agree that controlling blood cholesterol is critical to reducing major health problems, including stroke and heart attack. This Nebraska-developed compound should provide a powerful new tool for managing cholesterol. In animal studies, it lowered LDL, or bad cholesterol, by about 70 percent, compared with 10 percent for commercially available plant-based food additives.

Tularemia is one of six organisms classified as Class A, bioterrorism agents, but scientists know little about how it causes disease. In nature, tularemia primarily infects wild animals. University of Nebraska Institute of Agriculture and Natural Resources and the university's medical center scientists are collaborating to better understand this organism and to learn why some subspecies cause disease while others don't. IANR microbiologists have identified some genetic differences among different *F. tularensis* strains and are examining whether these differences are important to the disease process. These discoveries also could point the way for developing vaccines or antibiotics to prevent or treat tularemia.

The above examples and the impact statement to follow identify the types of contributions being made by the Agricultural Research Division activities to Federal Goal III.

Goal III Resources

Source of Funds	Federal*	State	All Other	Total
FY 2005 Expenditures ($ x 1,000)	$107	$1,029	$1,225	$2,361
Faculty SYs in FY 2005 - 6.0				

* Includes Hatch, Multistate, McIntire-Stennis and Animal Health funds

Impact Statements Related to Federal Goal III - Identified by Key Themes

Category: **Healthy, Well-Nourished Population**
Key Theme: *Nutraceuticals*
Human nutrition

Impact Statement: Boosting Soybeans' Omega-3 Levels could help Americans improve their nutrition.
(Relates to Nebraska Subgoal 1, and Output Indicator 3, and Outcome Indicator 2 & 3)

Issue:
Wild salmon, tuna and sardines are rich in omega-3 fatty acid, which is believed to be important in preventing heart disease, cancer and other ailments. However, many Americans don't get enough of this beneficial fat in their diets.

What has been done:
University of Nebraska plant scientists are using biotechnology to modify the soybean DNA to develop plants with improve nutritional characteristics, such as abundant omega-3 in the bean. Researchers identified genes from other plants, inserted these genes in soybean cells and produced plants high in gamma-linolenic acid and stearidonic acid, the building blocks for omega-3. Next they'll transfer genes from a harmless plant fungus into cells from these soybeans cells to induce production of omega-3. The research should take about a decade to commercialize. Eventually it should lead to soybeans high in omega-3 that could be fed to farm-raised fish or poultry to boost the omega-3 content of their meat.

Impact:
Consumers who eat the meat or eggs from fish or animals fed soybeans rich in omega-3 could improve their nutrition without changing their daily eating habits. Producing these specialty soybeans also should bring a premium for growers.

Funding:
Nebraska Research Initiative
Nebraska Soybean Board
University of Nebraska Agricultural Research Division
Hatch Act

Scope of Impact: National

Summary:
Many Americas don't get enough beneficial omega-3 in their diets. Fish such as wild salmon, tuna and sardines are rich in omega-3, which is touted for helping prevent heart disease, cancer and other ailments. IANR plant scientists are using biotechnology tools to develop soybeans with enhanced nutritional properties such as abundant omega-3 fatty acids. They've already inserted plant genes and

produced soybean plants with more of the building blocks of omega-3. Next they need to add genes from a harmless fungus to induce omega-3 production. This complex long-term research eventually should lead to soybeans high in omega-3 that could be fed to farm-raised fish or poultry to boost the omega-3 content of their meat. Consumers who eat the meat or eggs from fish or animals fed these enriched soybeans could improve their nutrition without changing their daily eating habits. Producing specialty soybeans also could bring a premium for growers.

Category: **Healthy, Well-Nourished Population**
Key Theme: *Human health*

Impact Statement: **Genetic Predisposition to Obesity research to identify genes that predispose people, animals to obesity could lead to new diagnostic and management tools.**
(Relates to Nebraska Subgoal 1, Output Indicators 2, and Outcome Indicator 3)

Issue:
America has a weighty problem. Nearly 65 percent of U.S. adults are overweight including 30 percent who are obese, according to the U.S. Centers for Disease Control and Prevention.

What has been done:
University of Nebraska animal scientists are studying the genes that predispose some people to obesity, which is a complex genetic trait. Each person or animal inherits hundreds of genes that interact with each other and the environment to create a unique predisposition for obesity. Scientists are comparing genes from several mice strains specially bred to burn either fewer or more calories. They're studying the difference in gene expression between the fat and normal mice to isolate obesity predisposition genes. They've found early clues to this complex puzzle. For example, they know the genes they're seeking are involved in energy regulation – the balance between calories consumed and calories burned.

Impact:
Better understanding the genetic underpinnings of obesity predisposition someday should lead to new tools to diagnose and manage obesity. Livestock production also should benefit. Identifying key genes could lay the foundation for producing leaner animals.

Funding:
National Institutes of Health
Nebraska Tobacco Settlement Biomedical Research Development Fund
University of Nebraska Agricultural Research Division
Hatch Act

Scope of Impact: National

Summary:
Nearly 65 percent of U.S. adults are overweight including 30 percent who are obese, according to the U.S. Centers for Disease Control and Prevention. IANR animal scientists are studying the genes that predispose some people to obesity. They're comparing genes from several mice strains specially bred to burn either fewer or more calories to identify genetic differences between the fat and normal mice

to isolate obesity predisposition genes. This long-term basic research should expand knowledge about the genetic underpinnings of obesity predisposition. That someday could lead to new tools to diagnose and manage obesity. Livestock production also should benefit. Identifying key genes could lay the foundation for producing leaner animals.

Category: **Healthy, Well-Nourished Population**
Key Theme: *Nutraceuticals*

Impact Statement: New cholesterol-fighting compound made from soybeans and beef tallow outperforms commercial plant-based food additives and should provide powerful new cholesterol management tool.
(Relates to Nebraska Subgoal 1, Output Indicators 3, and Outcome Indicator 1 & 2)

Issue:
Animal fats are widely considered dietary pariahs but University of Nebraska research shows certain saturated fats actually can lower cholesterol. Harnessing that cholesterol-fighting power could benefit the more than 140 million Americans whose blood cholesterol levels put them at risk for heart disease.

What has been done:
A University of Nebraska nutrition scientist has developed a promising new cholesterol-fighting compound using homegrown ingredients. He developed a way to combine stearic acid from beef tallow with plant sterols from soybeans. The result is a potent cholesterol-lowering compound that could be used as a dietary supplement or a food additive. Animal studies showed this new compound packs far more cholesterol-lowering power than commercially available plant-based food additives. Preliminary research also suggests it works at least as well as widely prescribed cholesterol-lowering stating drugs. The new compound is an outgrowth of Nebraska research on fats' role in heart disease which revealed that stearic acid, a saturated fat in beef tallow, actually lowers cholesterol. The university is patenting this technology and the team is further testing its effectiveness and exploring how best to commercialize it for consumers' benefit.

Impact:
Medical experts agree that controlling blood cholesterol is critical to reducing major health problems, including stroke and heart attack. This Nebraska-developed compound should provide a powerful new tool for managing cholesterol. In animal studies, it lowered LDL, or bad cholesterol, by about 70 percent, compared with 10 percent for commercially available plant-based food additives.

Funding:
University of Nebraska Agricultural Research Division
Hatch Act

Scope of Impact: National

Summary:
Beef tallow is a key ingredient in a promising new cholesterol-fighting compound. An IANR nutrition scientist combined stearic acid from beef tallow with plant sterols from soybeans to create a potent

cholesterol-lowering compound that could be used as a dietary supplement or a food additive. It outperformed commercially available plant-based food additives in animal studies. Preliminary research also suggests it works at least as well as widely prescribed cholesterol-lowering stating drugs. This is an outgrowth of earlier research by this College of Education and Human Sciences scientist who found that stearic acid, a saturated fat in beef tallow, actually lowers cholesterol. The university is patenting this technology, which could provide a powerful new tool for managing cholesterol. That's a national health concern because more than 140 million Americans' cholesterol levels put them at risk for heart disease, according to the American Heart Association.

Category: **Healthy, Well-Nourished Population**
Key Theme: *Human Health*

Impact Statement: **Tularemia genetics research into how tularemia causes disease is a critical step in protecting against potential biohazard.**
(Relates to Nebraska Subgoal 1, Output Indicators 4, and Outcome Indicator2)

Issue:
Tularemia, a disease known mainly to hunters as rabbit fever, has taken on new, potentially diabolical dimensions in the post-9/11 world. Biosecurity officials fear terrorists might try to turn the naturally occurring bacterium that causes tularemia into a biological weapon.

What has been done:
Francisella tularensis is one of six organisms classified as Class A, or leading, bioterrorism agents, but scientists know little about how it causes disease. In nature, tularemia primarily infects wild animals. People typically get it from skin contact with infected animals or ticks. A rare, potentially deadly inhaled form, called Type A, worries homeland security officials because it kills up to 60 percent of people who become infected. University of Nebraska Institute of Agriculture and Natural Resources and the university's medical center scientists are collaborating to better understand this organism and to learn why some subspecies cause disease while others don't. Such differences could lead to development of new control strategies. IANR microbiologists have identified some genetic differences among different *F. tularensis* strains and are examining whether these differences are important to the disease process.

Impact:
The nation needs scientific information to prepare for the possibility that terrorists might try to use tularemia as a weapon. Unraveling the genetic links to the disease-causing process is a critical step toward protecting people. These discoveries also could point the way for developing vaccines or antibiotics to prevent or treat tularemia.

Funding:
Nebraska Tobacco Settlement Biomedical Research Development Fund
University of Nebraska Agricultural Research Division
Hatch Act

Scope of Impact: National

Summary:
Tularemia, a disease known mainly to hunters as rabbit fever, has taken on new, potentially diabolical dimensions in the post-9/11 world. Biosecurity officials fear terrorists might try to turn the naturally occurring bacterium that causes tularemia into a biological weapon. University of Nebraska Institute of Agriculture and Natural Resources and the university's medical center scientists are collaborating to better understand this organism and learn why some subspecies cause disease while others don't. IANR microbiologists have identified some genetic differences among different strains of this bacterium and are examining their importance to the disease process. Unraveling the genetic links to the process is a critical step toward protecting people. These discoveries could point the way for vaccines or antibiotics to prevent or treat tularemia.

Federal Goal IV. To Achieve Greater Harmony (Balance) Between Agriculture and the Environment

Improvement of natural resources and environmental quality while maintaining a productive and profitable agricultural industry is on of three major themes in the Nebraska Agricultural Research Division Strategic Plan. Research activities in support of federal goal area IV have increased in recent years. The Nebraska goals are:

1. Improved environmental quality by conserving and enhancing air, soil and water resources.
2. Improved ecosystem management for sustained productivity and enhanced biodiversity.
3. Increased information and expertise on natural resources and environmental issues for facilitating policy development and successful implementation programs.

Research by University of Nebraska soil environmental chemist and environmental engineering graduate student shows that ozone effectively cleans carbon-based explosives residues, such as RDX and TNT, from soil. Lab tests on soil from a Texas bomb plant site shows ozone can be 100 percent effective at eliminating carbon-based residues. Large-scale ozone injection should make it easier and less costly to eliminate munitions contaminants from soil to prevent the toxic residues from polluting groundwater that often is a source of drinking water.

National Drought Mitigation Center at UNL continues to develop new tools for monitoring and preparing for drought and mitigating its impacts.. The Drought Impact Reporter is developing a nationwide database of drought impacts and gives the public a forum to provide input about its specific effects. Ongoing workshops for producers are providing valuable feedback that's helping tool developers enhance existing tools and develop new ones. In the planning stages is an online drought atlas that will provide producers a snapshot of drought risk on a local level. The National Drought Mitigation Center has helped lead a shift in drought planning from reactive crisis management to proactive risk management. They help policymakers and citizens plan for drought and reduce its impacts, rather than attempting to fix the damage after it's done.

The University of Nebraska-based National Drought Mitigation Center has developed the Vegetation Response Drought Index in collaboration with the U.S. Geological Survey's Earth Resources Observation System Data Center in Sioux Falls, S.D. The new index incorporates satellite data from EROS. That satellite data allows for an analysis of drought square mile by square mile by picking up differences in the temperatures of vegetation. The Vegetation Response Drought Index is more precise in detecting drought's presence and severity. As this index's use is expanded nationwide, it will help federal, state and local officials better plan to reduce drought's devastating impact.

To learn more about what happens to antibiotics in soil, University of Nebraska agricultural scientists teamed with a USDA Agricultural Research Service scientist and others on several years of field studies. Traces of oxytetracycline, an antibiotic commonly used in livestock, were detected in topsoil for 17 months after manure application.. Manured plots also contained significantly more tetracycline-resistant bacteria in the topsoil than commercially fertilized plots for five months after application. These results provide one of the first overviews of what happens when manure is applied to irrigated cropland.

Goal IV Resources

Source of Funds	Federal*	State	All Other	Total
FY 2005 Expenditures ($ x 1,000)	$966	$9,261	$11,025	$21,252
Faculty SYs in FY 2005 - 54.0				

* Includes Hatch, Multistate, McIntire-Stennis and Animal Health funds

Impact Statements Related to Federal Goal IV—Identified by Key themes

Category: **Greater Harmony Between Agriculture and the Environment**
Key Theme: *Hazardous materials*

Impact Statement: Ozone removes explosive residues from soil with less site disruption and cost than conventional soil removal methods.
(Relates to Nebraska Subgoal 1 & 3, Output Indicators 2, and Outcome Indicator 3)

Issue:
The soil around former bomb-making plants often is contaminated with toxic compounds that can wind up polluting groundwater and public drinking water supplies. Conventional methods of removing these contaminants from the soil, such as digging it up and incinerating it, are expensive, labor intensive and environmentally invasive.

What has been done:
Research by University of Nebraska soil environmental chemist and environmental engineering graduate student shows that ozone effectively cleans carbon-based explosives residues, such as RDX and TNT, from soil. They found that injecting ozone into soil as a fumigant turns the contaminants into harmless carbon dioxide. Ozone is commonly used to treat drinking water, but less was known about how it works to break down these compounds in soil. Lab tests on soil from a Texas bomb plant site shows ozone can be 100 percent effective at eliminating carbon-based residues. Scientists are perfecting their lab-scale technique for use with existing technology and equipment to pump ozone through the soil on a large scale. Ozone injection should be simpler and less expensive that conventional soil cleanup methods that involve digging up, removing and incinerating soil.

Impact:
Large-scale ozone injection should make it easier and less costly to eliminate munitions contaminants from soil to prevent the toxic residues from polluting groundwater that often is a source of drinking water.

Funding:
U.S. Department of Energy
University of Nebraska Agricultural Research Division
Hatch Act

Scope of Impact: National

Summary:
Polluted soil around former bomb-making plants often threatens to pollute water supplies. IANR soil scientists are working on similar, cheaper and less environmentally disruptive ways to remove toxic munitions compounds from soil before they leach into groundwater. School of Natural Resources researchers found that ozone effectively removes carbon-based explosives compounds such as TNT or RDX, when it's injected into soil. Ozone is widely used to clean polluted water but less was known about how it worked in soil until this study. These laboratory findings indicate ozone

injection should work on a large scale using existing technologies and equipment. The technique should make cleanup easier, less costly and more environmentally friendly than digging up and incinerating contaminated soil.

Category: **Greater Harmony Between Agriculture and the Environment**

Key Theme: *Drought prevention and mitigation*
Global change and climate change

Impact Statement: Drought Mitigation Research is the costliest natural disaster in the U.S.
(Relates to Nebraska Subgoal 3, Output Indicators 4 & 5, and Outcome Indicator 1 & 5)

Issue:
Drought is the costliest natural disaster in the U.S., with an annual impact of $6 billion to $8 billion that belies its slow, creeping nature. Accurate monitoring and predictions of drought are key to helping control its effects.

What has been done:
About six years after it launched its now widely used Drought Monitor in collaboration with the U.S. Department of Agriculture and National Oceanic and Atmospheric Administration, the University of Nebraska-Lincoln-based National Drought Mitigation Center continues to develop new tools for monitoring and preparing for drought and mitigating its impacts. The Vegetation Response Drought Index, a collaboration with the U.S. Geological Survey's Earth Resources Observation System Data Center in Sioux Falls, S.D., incorporates satellite and climate data that allows analysis of drought square mile by square mile by detecting vegetation stress. The Drought Impact Reporter is developing a nationwide database of drought impacts and gives the public a forum to provide input about its specific effects. New USDA funding, announced in 2005, supports an effort by climatologists and computer scientists to bring cutting-edge computer science technologies to producers' decision-making through the National Agricultural Decision Support System and other web-based tools. Ongoing workshops for producers are providing valuable feedback that's helping tool developers enhance existing tools and develop new ones. In the planning stages is an online drought atlas that will provide producers a snapshot of drought risk on a local level.

Impact:
The National Drought Mitigation Center has helped lead a shift in drought planning from reactive crisis management to proactive risk management. The Drought Monitor, Vegetation Response Drought Index, National Agricultural Decision Support System and other tools in use or under development by the center share one trait: They help policymakers and citizens plan for drought and reduce its impacts, rather than attempting to fix the damage after it's done.

Funding:
UNL Agricultural Research Division
Hatch Act
USDA, Cooperative State Research Education and Extension Service
USDA Risk Management Agency
U.S. Geological Survey

National Oceanic and Atmospheric Administration

Scope of Impact: National

Summary:
Drought is the costliest natural disaster in the U.S., with an annual impact of $6 billion to $8 billion. Accurate monitoring of drought and improved preparedness helps reduce that impact. The UNL-based National Drought Mitigation Center, collaborating with state, regional and national partners, continues to develop and enhance tools for predicting and mitigating drought. Best known is the widely used Drought Monitor. Others tools include the Vegetation Response Drought Index, which incorporates satellite data that provides for an analysis of drought square mile by square mile by detecting differences in the temperatures of vegetation; the Drought Impact Reporter, which gives the public a forum to provide data about drought's specific effects; the National Agricultural Decision Support System, which is bringing cutting-edge computer science technologies to agricultural producers' decision-making; and an online drought atlas that will provide producers with a snapshot of drought risk on a local level. Together, these tools are helping to change U.S. drought response from reactive crisis management to proactive risk management.

Category: Greater Harmony Between Agriculture and the Environment

Key Theme: Drought prevention and mitigation

Impact Statement: Vegetation Response Drought Index provides a more precise drought monitoring tool to help officials reduce drought's impact.

(Relates to Nebraska Subgoal 2 & 3, Output Indicators 4 & 5, and Outcome Indicator 1 & 5)

Issue:
Drought is the costliest natural disaster in the United States, with an annual impact of $6 billion to $8 billion that belies its slow, creeping nature. Accurate monitoring and predictions of drought are key to helping control its effects.

What has been done:
About five years after it launched its now widely used Drought Monitor in collaboration with the U.S. Department of Agriculture and National Oceanic and Atmospheric Administration, the University of Nebraska-based National Drought Mitigation Center has developed the Vegetation Response Drought Index in collaboration with the U.S. Geological Survey's Earth Resources Observation System Data Center in Sioux Falls, S.D. The index, now being tested in a seven-state region, complements and improves on the earlier Web-based drought monitor, whose scope is limited by the incomplete geographical coverage of weather stations. The new index incorporates satellite data from EROS. That satellite data allows for an analysis of drought square mile by square mile by picking up differences in the temperatures of vegetation.

Impact:
Climate data such as rainfall amounts are key indicators of drought trends, but nothing captures drought's impact as directly as plant stress. Plants under stress will have higher leaf temperatures than

those that are not. By capturing that information and displaying it in a map similar to the Drought Monitor, the Vegetation Response Drought Index is more precise in detecting drought's presence and severity. As this index's use is expanded nationwide, it will help federal, state and local officials better plan to reduce drought's devastating impact.

Funding:
University of Nebraska Agricultural Research Division
Hatch Act
U.S. Geological Survey
National Drought Mitigation Center
High Plains Regional Climate Center

Scope of Impact: National

Summary:
Drought is the costliest natural disaster in the United States, with an annual impact of $6 billion to $8 billion. Accurate monitoring of drought helps reduce that impact. The Vegetation Drought Response Index, developed by the University of Nebraska-based National Drought Mitigation Center and the U.S. Geological Survey's Earth Resources Observation System, incorporates satellite data from the USGS to give a more detailed look at drought's scope and severity than current tools such as the Drought Monitor. The index, now being tested in a seven-state region, captures changing temperatures in vegetation; the higher a plant leaf's temperature, the more drought stress it is under. This precision could allow federal, state and local officials to more specifically target drought-mitigation efforts.

Category: Greater Harmony Between Agriculture and the Environment
Key Theme: Natural resource management

Impact Statement: Antibiotic Fate in Soil when manure with antibiotic residues are applied to irrigated cropland.
(Relates to Nebraska Subgoal 3, Output Indicators 2, 3 & 7, and Outcome Indicator 1 & 3)

Issue:
Farmers long have fertilized fields and pastures with livestock manure, which enriches soil and puts waste to good use. Today, manure may contain traces of antibiotics used in livestock production and there's growing interest in knowing what happens to antibiotics in the environment.

What has been done:
To learn more about what happens to antibiotics in soil, University of Nebraska agricultural scientists teamed with a USDA Agricultural Research Service scientist and others on several years of field studies. Traces of oxytetracycline, an antibiotic commonly used in livestock, were detected in topsoil for 17 months after manure application. Two years of testing found no oxytetracycline in water collected 8 feet under test plots. Manured plots also contained significantly more tetracycline-resistant bacteria in the topsoil than commercially fertilized plots for five months after application. Levels declined over time with no difference after five months. Further research is needed to determine whether the increase in resistant bacteria originates in the manure or develops in natural soil bacteria.

Impact:
Little has been known about the fate of antibiotic residues in soil. These results provide one of the first overviews of what happens when manure is applied to irrigated cropland. Findings lay the scientific foundation for further research to understand the potential health and environmental implications.

Funding:
University of Nebraska Agricultural Research Division
University of Nebraska Foundation
Hatch Act

Scope of Impact: National

Summary:
There's growing interest in the fate of antibiotics in the environment. IANR research is providing information about what happens to antibiotic residues in manure when it's applied to irrigated cropland. In field studies at North Platte, scientists detected traces of oxytetracycline, an antibiotic commonly used in livestock, in topsoil for 17 months after manure application. Manured plots contained significantly more tetracycline-resistant bacteria in the topsoil than commercially fertilized plots for five months after application. Levels declined over time with no difference after five months. Scientists don't know whether the increase in resistant bacteria originates in the manure or develops in natural soil bacteria. There's much more to be learned but these findings lay the scientific foundation for further research to better understand potential health and environmental implications.

Federal Goal V. To Enhance Economic Opportunities and the Quality of Life Among Families and Communities

Nebraska's population has steadily shifted. Rural areas see declining populations relative to regional trade centers and metropolitan areas. These changes are leading to a decline in the number of young people in rural Nebraska. The impacts of these shifts on main street businesses and communities are dramatic in many cases. Over the next 30 years, Nebraska's 65-and-older population is expected to nearly double. In addition to the aging population, other demographic changes include the increase in minority populations in Nebraska. Nutrition, health and wellness, including obesity, are critically important to Nebraskans. ARD research programs deal with policy issues as well as research to assist educational programs in these areas. The research programs are closely linked to Cooperative Extension educational programs. The specific Nebraska goals related to this area are:

1. Enhance basic life skills for Nebraska's children, youth and adults.
2. To enhance business and livable employment opportunities.

A University of Nebraska-Lincoln agricultural economist researched how declining lake levels have affected the region's recreation industry and whether short-term water management strategies to reduce that impact could be economically justifiable. Those strategies would make less water available to irrigators or hydro-power interests for one year by holding back more water in the reservoir. This one-year hold back potentially could increase the lake's water level for recreational use for several years to come, depending on how quickly the reservoir refills, and boost benefits to recreational uses enough to offset the costs of compensating irrigators or power interests for their losses. The study showed that lakeside businesses reported steady declines since the drought began in 2001 and that recreational use of Lake McConaughy in 2004 was 32 percent below the most recent 10-year average. Half of the McConaughy visitors interviewed said they'd visit the lake more often if its levels were normal. This research will be a factor in reservoir management decisions and broad policy discussions in the state Legislature over how best to manage water use among competing interests.

College of Education and Human Sciences researchers studied bilingual Latinos in northeast Nebraska pursuing online classes from UNL. They found significant family or community support and access to child care are keys to success. Participants with more support from their partners and who were more integrated into their communities reported less stress and depression. This preliminary research highlighted the need for more comprehensive information on barriers to education. The team is expanding its research to explore issues of marital dynamics and psycho-social health among these rural Nebraska immigrants and their families. Funding and further research should lead to better services, such as mentoring relationships and informal support

networks, to reduce obstacles and improve chances of success for rural immigrants and women seeking an education. Participants said their involvement in the program also made them role models for their children and helped their children recognize the value of education.

University of Nebraska agricultural scientists examined on-farm energy consumption and ethanol yield for today's progressive corn management systems and modern, higher efficiency ethanol plants. Converting irrigated corn to ethanol has an energy output to energy input ratio of 1.3-to-1; for dryland corn it's 1.4-to-1. Turning corn into ethanol creates an important market for farmers and a renewable, cleaner burning alternative to fossil fuels. In Nebraska 23 percent of all corn is used for ethanol and it's an important new industry for rural economies.

Goal V Resources

Source of Funds	Federal*	State	All Other	Total
FY 2005 Expenditures ($ x 1,000)	$161	$1,544	$1,838	$3,543
Faculty SYs in FY 2005 - 9.0				

* Includes Hatch, Multistate, McIntire-Stennis and Animal Health funds

Impact Statements Related to Federal Goal V—Identified by Key Themes

Category: **Enhance Economic Opportunities and Quality of Life Among Families and Communities**

Key Theme: *Jobs/employment*
Tourism

Impact Statement: Lake McConaughy reservoir level affects community, recreational users, and businesses.

(Relates to Nebraska Subgoal 2, Output Indicators 5 & 6, and Outcome Indicator 3)

Issue:
Several years of drought have left Lake McConaughy, Nebraska's largest reservoir, at historic lows. The persistent low levels are affecting a variety of lake constituents including recreational users and businesses that serve them.

What has been done:
In 2004-05, a University of Nebraska-Lincoln agricultural economist researched how declining lake levels have affected the region's recreation industry and whether short-term water management strategies to reduce that impact could be economically justifiable. Those strategies would make less water available to irrigators or hydro-power interests for one year by holding back more water in the reservoir. This one-year holdback potentially could increase the lake's water level for recreational use for several years to come, depending on how quickly the reservoir refills, and boost benefits to recreational uses enough to offset the costs of compensating irrigators or power interests for their losses.

Impact:
The study showed that lakeside businesses reported steady declines since the drought began in 2001 and that recreational use of McConaughy in 2004 was 32 percent below the most recent 10-year average. Half of the McConaughy visitors interviewed said they'd visit the lake more often if its levels were normal. This research will be a factor in reservoir management decisions and broad policy discussions in the state Legislature over how best to manage water use among competing interests.

Funding:
UNL Agricultural Research Division
Hatch Act
Federal grants

Scope of Impact: Regional

Summary:
Persistent drought has left Lake McConaughy, Nebraska's largest reservoir, at historic lows, reducing recreational use of the lake and resulting in steady declines in profits for businesses that cater to lake users. An IANR agricultural economist's study determined that in some circumstances

it would be economically justifiable for the state's overall economy to make less water available to irrigators or hydro power interests for one year by holding back more water in the reservoir. This one-year hold back potentially could increase the lake's water level for recreational use for several years to come, depending on how quickly the reservoir refills, and boost income from recreational uses enough to offset the costs of compensating irrigators or power interests for their losses. This research will be a factor in broad policy discussions in the state Legislature over how best to manage water use among the many interests.

Category: Enhance Economic Opportunities and Quality of Life Among Families and Communities.

Key Theme: Children, youth, and families at risk

Impact Statement: Rural Immigrant language barriers limit access to education.
(Relates to Nebraska Subgoal 1, Output Indicators 4, and Outcome Indicator 1)

Issue:
Going to college while working full time is hard for anyone. It's especially tough if you're a recent immigrant with a language barrier. University of Nebraska-Lincoln researchers hope to aid rural immigrants by learning what helps or hinders their effort to complete an education.

What has been done:
College of Education and Human Sciences researchers studied bilingual Latinos – most of whom were first- or second-generation immigrants – in northeast Nebraska pursuing online classes from UNL. They found significant family or community support and access to child care are keys to success. Participants with more support from their partners and who were more integrated into their communities reported less stress and depression. This preliminary research highlighted the need for more comprehensive information on barriers to education. The team is expanding its research to explore issues of marital dynamics and psycho-social health among these rural Nebraska immigrants and their families.

Impact:
Funding and further research should lead to better services, such as mentoring relationships and informal support networks, to reduce obstacles and improve chances of success for rural immigrants and women seeking an education. Participants said their involvement in the program also made them role models for their children and helped their children recognize the value of education. One participant said, "... my little girl says sometimes, 'I want to be a teacher because you're a teacher'."

Funding:
U.S. Department of Education
UNL Agricultural Research Division
Hatch Act

Scope of Impact: National

Summary:
Going to college while working full time is hard for anyone. It's especially tough for recent immigrants with language barriers. UNL researchers hope to aid rural immigrants by identifying what helps or hinders their effort to complete an education. College of Education and Human Sciences researchers studied bilingual Latinos – most of whom were first- or second-generation immigrants – in northeast Nebraska pursuing online classes from UNL. They found significant family or community support and access to child care are keys to success. These results and further research should help provide better services, such as mentoring relationships and informal support networks, to improve chances of success for rural immigrants and women seeking an education. Participants said their involvement in the program also made them role models for their children and helped their children recognize the value of education. One participant said, "... my little girl says sometimes, 'I want to be a teacher because you're a teacher'."

Category: Enhance Economic Opportunities and Quality of Life Among Families and Communities; Competitive Agricultural Systems in a Global Economy; Greater Harmony Between Agriculture and the Environment

Key Theme: *Jobs/Employment*
Impact of Change on Rural Communities
Biofuels
Agricultural profitability

Impact Statement: Modern Ethanol Energy Balance research shows corn ethanol yields 30 percent more energy than it takes to produce it.
(Relates to Nebraska Subgoal 2, Output Indicators 5, and Outcome Indicator 2)

Issue:
Farming practices and corn ethanol conversion technologies have become significantly more efficient over the past two decades. Yet corn ethanol's energy efficiency still gets a bad rap, mainly because assessments are based on outdated data from the 1980s and early 1990s. To make national policy choices, decision-makers need information on modern ethanol production efficiencies.

What has been done:
To calculate a more up-to-date energy balance for corn ethanol, a team of University of Nebraska agricultural scientists examined on-farm energy consumption and ethanol yield for today's progressive corn management systems and modern, higher efficiency ethanol plants. This analysis shows today's ethanol has a positive energy balance – it yields more energy than is used to produce it. Today's ethanol is about 30 percent ahead energy-wise. Converting irrigated corn to ethanol has an energy output to energy input ratio of 1.3-to-1; for dryland corn it's 1.4-to-1.

Impact:
Having accurate, current information about modern ethanol's energy balance should help decision-makers make better informed national energy policy choices. Both farmers and the environment should benefit. Turning corn into ethanol creates an important market for farmers and a renewable, clearer

burning alternative to fossil fuels. In Nebraska 23 percent of all corn is used for ethanol and is an important new industry for rural economies.

Funding:
U.S. Department of Energy
USDA
University of Nebraska Agricultural Research Division
Hatch Act

Scope of Impact: National

Summary:
Ethanol made from corn has a positive energy balance, meaning it yields more energy than is used to produce it. That's the conclusion of new University of Nebraska research that calculated the energy balance of modern ethanol production. Institute of Agriculture and Natural Resources researchers assessed how much fossil fuel is needed to grow corn, transport it, process it into ethanol, blend it with gas and get it to the pump. They found that today's ethanol is about 30 percent ahead energy-wise. Converting irrigated corn to ethanol has an energy output to energy input ratio of 1.3-to-1; for dryland corn it's 1.4-to-1.These findings on modern ethanol production are especially important because most studies used to assess ethanol's potential have been based on 10- to 20-year-old data that doesn't reflect farming and production efficiency gains made during the past two decades. This more accurate data should help policy-makers make better informed national energy policy choices.

.

B. Stakeholder Input Process

The processes used for stakeholder input for the Agricultural Research Division were described in detail in the initial ARD Plan of Work. Nebraska has had an extensive system of stakeholder input in place for many years. The Agricultural Research Division and the Cooperative Extension Division collaborate routinely in the planning and development of programs. These divisions, as part of the Institute of Agricultural and Natural Resources (IANR), have been partners in development of Strategic Plans for over 10 years.

a) Actions Taken to Seek Stakeholder Input

IANR again conducted listening sessions across Nebraska in 2005. While the sessions were open to the general public, special invitations were made to ensure representation by underserved groups. The participants included limited resource audiences, ethnic minorities, state and local agency representatives, volunteer organization representatives, school officials, in-state clientele and out-of state stakeholders. The findings from the listening sessions were consistent with previous years, with water quality/quantity and rural economic development being the highest priorities.

Most IANR departments, research and extension centers, interdisciplinary centers and program areas have external advisory groups representing stakeholders and users. These groups meet at least annually and provide input on current and future programs of the units. The Agronomy and Horticulture Department Advisory Board has 25 members who meet twice annually. They provided information on strategic issues related to Agronomy and Horticulture teaching, research and extension. An Animal Science Department Advisory Committee was established in 2001 and has met several times. It has 27 members from various segments of the livestock, meat, and feed industry.

The Northeast Nebraska Experimental Farm Association serves as the stakeholder input group for the Northeast Research and Extension Center and Haskell Agricultural Laboratory. This group consists of representatives from each of the counties in the northeast district and meets annually to provide input on program needs at NEREC. Other research centers with advisory committees which meet annually include the High Plains Agricultural Lab and the Gudmundsen Sandhills Lab. Examples of programs which have advisory committee meetings which meet at least annually include the Republican River Basin Irrigation Management Demonstration Project and the *E. coli* 0157:H7 Food Safety Research Program.

(b) Brief Statement of the Process Used by the Recipient Institution to Identify Individuals in Groups Who are Stakeholders and to Elicit Input from Them

The Animal Science Advisory Committee began by familiarizing members with the department's research, extension, and teaching programs. Currently, the Committee is providing input on future needs.

The Department of Nutrition and Health Science (formerly Nutritional Science and Dietetics) meets twice per year with its Community Nutrition Partnership Council. This

Council helps to coordinate nutrition education for limited resource audiences. The members of the Council represent a broad group of state and local agencies, volunteer organizations, school officials, and others. They provide valuable input both on extension needs for Cooperative Extension and research needs for these types of programs.

The Department of Agricultural Economics advisory council consists of stakeholders who help to provide perspectives on research and education needs at state, regional and national levels.

The Department of Agricultural Leadership, Education, and Communication's Advisory Council meets twice annually and consists of representatives from clientele groups throughout the state.

The above examples are only a part of the on-going stakeholder process. While the types of membership for these advisory groups vary, in all cases the intent is to have a membership selection process which allows for good representation from all clientele groups and rotation of membership to provide different views.

c) A Statement of How Collected Input was Considered

Minutes of meetings and reports are maintained and revisited periodically to see if programs have been adjusted in response to the recommendations. It is essential for effective advisory group functioning that the membership be able to review and reflect upon the impact of earlier recommendations. Stakeholder input has been valuable to units in making decisions on which programs to emphasize or initiate as well as which programs to de-emphasize. Stakeholder input is often critical in helping units and administrators make decisions on which areas are highest priorities for filling faculty positions. Since the filling of faculty positions is a critical element in refocusing programs, reaffirming priorities, or identifying emerging issues to address, the stakeholder input is very valuable in helping units and the Agricultural Research Division in making these decisions. The current five-year IANR Strategic Plan is based on the results of the listening sessions, reactions and input from the faculty and consideration of federal priorities.

C. Program Review Process

Nebraska has made no significant changes in program review processes since the 5-Year Plan of Work was submitted. The scientific peer review process used the by Agricultural Research Division as described in the 5-Year Plan of Work remains the same.

D. Evaluation of the Success of Multi and Joint Activities

1) Did the planned programs address the critical issues of strategic importance, including those identified by the stakeholders?

Critical issues of strategic importance identified by stakeholders are directly reflected in the IANR Strategic Plan. The Strategic Plan serves as a fundamental document which guides decision-making on program emphasis and staffing. ARD faculty currently participate in multi-state projects which are provided research funding support through the multistate research component of the federal formula funds. These projects are selected and approved by regional Director Associations because they are high priority needs identified for multistate activity. A list of current ARD participation in multistate committees and the related federal goals is attached as Appendix 1.

2) Did the planned programs address the needs of under-served and under-represented populations of the state?

ARD research programs related to human nutrition and healthy lifestyles were highlighted under the federal goals and key themes. The results of this research feed science-based information directly into Cooperative Extension programs which target under-served and under-represented populations. Nutritional sciences research includes the project on evaluating the nutritional characteristics of meat from American bison. This is important because the growth, production and use of American bison as a healthy meat source is increasing and the fact that bison herds have been started on Nebraska's Native American reservations. A research project on assessing managerial and work force development in food service management is providing information useful for effective training of low income and minority populations working in the food service area.

3) Did the planned programs describe the expected outcomes and impacts?

Output and outcome indicators were described in the 5-Year Plan of Work submitted in 2000. The impacts of the example projects described in the accomplishments and results section relate directly to these output and outcome indicators.

4) Did the planned programs result in improved program effectiveness and/or efficiency?

Effective documentation of research programs, joint program output and outcomes, and ultimately impacts is an important part of our program activity. Individual faculty members are expected to identify outcomes and impacts in their annual faculty reports. The impact reports that are included in the accomplishment section of this report are developed for use by stakeholders and originate with the impacts identified by individual faculty annually. Having to document individual impacts, as

well as interdisciplinary and joint program impacts keeps faculty focused on the need for productive programs.

The joint planning of multistate project activity results in less duplication and more cooperative program efforts. Many University of Nebraska IANR faculty have joint Agricultural Research Division and Cooperative Extension Division appointments. Therefore, joint planning is assured and this results in research programs that are directly related to Cooperative Extension's education needs. This arrangement definitely improved program effectiveness and/or efficiency.

U.S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Actual Expenditures of Federal Funding for Multistate Extension Activities and Integrated Activities
(Attach Brief Summaries)
Fiscal Year: 2005

Select One: Interim X Final
Institution: University of Nebraska-Lincoln Extension and Ag Experiment Station
State: Nebraska

	Integrated Activities (Hatch)		Multistate Extension Activities (Smith-Lever)		Integrated Activities (Smith-Lever)	
Established Target %	25	%	25	%	25	%
This FY Allocation (from 1088)	$3,161,109		$4,844,339		$4,844,339	
This FY Target Amount	$790,277		$1,211,085		$1,211,085	
Title of Planned Program Activity						
Goal 1: Integrated Crop Management, Integrated Livestock Systems Management, Sustainable Agricultural Production Systems	$620,474		$433,473		$569,274	
Goal 2: Food Processing and Food Service Management, Food Safety	$69,092		$52,135		$71,107	
Goal 3: Human Nutrition, Health and Safety	$3,253		$43,688		$22,161	
Goal 4: Natural Resource Management and Protection, Environmental Protection, Environmental and Natural Resources Policy	$271,358		$469,617		$417,137	
Goal 5: Family Strengths	$31,448		$226,503		$134,480	
Total	$995,625		$1,225,416		$1,214,159	
Carryover						

Certification: I certify to the best of my knowledge and belief that this report is correct and complete and that all outlays represented here accurately reflect allowable expenditures of Federal funds only in satisfying AREERA requirements.

Dr. Elbert C. Dickey — March 31, 2006
Director of University of Nebraska-Lincoln Extension — **Date**

Dr. Gary L. Cunningham — March 31, 2006
Director of University of Nebraska-Lincoln Ag Experiment Station — **Date**

F. INTEGRATED RESEARCH AND EXTENSION ACTIVITIES

Below are a few examples of integrated Research and Extension activities.

Goal 1

Activity: Integrated Crop Management

Topic: Organic Farming Project

Issue: Organic farming is one of the fastest growing segments of U.S. agriculture. In Nebraska, certified organic crop and pasture acreage nearly doubled from 1997 to 2003, according to the U.S. Department of Agriculture. To capitalize on this expanding market, the state's farmers need practical, science-based information about growing food organically under Nebraska conditions.

What has been done: The University of Nebraska-Lincoln in 2005 initiated a project to expand organic farming research and education, enhance collaborations with growers and develop science-based information for organic food production. As part of a $750,000 grant, Institute of Agriculture and Natural Resources researchers will establish the university's first certified organic research plots at four research farms around the state where scientists can study locally important organic production issues. Scientists will work closely with organic farmers. Advisory committees of organic producers are helping to guide research and scientists will conduct studies on cooperating certified organic farms. Education is a key part of this project. A UNL Extension educator will coordinate the project and plan how best to share findings and organic concepts with farmers and students. The overall aim is to incorporate organic farming concepts into IANR's extension, research and teaching.

Impact: This research and education effort is laying the foundation to help the university meet the increasing need for practical, science-based information about organic farming in Nebraska. Establishing certified organic test plots will take three years but will make possible long-term research on organic systems and allow researchers to provide localized information for producers.

Summary: Organic farming is one of the fastest growing segments of U.S. agriculture. A new IANR research and extension project is laying the foundation to expand organic farming research and education, enhance collaborations with growers and develop science-based information for organic food production in Nebraska. As part of a $750,000 USDA-CSREES grant, the team is establishing the university's first certified organic research plots at four research farms around the state where scientists will study locally important organic farming issues. They'll also work closely with the state's organic growers, including conducting studies on certified organic farms. Education is a key part of this project. This research and education effort is laying the foundation that will enable the university to meet the increasing need for practical, science-based research and education about organic farming in Nebraska.

Funding:
UNL Agricultural Research Division
UNL Extension
USDA Cooperative State Research, Education and Extension Service

Activity: Integrated Livestock Systems Management

Topic: Feedlot Heat Stress Research

Issue: Still, sweltering, sticky summer days can be deadly for feedlot cattle. Reducing cattle deaths and performance losses from severe heat and humidity is important to feedlot profitability.

What has been done: Research over the past decade by University of Nebraska-Lincoln animal scientists at the Northeast Research and Extension Center greatly expanded understanding of the nature of heat waves and their effects on cattle. Based on these findings, researchers developed management tools feedlot operators can use to reduce heat stress in cattle. An extensive UNL Extension education effort helped producers implement these preventive measures. Feedlot cattle deaths steadily declined during the most severe heat waves of 1995, 1999 and 2005 in northeast Nebraska and northwest Iowa – the period during which these management techniques were introduced.

Impact: Implementation of UNL's heat stress reduction strategies is saving the region's cattle industry millions annually in cattle deaths and performance losses. In the 2005 heat wave alone, widespread adoption of these strategies saved the region's cattle industry between $10 million and $27 million. That estimate is based on the heat waves' severity and the number of cattle on feed at the time.

Summary: Widespread adoption of IANR-developed strategies for reducing heat stress in feedlot cattle is saving the region's cattle industry millions annually in cattle deaths and performance losses. In the past decade, research by UNL animal scientists at the university's Northeast Research and Extension Center greatly expanded understanding of the nature of heat waves and their impact on cattle. Researchers developed management tools to reduce heat stress in cattle; an extensive UNL Extension education effort helped producers adopt these preventive measures. An economic analysis showed a steady decline in cattle deaths during three severe heat waves since 1995. In the 2005 heat wave alone, it's estimated that widespread use of these tools saved the region's cattle industry between $10 million and $27 million in death and performance losses.

Funding:
UNL Agricultural Research Division
UNL Extension
USDA National Research Initiative

Activity: Sustainable Agricultural Production Systems

Topic: Sunflower Production Boosts Producer Income

Issue: Sunflowers can help Panhandle farmers diversify, control pests and disease, spread production risks and make the most of limited water. Strong prices boosted interest in sunflower production in 2005 and increased the need for timely science-based information.

What has been done: University of Nebraska-Lincoln Extension responded quickly to this increased demand for information from first-time and established growers by offering educational programs based on ongoing research at the Panhandle Research and Extension Center. High demand for confection sunflower and sunflower oil had pushed up prices and continued drought left producers seeking crops that need less irrigation water than corn. Extension provided information on producing sunflowers, individual site visits and discussions with new growers as part of a first-time grower mentoring program. Extension also offered sunflower tours and incorporated sunflower information into annual crop production meetings. Extension was able to respond quickly thanks to ongoing sunflower studies by UNL researchers in the Panhandle. Over the years, this research has provided information on how best to produce sunflowers in the region and helped increase sunflower acreage.

Impact: These timely educational efforts helped the region's growers capitalize on strong sunflower prices. Panhandle sunflower production jumped nearly 170 percent in 2005 from 2004 to 89,000 acres. Much of the crop was grown on limited irrigation acres, thanks in part to extension information. The region's gross income from sunflowers in 2005 was about $17 million, about triple the 2000-2004 average.

Summary: Strong prices and continued drought in 2005 boosted Panhandle farmers' interest in growing sunflowers. UNL Extension met the increased demand for science-based production information through educational programs for established and first-time growers. Extension provided growers information on producing sunflowers, including tours, meetings and a first-time grower mentoring program. Extension was able to respond quickly thanks to ongoing sunflower studies by UNL researchers in the Panhandle. These timely educational efforts helped the region's growers capitalize on strong sunflower prices. Panhandle sunflower production jumped nearly 170 percent in 2005 from 2004 to 89,000 acres. Much of the crop was grown on limited irrigation acres, thanks in part to extension information. The region's gross income from sunflowers in 2005 was about $17 million, about triple the 2000-2004 average.

Funding:
UNL Agricultural Research Division
UNL Extension
USDA-Sustainable Agriculture Research and Education

Goal 2

Activity: Food Processing and Food Service Management of Food Safety

Topic: Research Aids Labeling Decisions

Issue: For most people, food labels provide helpful nutritional information. For people with food allergies, accurate labels can be a matter of life and death.

What has been done: An international study by University of Nebraska-Lincoln food scientists found that highly refined soybean oil does not trigger reactions in soy-sensitive people. Refined soy oil is commonly used in foods worldwide. Findings don't apply to cold-pressed soy oil, which has higher levels of protein, or allergens, that may present a risk to soy-allergic consumers

and should be labeled. These UNL Food Allergy Research and Resource Program scientists shared their findings internationally with policymakers, congressional staffers, industry, farmers and consumers.

Impact: The UNL findings provided scientific evidence for European Union food allergen labeling decisions in 2005 and the U.S. Food Allergen Labeling and Consumer Protection Act of 2004. The EU temporarily exempted highly refined soy oil from food allergen labeling regulations. Earlier, U.S. regulators exempted highly refined vegetable oils derived from known allergens, such as soybeans or peanuts, from the federal food allergen labeling law that took effect this year. These decisions helped preserve farmers' widest possible access to world markets and expanded the types of foods soy-allergic people know they can safely consume.

Summary: UNL soybean oil research is influencing food allergen labeling laws here and abroad. An international study by IANR food scientists confirmed that highly refined soybean oil does not cause reactions in people who are allergic to soybeans. Scientists shared the Food Allergy Research and Resource Program study results internationally. Their findings played a role in European Union food allergen labeling decisions in 2005 and the U.S. Food Allergen Labeling and Consumer Protection Act of 2004. These decisions helped preserve soybean growers' widest possible access to world markets. Results assure soy-allergic consumers that they can safety eat a wider range of processed foods if they contain only refined soy oil.

Funding:
UNL Agricultural Research Division
UNL Extension
United Soybean board
Private food companies

Goal 3

Activity: Human Nutrition, Health and Safety

Topic: Food Allergen Tests

Issue: Consumers with food allergies and food processing companies both want to be sure that traces of food allergens don't unintentionally end up in foods where they are not a labeled ingredient. For people with food allergies, such cross-contamination can result in potentially life-threatening reactions.

What has been done:
University of Nebraska-Lincoln food scientists are leaders in developing tests that allow companies to rapidly, accurately detect minute traces of an allergenic food on equipment or in foods processed on shared equipment. In 2005, the team's new test for soy flour became commercially available. The team earlier developed tests for peanuts, milk, eggs, almonds and wheat gluten. A test for hazelnuts could be commercialized in 2006. All these tests are commercially available to the food industry through a university licensing agreement with Neogen, a Michigan company.

Impact:
Soy, milk, eggs, peanuts, tree nuts and wheat are among the eight common foods responsible for all food allergic reactions so developing rapid tests for these foods is helping industry address some cross-contamination concerns. Widespread industry use of these UNL-developed tests has helped industry make foods safer for people with food allergies.

Summary:
The food industry is using tests developed by UNL food scientists to protect allergic consumers by ensuring their products contain only the intended ingredients. These tests allow companies to rapidly detect traces of an specific allergenic food on equipment or in foods processed on shared equipment. That's important because even a small amount of an allergenic food can cause serious reactions in people who are sensitive to that food. In 2005, the team's test for soy flour became commercially available. Researchers earlier devised tests for peanuts, milk, eggs, almonds and wheat gluten. The tests are commercially available to industry through a university licensing agreement with Neogen, a Michigan company. Widespread industry use of these UNL-developed tests is helping food manufacturers make their foods safer for people with food allergies.

Funding:
UNL Agricultural Research Division
UNL Extension
UNL Food Allergy Research and Resource Program member companies
USDA

Goal 4

Activity: Natural Resources Management and Protection

Topic: Water Optimizer

Issue: Nebraska irrigators facing water shortages must make difficult and complex choices about how best to use limited water.

What has been done: An agricultural economist and a biological systems engineer at the University of Nebraska-Lincoln developed the Water Optimizer. This decision-support computer program became available in 2005 to help farmers make better-informed cropping choices such as determining whether it would be most profitable to grow different crops, irrigate fewer acres, apply less water to existing crops or go to dryland farming. Growers load information about their operation such as the amount of water available, soil type, irrigation system type and fuel type for irrigation. They also enter production costs, irrigation costs, crop prices and crop type. The Water Optimizer is available on the Web at http://extension-water.unl.edu/ or on a DVD/CD set and was promoted at dozens of UNL Extension meetings in 2005.

Impact: This Institute of Agriculture and Natural Resources-developed tool is helping Nebraska farmers make more informed choices that conserve water and producer profits. Nearly 700 users downloaded or purchased the tool in 2005.

Summary: Nebraska irrigators facing water shortages have a new tool to help them make difficult and complex choices about how best to use their limited water supplies. The Water Optimizer, a decision-support computer program developed by IANR researchers, became available in 2005 to help farmers make more informed choices that conserve water and producer profits. Nearly 700 producers downloaded or purchased the tool in 2005. It lets users enter individualized information and calculate what crops will be most profitable with the given costs and available water. By running "what if" scenarios, growers can see the best options for farming with limited water whether it be growing different crops, irrigating fewer acres, applying less water to existing crops or going to dryland farming.

Funding:
UNL Agricultural Research Division
UNL Extension

Activity: Environmental Protection

Topic: Soybean Rust

Issue: Soybean rust is a new major disease worry for growers nationwide. University of Nebraska-Lincoln plant pathologists are studying this threat and providing resources to ensure Nebraska farmers are ready to combat soybean rust if it strikes the state.

What has been done: Plant pathologists created a one-stop soybean rust resource Web site at http://soybeanrust.unl.edu. Extension teamed with the Nebraska Soybean Board to offer a toll-free phone line with recorded updates and management information, and specialists and extension educators developed publications with specifics farmers can use to prepare. UNL plant pathologists also conducted 13 field trials across Nebraska in 2005.

Impact: This Institute of Agriculture and Natural Resources research and extension effort and close collaboration with the Nebraska Soybean Board has helped growers learn about and prepare for this new disease. Research will provide practical, science-based information growers and companies will use to control rust under Nebraska conditions. Researchers will use preliminary results and future field trials to devise an integrated soybean rust management program for Nebraska growers.

Summary: Soybean rust is a new major disease worry for growers nationwide. UNL plant pathologists are working to ensure Nebraska farmers have the information and resources to combat soybean rust if it strikes the state. In 2005, plant pathologists created a one-stop soybean rust resource Web site at http://soybeanrust.unl.edu. Extension teamed with the Nebraska Soybean Board to offer a toll-free phone line with recorded updates and management information and specialist and extension educator developed publications with specifics farmers can use to prepare. Researchers conducted 13 field trials statewide. This IANR research and extension effort and close collaboration with the Nebraska Soybean Board has helped growers learn about and prepare for this new disease. Research findings will provide practical, science-based information growers and companies will use to control rust under Nebraska conditions.

Funding:
UNL Agricultural Research Division
UNL Extension
North Central Soybean Research Program
USDA Animal and Plant Health Inspection Service
Nebraska Soybean Board

Activity: Environmental and Natural Resources Policy

Topic: Groundwater Level Monitoring

Issue: Nebraska has some of the world's most abundant groundwater supplies, but groundwater levels have dropped in many areas in recent years. Natural resources managers, irrigators and policymakers need current information to better assess and manage this valuable resource.

What has been done: For 75 years, the University of Nebraska's groundwater monitoring program has annually recorded and published Nebraska groundwater level rises and declines. Today, the program uses early spring readings from more than 5,400 irrigation, domestic, observation and monitoring wells. Yearly changes and cumulative changes since irrigation development began are published as colored maps and are available online. In 2005, the program published a map depicting widespread groundwater level declines from 2000 to 2005, the period of the current drought. Through a partnership with USDA's Risk Management Agency, the program is placing satellite uplinks and associated technology on 52 rapid response wells. This new technology, which will be available on the Internet by fall 2007, will provide current well level readings online to anyone with a computer.

Impact: Annual and longer-term groundwater level information have long been used by decision makers and resource managers to set policies related to groundwater pumping and to make key decisions about how to use this resource. Recent drought coupled with recent water policy and legal decisions have increased the need for current groundwater information. The new rapid monitoring program will provide immediate snapshots of groundwater conditions across the state to aid growers and policymakers.

Summary: UNL water researchers are teaming with the USDA's Risk Management Agency to provide current groundwater levels across Nebraska via the Internet. For 75 years, the university has recorded levels in groundwater wells statewide and reported findings annually in publications to aid decisions about groundwater use, management and policy. Those color maps also are available online. Through the new partnership, satellite uplink and computer equipment is being installed on 52 on the 5,400 wells monitored statewide to compile groundwater data. This will allow information about current levels to be shared immediately via the Web. Recent drought coupled with recent water policy and legal decisions have increased the need for more timely groundwater information. The new rapid monitoring program, which will be available on the Internet by fall 2007, will provide a real-time snapshot of groundwater status.

Funding:
UNL Agricultural Research Division
UNL Extension
USDA Risk Management Agency

Goal 5

Activity: Family Strengths

Topic: Rural Women's Concerns

Issue: The outcomes of public policy choices, including welfare reform, can be quite different in rural than in urban areas. Policy-makers sometimes lack information on those differences.

What has been done: As part of a national three-year study on welfare reform and rural women, University of Nebraska family scientists asked 42 rural women of all incomes about child care, transportation and medical services in their communities as well as their jobs, incomes, expenses and spending habits. They wanted to determine what concerns rural women share regardless of income as well as differences based on income. Rural women tend to worry most about transportation, access to medical services and limited child-care options regardless of income. For example, a lot of women must drive at least two hours to receive medical services. While 80 percent of women reported being employed, many go in and out of the work force due to transportation and child care. Future research will include more in-depth studies comparing Nebraska women to women in other states and the Nebraska survey has been expanded.

Impact: Child care, transportation and health care are just a few things rural women worry about regardless of income. Results of the College of Education and Human Sciences study will provide information about the impact and consequences of welfare reform on rural women as well as general economic information to help policy-makers assess rural impacts of future public policy decisions.

Summary: Child care, transportation and health care are just a few things rural women worry about, IANR research shows. As part of a national three-year study on welfare reform and rural women, College of Education and Human Sciences family scientists asked 42 rural women about child care, transportation and medical services as well as their jobs, incomes, expenses and spending habits. Research has been expanded and results will provide information about the impact and consequences of welfare reform on rural women. Findings also will offer general economic information to help policy-makers assess the rural impact of future policy decisions.

Funding:
UNL Agricultural Research Division
UNL Extension
UNL College of Education and Human Sciences
Hatch Act

Appendix 1

Multi-State Research Committees with Current Agricultural Research Division Faculty Participation

No.	Title	Participating Unit *	Federal Goal
NRSP-1	Research planning using the Current Research Information System (CRIS)	Administration	N/A
NRSP-3	The National Atmospheric Deposition Program (NADP) - A long-term monitoring program in support of research effects of atmospheric deposition	SNRS	4
NRSP-4	High Speciality Crop Pest Management	Entomology	1
NRSP-8	National Animal Genome Research Project	Animal Science	1
NC-007	Conservation, Management, Enhancement and Utilization of Plant Genetic Resources	Agron/Hort PREC	1
NC-100	Regional Research Coordination, N C Region	Administration	NA
NC-107	Evolving Pathogens, Targeted Sequences, and Strategies for Control of Bovine	VBS	1
NC-170	Mediating Exposure to Environmental Hazards through Textile Systems	TCD	3
NC-205	Ecology and Management of European Corn Borer and other Stalk-boring Lepidoptera	NEREC Ent	1
NC-213	Marketing and Delivery of Quality Cereals and Oilseeds	FS&T Agron/Hort	1
NC-218	Assessing Nitrogen Mineralization and other Diagnostic Criteria to Refine Nitrogen Rates for Crops and Minimize Losses	Agron/Hort	1
NC-219	Using Stage Based Intervention to Increase Fruit and Vegetable Intake in Young Adults	Nutr	3
NC-229	Porcine Reproductive & Respiratory Syndrome (PRRS): Mechanisms of Disease and Methods for the Detection, Protection and Elimination of PRRS Virus	VBS	1
NC-1003	Impact Analysis and Decision Strategies for Agricultural Research	Ag Econ	1
NC-1004	Genetic and Functional Genomic Approaches to Improve Production Quality of Pork	An Sci	1
NC-1005	Landscape Ecology of White-tailed Deer in Agro-forest Ecosystems: a Cooperative approach to Support Management	SNRS	4

No.	Title	Participating Unit *	Federal Goal
NC-1006	Methods to Increase Reproductive Efficiency in Cattle	An Sci	1
NC-1007	Enteric Diseases of Swine and Cattle Prevention Control and Food	VBS	1
NC-1010	Interpreting Cattle Genomic Data: Biology, Application and Outreach	An Sci	1
NC-1011	Rural low-income families: Tracking their well-being and function in an era of welfare reform	FCS	5
NC-1016	Economic assessment of changes in trade arrangements, bio-terrorism threats and renewable fuels requirements on the U S Grain and Oilseed sector	Ag Econ	2
NC-1018	Impact of climate and soil on crop selection and management	SNR	4
NC-1020	Beef cattle grazing systems that improve production and profitability while minimizing risk and environmental impacts	An Sci	1
NC-1021	Nitrogen cycling, loading and use efficiency in forage-based livestock production systems	Agron/Hort	4
NC-1022	The chemical and physical nature of particulate matter affecting air, water and soil quality	SNR	4
NC-1023	Improvement of Thermal and Alternative Processes for Foods	IAPC	2
NC-1025	Mycotoxins:Biosecurity and Food Safety	Plant Path	2
NC-1026	Characterize Weed Populations Dynamics for Improved Long-term Weed Management Decision Making	Agron/Hort	1
NC-1100	North Central Regional Center for Rural Development	Ag Econ	5
NC-1119	Management Systems to improve the economic and environmental sustainability of dairy enterprises	Ag Econ	1
NC-1131	Molecular Mechanisms Regulating Skeletal Muscle Growth and Differentiation	Food Sci	1
NC-1142	Regulation of Photosynthetic Processes	Biochem	1
NC-1167	N–3 Polyunsaturated Fatty Acids and Human Health and Disease	Nutr	3
NCAC-1	Crop Soil Research	Agro/H	NA
NCAC-2	Animal Health Advisory Committee	VBS	NA

No.	Title	Participating Unit *	Federal Goal
NCAC-4	Horticultural Crops	Agro/H	NA
NCAC-5	Human Sciences	Home Ec	NA
NCAC-6	Livestock Production	An Sci	NA
NCAC-10	Forestry and Forest Products	SNRS	NA
NCAC-12	Agricultural Economics	Ag Econ	NA
NCAC-14	Plant Pathology	Plant Path	NA
NCAC-15	Entomology and Economic Zoology	Ent	NA
NCAC-16	Agricultural Engineering	BSE	NA
NCAC-22	Food Science and Human Nutrition	FS&T, Nutr	NA
NCAC-23	Fisheries and Wildlife	SNRS	NA
NCAC-24	Agricultural Education Research	AgLEC	NA
NCCC-9	MWPS: Research and Extension Education Materials	Agron/Hort	5
NCCC-22	Small Fruit and Viticulture Research	Agron/Hort	1
NCCC-31	Ecophysiological Aspects of Forage Management	Agron/Hort	1
NCCC-42	Committee on Swine Nutrition	An Sci	1
NCCC-52	Family Economics	FCS	5
NCCC-65	Social Change in the Market Place: Consumer/Retail/Producer Interface	TCD	1
NCCC-84	Potato Breeding and Genetics Technical Committee	PREC	1
NCCC-97	Regulation of Adipose Tissue Accretion in Meat-Producing Animals	An Sci	1
NCCC-170	Research Advances in Agricultural Statistics	Stat	1
NCCC-204	The Interface of Molecular and Quantitative Genetics in Plant and Animal Breeding	Agron/Hort	1
NCDC-201	Nanotechnology and Biosensors	IAPC	1
NCDC - 202	Soybean Rust	Plant Path	1
NCDC-204	Biological control of plant pathogens in the North Central Region	Agron/Hort	4
NCDC-206	Impact of changing management systems on soil nematode communities	Plant Path	4
NCDC-207	Research and Education Support for the Renewal of Agriculture and the Middle	Agron/Hort	5

No.	Title	Participating Unit *	Federal Goal
NCERA-3	Soil Survey	Agron/Hort	4
NCERA-57	Swine Reproductive Physiology	An Sci	1
NCERA-59	Soil organic matter: Formation, function and management	Agron/Hort	4
NCERA-87	Beef-Cow-Calf Nutrition and Management Committee	An Sci	1
NCERA-89	Swine Management Research Committee	An Sci	1
NCERA-103	Specialized soil amendments and products, growth stimulants and soil fertility management programs	Agron/Hort	4
NCERA-125	Biological control of arthropods and weeds	Entom	4
NCERA-137	Soybean Diseases	Plant Path	1
NCERA-148	Migration and Dispersal of Agriculturally Important Biota	PREC	4
NCERA-180	Site-Specific Management	Agron/Hort	1
NCERA-184	Management of Small Grain Diseases	Plant Path	1
NCERA-192	North Central Regional Turfgrass	Agron/Hort	1
NCERA-194	Improving the Management and Effectiveness of Cooperatively Owned Business Organizations	Ag Econ	1
NCERA-199	Implementation and Strategies for National Beef Cattle Evaluation	Statistics	1
NCERA-200	Management Strategies to Control Major Soybean Virus Diseases in the North Central Region	Plant Path	4
NCR-13	Soil Testing and Plant Analysis	Agro/H	1
NCR-46	Development, Optimization, and Delivery of Management Strategies for Corn Rootworms	Ent	1
NCR-131	Animal Behavior and Welfare	AnSci	1
NCR-167	Corn Breeding Research	Agro/H	1
NCR-173	Biochemistry and Genetics of Plant-Fungal Interactions	Plant Path	1
NCR-193	Plant Health: Managing Insect Pests and Diseases of Landscape Plants	SNRS	1
NCR-201	Integrated Pest Management	Agro/Hort Ent	1
NCR-202	Health and Survival of Honey Bee Colonies	Ent	1

No.	Title	Participating Unit *	Federal Goal
NCR-206	Nutrition and Management of Feedlot Cattle to Optimize Performance, Carcass Value and Environmental Capability	An Sci	1
NE-1010	Breeding and Genetics of Forage Crops to Improve Productivity, Quality, and Industrial Uses	Agron/Hort	1
NE-1017	Developing and Integrating Components for Commercial Greenhouse Production System	BSE	4
NE-1020	Multi-state Evaluation of Winegrape Cultivars and Clones	Agron/Hort	5
NE-1022	Poultry Production Systems: Optimization of Production and Welfare Using Physiological, Behavioral and Physical Assessments	An Sci	1
S-295	Enhancing Food Safety Through Control of Food-Borne Disease Agents	FS&T	2
S-1000	Animal Manure and Waste Utilization, Treatment and Nuisance Avoidance for a Sustainable Agriculture	BSE	4
S-1002	New Technologies for Utilization of Textile Materials	TC&D	3
S-1005	Sources, Dispersal and Management of Stable Flies on Grazing Beef and Dairy Cattle	Ent WCREC	1
S-1007	Science and Engineering for a Biobased Industry and Economy	BSE	1
S-1008	Genetic Selection and Crossbreeding to Enhance Reproduction and Survival of Dairy Cattle	An Sci	1
S-1010	Dynamic Soybean Pest Management for Evolving Agricultural Technologies and Cropping Systems	Ent	1
W-112	Reproductive Performance in Domestic Ruminants	An Sci	1
W-173	Stress Factors of Farm Animals and Their Effects on Performance	Stat	1
W-1002	Nutrient Bioavailability -Phytonutrients and Beyond	Nutr	3
W-1082	Evaluating the Physical and Biological Availability of Pesticides and Pharmaceuticals in Agricultural Contexts	Agron/Hort	4

No.	Title	Participating Unit *	Federal Goal
W-1150	Exotic Germplasm Conversion and Breeding Common Bean (Phaseolus vulgaris L.) For Resistance to Abiotic and Biotic Stresses and to Enhance Nutritional Value	Plant Path	1
W-1171	Germ Cell and Embryo Development and Manipulation for the Improvement of Livestock	An Sci	1
W-1177	Enhancing the Global Competitiveness of U S Red Meat	PREC An Sci	1
W-1186	Genetic Variability in the Cyst and Root-Knot Nematodes	Plant Path	1
W-1190	Interfacing Technological, Economic, and Institutional Principles for Managing Intersector Mobilization of Water	Ag Econ	4
WERA-11	Western Regional Turfgrass Research	Agron/Hort	1
WERA-55	Rangeland Resource Economics and Policy	Ag Econ	1
WERA-60	Science and Management of Pesticide Resistance	Ent	1
WERA-66	Integrated Management of Russian Wheat Aphid and Other Cereal Aphids	PREC Ent	1
WERA-72	Agribusiness Research Emphasizing Competitiveness	Ag Econ	5
WERA-77	Management Invasive Weeds in Wheat	PREC	1
WERA-95	Vertebrate Pests of Agriculture, Forestry and Public Lands	SNRS	4
WERA–97	Diseases of Cereals	Plant Path	1
WERA-202	Climatic Data Application in Irrigation Scheduling and Water Conservation	BSE	4

* Unit Abbreviations

Ag Econ	Agricultural Economics
AgLEC	Agricultural Leadership, Education and Communication
Agro/H	Agronomy and Horticulture
An Sci	Animal Science
Biochem	Biochemistry
BSE	Biological Systems Engineering
Biometry	Biometry
Ent	Entomology
FCS	Family and Consumer Science
FS&T	Food Science and Technology
IAPC	Industrial Ag Products Center
Nutr	Nutritional and Health Sciences
Plant Path	Plant Pathology
SNRS	School of Natural Resource Sciences
TCD	Textiles, Clothing and Design
VBS	Veterinary and Biomedical Sciences
NEREC	Northeast Research and Extension Center
PREC	Panhandle Research and Extension Center
SCREC	South Central Research and Extension Center
WCREC	West Central Research and Extension Center