

**PLAN OF WORK**  
**Annual Report**

***SOUTH DAKOTA STATE UNIVERSITY***  
***Federal Fiscal Year 2005***  
***October 1, 2004 - September 30, 2005***

Introduction

The South Dakota State University (SDSU) College of Agriculture and Biological Sciences (ABS) is comprised of the South Dakota Agricultural Experiment Station (AES), South Dakota Cooperative Extension Service (CES), and AgBio Academic Programs (AP). The SDSU College of Family and Consumer Sciences (FCS) is actively involved in programs conducted with AES and CES. This institution serves South Dakota and the Northern Great Plains, and through cooperative arrangements conducts programs that impact the nation and world.

The population of South Dakota is ranked 46<sup>th</sup> in the nation, with an estimated 775,933 people (2005 Census Estimate). One-third of the population is found in the two largest counties, and 44 percent of the population is found in the five largest counties. The largest counties also have the most active growth in population, income and economic development. Minnehaha County alone has 20 percent of the state's population. Lincoln County is ranked as the fifth fastest growing county in the nation. The remaining 60 counties have lower levels of population growth, and pervasive levels of poverty. Poverty is particularly high on the Native American reservations in the state.

Historically, between 12 and 16 percent of South Dakota's population ranks below the poverty level, and in 2003 the number was estimated to be 12.3 percent. The U.S. Department of Agriculture's Economic Research Service reports that in 2003, the average annual income in South Dakota was \$28,856. Statewide unemployment is consistently in the three to four percent range, and was at 3.5 percent in 2004. This indicates that most citizens are employed, but do not have high paying jobs. One result is that most families have two wage earners, in some cases each wage earner holds more than one job. These factors set the stage for out-migration from South Dakota to other places that are perceived to have job opportunities with higher income. Recently, this out-migration has slowed, and reversed in the 30-40 year old category as they return to South Dakota. Quality of family life issues are listed as key reasons for these people to return to their home state.

South Dakota has five Native American reservations. The Native American population represents approximately eight percent of the total state population. Three of the counties with reservations have been listed among the ten poorest counties in the United States. Unemployment, alcoholism, poor diet, obesity, diabetes and other health and social problems are prevalent in these areas.

South Dakota State University has developed working agreements with the four 1994 Land Grant Institutions located in South Dakota, and is continuing to offer programs that address these social and economic needs.

Agriculture is the largest sector of the state's economy, generating a total impact of \$16.8 billion in 2002. Seventy-four percent of all farms earn less than \$100,000 per year, while 24% earn between \$100,000 and \$499,999 each year. Two percent earned \$500,000 or more. This indicates there are two types of agriculture being conducted in South Dakota: large-scale and small-scale agriculture. Currently, there are 31,600 farms with an average size of 1,386 acres.

The Northern Great Plains was known as the Great American Desert during the 19<sup>th</sup> Century. Numerous types of abiotic, biotic and social stresses continue to be a part of living in the Northern Great Plains. A major emphasis of SDSU research and Extension programs is aimed at assisting citizens in dealing with the various forms of stress that are a part of living here. To highlight this commitment to stress-related research and education, the ABS College adopted the Biostress philosophy during the early 1990's.

Biostress has been used as a term to recognize the various forms of stress; biotic, edaphic, climatic, economic, and even sociological. Additionally, the Biostress philosophy has been used as a concept to implement broad interdisciplinary programs at SDSU. AES scientists, Extension specialists and teachers of diverse departments and disciplines work together and share resources.

The South Dakota Agricultural Experiment Station has research facilities at eight primary locations within the state. Most of the scientists are located at the main campus in Brookings, but they conduct research throughout the state. Scientists, and Extension specialists, are also located at the SDSU West River Ag Center at Rapid City. The West River Center serves as the primary host for integrated CES and AES programs west of the Missouri River. Research project leaders are also located at the Dakota Lakes Research Farm near Pierre, in central South Dakota, and at the Southeast South Dakota Research Farm near Beresford. Both of these research farms also feature strong Extension educational components. Both farms focus on farming systems research, with no-till technology and irrigation being emphasized at Dakota Lakes and diversification of corn/soybean rotations and livestock feeding being emphasized at the Southeast Farm.

There are four research farms that are continuously staffed with support personnel. The AES scientists from Brookings and Rapid City conduct research at these stations; however, project leaders are not permanently located there. Crop production research is conducted at the Northeast Research Station near Watertown and at the Central Crops and Soils Research Station near Highmore. Neither of these stations are irrigated. Beef, sheep, and range research is conducted at the Antelope Station near Buffalo in Northwestern SD and at the Cottonwood Station in the West-Central part of the state. AES and CES staff work cooperatively to offer educational field days at each station.

There are also several locations where AES research is conducted on cooperating stakeholder property. These cooperative arrangements greatly augment our research capabilities and provide direct linkages with many of our rural stakeholders.

In addition to research conducted by AES scientists, the Cooperative Extension Service is also doing on-farm research across South Dakota. This takes the form of demonstration projects, interpretation of AES research, and helping to transfer information from the scientist to the agricultural user. Each year, more than 40,000 Extension field demonstration plots across South Dakota provide farmers with direct access to applied research data specific to their local conditions.

The Cooperative Extension Service has offices located in 63 South Dakota Counties and two Native American Reservations. An individual Memorandum of Agreement with each county documents the relationships, and establishes County Extension Advisory Boards. At the Field Education Unit level, county representatives of these boards provide input on programming efforts. The combined presence of Agricultural Experiment Station Research Farms and County Extension Offices across the state means that the South Dakota State University College of Agriculture and Biological Sciences is uniquely able to deliver educational services and meet the needs of the people of South Dakota.

This integrated Annual Report is a summary of the College's activities for Federal Fiscal Year 2005, as required by the Agriculture Research, Extension, and Education Reform Act of 1998 (AREERA). This report incorporates the five national goals established in the Cooperative State Research, Education and Extension Service (CSREES) Agency Strategic Plans and linked to the five national goals within the Research, Education and Economics Mission Area of the U.S. Department of Agriculture. This annual report summarizes programs that are built on substantial stakeholder input from all segments of South Dakota.

## **FY 2005 Annual Report of Accomplishments and Results**

**Goal 1: Enhance Economic Opportunities for Agricultural Producers.** *(Previously Goal 1: An agricultural system that is highly competitive in the global economy.)*

1862 Research - X

1862 Extension - X

**Program Description:** Competitive and Profitable Agricultural Production Systems

**Overview:**

The SDSU Cooperative Extension Service and Agricultural Experiment Station have integrated activities to develop and support competitive and profitable agricultural production systems. This is accomplished by: 1) providing improved and sustainable

agricultural and risk management skills and practices that allow producers to be competitive and profitable in the global agricultural market; 2) expanding genetic foundations for crops and livestock; 3) refining science-based management tools that address biotic and abiotic stress in the Northern Plains; and, 4) identifying and evaluating new agricultural products and value-added opportunities. The Cooperative Extension Service and Agricultural Experiment Station have achieved a number of results in support of the goals listed above. These include:

Program: Management Systems

*Output:* Management systems are continually evaluated to determine greater efficiency leading to increased productivity and/or profit. These systems must perform in the full range of economic and environmental settings, from times of prosperity to times of difficulty. South Dakota's land grant university works to give producers the management tools to make appropriate decisions during times of natural disasters like floods, storms or drought; as well as during times of economic downturn which may have causes reaching beyond agriculture. Using the new knowledge developed by the Agricultural Experiment Station, an on-going effort of the Cooperative Extension Service is to help agricultural producers become better managers by contemplating new management techniques. During this reporting period, scientists demonstrated improved agronomic practices at field demonstration plots and in publications; they worked to describe genetic advances in crops such as wheat that are better adapted to South Dakota's harsh climate; and they worked to show livestock producers how to use ethanol co-products to reformulate rations for greater profits. These efforts are described in greater detail as Key Themes.

*Outcome:* Farmers and ranchers continue to improve their agricultural management skills, using information developed by the Agricultural Experiment Station and brought to clients across the state by the Cooperative Extension Service. During a year when fuel prices increased 50 percent or more, these management practices gave important decision-making tools to farm families that already operate on small profit margins. In one five-county area, improved genetics and management practices were applied to 380,000 acres of wheat, ultimately generating \$11.4 million beyond the income normally earned through traditional practices.

*Impact:* The success of improved management practices can be best observed when looking at specific enterprises. For example, in 1999, 56 percent of spring wheat was grown from recommended varieties. By promoting new management practices and varieties specifically adapted to South Dakota production issues, 69 percent of spring wheat was planted from recommended varieties in 2005. When the impact of these new varieties are combined with management practices such as no-till farming, participating producers reported yield increases of at least five bushels per acre. With rising fuel costs, no-till practices reduced production costs significantly, another factor leading to increased profits.

### Program: Crop Systems

*Output:* SDSU and the land grant system offer a science-based approach to crop management and food production. Agricultural Experiment Station scientists and Extension specialists and educators work collaboratively to focus resources on issues of significance that have been identified by stakeholders. For example, SDSU has an active crop variety research program. Scientists work to improve the genetic traits of crops in response to environmental and disease problems faced by South Dakota producers. SDSU develops crop cultivars, germplasm and inbred lines of soybean, spring wheat, winter wheat, rye, corn, oat, sunflower, forage crop, turfgrass, and woody horticultural plants. SDSU also works with other land grant institutions to develop plant varieties that are resistant to developing disease threats, like Bean Pod Mottle Virus. These efforts are described in greater detail as a Key Theme.

*Outcome:* SDSU-developed crop varieties are used extensively throughout South Dakota and the Northern Great Plains region. A 2002 survey of wheat variety use (USDA-NASS, 2002) showed that SDAES varieties were used on approximately 61% of the 2.95 million acres planted to wheat in 2002. SDSU crop breeding programs provide varieties adapted to South Dakota growing conditions. Additional performance testing documents which varieties will perform best in South Dakota's climate.

*Impact:* Annual increased profits from South Dakota's wheat crop alone are nearly equal to South Dakota's total investment in agricultural research. Agricultural Experiment Station scientists develop wheat varieties that produce average annual yield increases of .5 to 1 bushel per acre. When planted on South Dakota's 3.3 million wheat acres, this represents as much as \$8 million in additional income from wheat.

### Program: Livestock Systems

*Output:* SDSU programs literally extend from the farm gate to the consumer's plate, and range from programs that test for and control new diseases, to efforts to restructure cuts of beef to achieve greater value for the producer and increased acceptance by the consumer. Educational programs are offered by the Cooperative Extension Service for livestock producers on topics including: nutrition and diet formulation for increased profits, improved genetics, health and disease prevention, and marketing. One emerging opportunity in South Dakota comes from the production of ethanol. A co-product of ethanol production is a cost-effective source of protein and energy. Cooperative Extension Service specialists and educators, working from research conducted by the Agricultural Experiment Station, are helping livestock producers learn to use Dried Distillers Grains (DDG) in rations for feedlot cattle, nursery pigs, grow-finish pigs, lactating sows and gestating sows. In one example, a research project was conducted in western South Dakota to evaluate early-weaned heifers developed on range supplemented with DDG. These efforts are described in greater detail as a Key Theme.

*Outcome:* South Dakota livestock producers continually evaluate livestock management options that strengthen overall profitability. In the example of feedlot cattle, replacing corn in 20 percent of the diet results in a total savings of \$1.4 million for cattle feeders in the state. Applying this technique to weaned calves on range generates even greater savings.

*Impact:* Livestock production is one of the pillars of South Dakota's economy. SDSU has played an important role in livestock production by providing reliable, science-based information on topics related to animal agriculture.

Assessment:

The programs of the Cooperative Extension Service and Agricultural Experiment Station have enhanced agricultural production systems, helped individual producers increase the profit potential of their enterprises, and led to the production of higher quality product at greater profit. Extension specialists and educators, and AES scientists have developed multi-state and interdisciplinary relationships which allow them to share new knowledge, and utilize the strengths of each entity for the overall benefit of stakeholders. The following Key Themes offer greater detail regarding the contributions and value of the land grant system in South Dakota.

**GOAL ONE FUND SUMMARY**

Total Expenditures by Source of Funds

Hatch	1,491,955
State Match	1,491,955
FTE	196.02
Smith Lever	869,333
State Match	869,333
FTE	46.08

**Key Themes for Goal One**

**Key Theme: Management Systems** “Improved Agronomic Management”

*Brief description of the activity* - Wheat is an important cash crop in north central South Dakota, an area that often faces crop diseases, pests and weather challenges. Wheat growers, seed dealers, and Crop Improvement Associations require current information about new varieties to make planting decisions that are based on the most current agronomic practices available.

Extension educators operate spring wheat and winter wheat variety evaluation plots in five counties in north central South Dakota. Production workshops, crop tours, radio programs, mailings, and one-on-one farm visits are used to keep wheat growers informed about new varieties, and no-till wheat production advances.

*Short impact statement* - Extension variety trials, education programs and plot tours helped producers increase wheat yields by five bushels an acre. In 2005 the difference between the top and bottom yielding varieties meant an additional \$30 for each acre of wheat. This represents \$11.4 million in additional income from the 380,000 acres in these five counties.

*Source of Funding*  
Smith Lever (b) & (c)  
State Funds

*Scope of impact, identifying which of the following apply to the activities conducted*  
(0) State specific

**Key Theme: Crop Systems "Wheat Research Generates Millions for South Dakota Economy"**

*Brief description of the activity* - Seed science is a mechanism for the delivery of genetic traits and technologies for producers, and the means for continued specialization of crops with traits that enhance the value of our crops, and the profitability of our producers. In South Dakota, the wheat breeding program works to develop new varieties, and conducts research in best farming practices to maximize the long-term productivity of South Dakota resources.

SDSU wheat research addresses the challenges faced by South Dakota wheat growers. For example, scab in spring wheat can be devastating to yields. In the wet year of 1993, scab cost South Dakota spring wheat producers an estimated \$80 million in just one year. SDSU scientists are selecting DNA markers for scab resistance for marker-assisted breeding in spring wheat. Other projects are in place to seek answers and solutions to disease, insect and production problems involved in wheat production.

*Short impact statement* - Agricultural Experiment Station scientists develop varieties that produce average annual yield increases of .5 to 1 bushel per acre. When planted on South Dakota's 3.3 million wheat acres, this represents an annual increase of 1.3 to 3.3 million bushels worth \$6 to \$6 million in additional income from the wheat crop. South Dakota's total investment in all AES research is \$9.1 million. The return on wheat varieties alone is equal to as much as 90 percent of South Dakota's total state investment in all Agricultural Experiment Station research.

*Source of Funding*  
Hatch  
State – State Funds

*Scope of impact, identifying which of the following apply to the activities conducted*  
(0) State specific

**Key Theme: Livestock Systems** “Dried Distillers Grain means more profits for livestock producers”

*Brief description of the activity* – South Dakota's land grant university is exploring the nutritional value, handling, management and economic impacts of alternative feed ingredients for livestock diets. Dried distillers grain (DDG), the corn co-product from ethanol production, is high in protein and energy and easily available and affordable across most of South Dakota. South Dakota's ethanol plants produce about 2.7 gallons of ethanol, plus about 17 pounds of DDG for every bushel of corn they process.

Agricultural Experiment Station scientists have conducted extensive research on utilization of DDG in livestock rations. This research has determined that DDG can be used in rations for feedlot cattle, nursery pigs, grow-finishing pigs, lactating sows, and gestating sows. DDG also provides an effective supplement for early weaned heifers in range conditions experiencing drought conditions. The Cooperative Extension Service has taken this information to livestock producers, and incorporated these research findings in recommendations for ration formulations. Extension Educators and Specialists have also worked with Experiment Station scientists to design local livestock feeding demonstrations.

*Short impact statement* - Agricultural Experiment Station research on feedlot cattle has indicated that if dried distillers grains replace corn in 20 percent of the diet, it would result in a savings of \$2.32 per animal, or a total of \$1.4 million for South Dakota cattle feeders. In addition, feeding dried distillers grains supplements to early weaned calves on rangeland, rather than in feedlots, represents an overall savings of \$2.5 million for northwest South Dakota beef producers.

*Source of Funding*

Hatch Act

Smith-Lever 3(b) & (c)

State

Other – USDA CSREES grant to Four-States Ruminant Consortium

*Scope of impact, identifying which of the following apply to the activities conducted*

(1) State Specific

(4) Integrated Research and Extension



## **Goal 2: Support Increased Economic Opportunities and Improved Quality of Life in Rural America.** (Previously Goal 5:

*Enhanced economic opportunity and quality of life for Americans)*

1862 Research - X

1862 Extension - X

**Program Description:** Economic Opportunity and Quality of Life

### **Overview:**

The SDSU Cooperative Extension Service and Agricultural Experiment Station work jointly to enhance economic opportunity and overall quality of life. This is accomplished by: 1) helping families learn how to cope with challenges and meet individual needs, allowing them to be more resilient to stress and crisis; 2) emphasizing economic development, including the mobilization of community development efforts that enhance local job opportunities, community facilities and services, housing and strengthen the perceived future of the individual community; 3) advocating retirement planning, and initiating efforts to enhance the quality of life in senior years; 4) fostering volunteerism; 5) helping youth to become self-reliant, healthy and productive members of society; 6) providing career opportunities through higher education; and, 7) identifying, studying and communicating opportunities to improve rural economies and standards of living. The Cooperative Extension Service and Agricultural Experiment Station have achieved a number of results in support of the goals listed above. These include:

### Program: Economic Development

*Output:* SDSU places a high priority on assisting stakeholders to deal with the myriad of opportunities that may lead to new businesses, new products, and a stronger economy. There are many examples of how SDSU research and educational efforts have fostered economic development opportunities. One area of particular interest is value added product development. SDSU has played a major leadership role in the research and educational support needed to launch the South Dakota Certified Beef program. Economic development also can occur through breeding and genetic improvement of crops. One example is a new hard white winter wheat that has been developed specifically for the Northern Plains, an area that typically produces hard red spring and winter wheat. In the 1970s, SDSU conducted fundamental research to develop distillation technology for modern corn ethanol plants. These efforts are described in greater detail as a Key Theme.

*Outcome:* SDSU efforts have led to new uses that add value to agricultural products. In addition, a new generation of community leaders has learned how to foster local economic development efforts.

*Impact:* Research-based knowledge, brought to citizens through educational efforts of the Cooperative Extension Service, often fosters growth and development on the individual as well as community level. As these efforts develop over time, it may be many years before the true impact is realized. For example, SDSU's ethanol distillation research in the 1970s has led to the establishment and growth of the modern ethanol industry, a \$1.5 billion industry in South Dakota.

Program: Improved Quality of Life

*Outputs:* SDSU has several programs that address sustainability and improvement of quality of life issues. From increasing rural tourism opportunities, to the development of a bio-based energy system, SDSU actively works to improve economic opportunities, leading to strengthened families and personal finances. The SDSU Cooperative Extension Service has increased its already substantial emphasis on serving Native American and other minority populations by providing educational information in Spanish. In some cases, the opportunities to provide educational services occur during times of immediate crisis. One example is the Extension response to a major November ice storm. With 50,000 households without power for several weeks in bitter cold, county Extension staff provided education and support in the areas of personal stress, family and financial management, food safety, livestock health and nutrition, horticultural salvage, and electric power usage. These efforts are described in greater detail as a Key Theme.

*Outcomes:* Twenty-five of South Dakota's counties were affected by the November ice storm. The Cooperative Extension Service was active in every community, with the response of each County Extension Office reflecting local needs. In many counties, Extension Centers were designated as Emergency Shelters. As the crisis wore on, CES staff provided education and support to address specific areas of stress. Extension staff worked with county and state emergency management officials, in some cases contacting each household to confirm residents were safe.

*Impacts:* South Dakotans survived the ice storm and power outage with no loss of human life. Personal stories from citizens serve as a dramatic testament to the dedication of Extension staff. Educators endured the same hardships as their clients, and went out of their way to work with hospitals, clinics, grocery stores, power companies, law enforcement, and emergency personnel to assure science-based information was available to help people cope with the disaster.

Program: Youth and Family Development

*Output:* SDSU offers numerous educational opportunities that help young people develop positive character traits, experience the value of the local agricultural economy, personally identify opportunities to earn money, and learn fiscal responsibility. Because South Dakota has a substantial Native American population, SDSU strives to incorporate Native American values in educational programs such as "We Are All Relatives," a Character Counts! Program. These efforts are described in greater detail as a Key Theme.

*Outcome:* The KidQuest program taught fifth and sixth grade students about nutrition and the need physical activity. In another program, SDSU has developed a program to help parents and coaches practice achievement motivation, conflict resolution, and other important life skills. SDSU has also introduced Native American traditional values to students in grades K-12 through the We Are All Relatives is a Character Counts! Program. The program ties together the Six Pillars of Character and the four traditional values of the Lakota/Dakota people. The program "We Are All Relatives" has been piloted in nine South Dakota school districts as well as schools in three other states.

*Impact:* Students learn about character, nutrition and exercise, fiscal responsibility, and cultural values, offering the promise of a lifetime of service to their communities. Ultimately, this leads to enhanced economic opportunities for future generations.

Assessment:

The programs of the Cooperative Extension Service and Agricultural Experiment Station have strengthened economic opportunities and offered programs to enhance the quality of life in South Dakota and the region. Programs of the Cooperative Extension Service have increased youth competence in the area of personal, social and citizenship skills. Families are more resilient to stress, and have practiced improved financial planning for all life stages, particularly retirement. Agricultural Experiment Station scientists have identified how value-added industries work to capture economic opportunities for agricultural producers and rural communities. SDSU continues to be a leader in the development of a nationwide model to study ag-based bio-energy opportunities, leading to the federal authorization of the Sun Grant Initiative within the Land Grant System. SDSU research clarifies that development of value-added industries will require strong communication and team efforts between producers and rural community residents. Extension specialists and educators, and AES scientists have developed multi-state and interdisciplinary relationships that allow them to share new knowledge, and utilize the strengths of each entity for the overall benefit of stakeholders. The following Key Themes offer greater detail regarding the contributions and value of the land grant system in South Dakota.

**GOAL TWO FUND SUMMARY**

Total Expenditures by Source of Funds

Hatch	262,524
State Match	262,524
FTE	16.29
Smith Lever	372,571
State Match	372,571
FTE	19.75

## Key Themes for Goal Two

### **Key Theme: Economic Development “Biofuels Research Leads to Ethanol Industry”**

*Brief description of the activity* - American consumers are feeling the pinch of sky-rocketing energy costs. While there are numerous energy alternatives on the horizon, ethanol is the first domestically produced, non-petroleum energy source that is currently on the market. Corn-based ethanol can reduce America's reliance on imported fossil fuels and petroleum-based products.

In the 1970s, South Dakota State University conducted fundamental research to develop distillation technology for modern corn ethanol plants. This research helped establish the science-based foundation of the modern ethanol industry. As is often the case with research, it took three decades for the breakthroughs in science to be transformed into an accepted product.

Scientists currently are working on technologies to bring even more added value to the co-products of ethanol: refining rations from distillers grains – high in protein and energy and now affordable and available – and experimenting with plastic-like biodegradable products with potential applications ranging from packaging to biomedical equipment.

*Short impact statement* - Today, corn-based ethanol production in South Dakota is a \$1.5 billion industry, with the nation's largest plant located just four miles from South Dakota State University. One of every three rows of corn grown in South Dakota is used to produce ethanol.

South Dakota ethanol plants produce about 2.7 gallons of ethanol for every bushel of corn. Given that South Dakota and many other states allow a 10% blend of ethanol, each bushel of corn can enhance about 27 gallons of gasoline. This means that one bushel of corn makes enough ethanol, when blended at 10 percent with gasoline, to fill the fuel tank of a Ford F150 pickup.

#### *Source of Funding*

Hatch Act

State – State Funds

#### *Scope of impact, identifying which of the following apply to the activities conducted*

(1) State Specific

### **Key Theme: Economic Development “South Dakota Certified Beef”**

*Brief description of the activity* – South Dakota produces 3,750,000 cattle each year, ranking seventh in the production of all cattle and calves in the United States. South Dakota cattle have the established reputation of being the world's best beef. But the reputation didn't automatically translate into premium prices for South Dakota produced beef.

South Dakota set upon a course of action designed to create a premium beef product, which could be demonstrated to consumers by meeting and exceeding quality standards for beef.

At the request of South Dakota Governor Mike Rounds, SDSU animal scientists were instrumental in the development of the South Dakota Certified Beef program. A new Extension meat specialist position has been created in response to Governor Rounds' request that the Cooperative Extension Service play a major role in the launch of the program. Two faculty members serve on the program's marketing advisory committee. As the program is implemented, the primary role of SDSU Extension staff will be education and training of processors, as well as monitoring and sampling product quality and tracking results over time to measure continuous improvement.

To provide a scientific basis for the program, SDSU animal scientists conducted a comprehensive review of research studies that evaluated meat quality. Twenty-six different factors were identified in 85 different studies that affect the eating quality of beef. These factors were ranked according to the effect each had on the beef product. Factors included animal age, gender, breed, and processing techniques. These science-based factors created the product base-line for the program. To enroll in the South Dakota Certified Beef program, producers must complete the South Dakota Beef Quality Assurance/Critical Management Plan Program training offered by the Extension Service, and be certified to have an official USDA Premises number. Beef producers and processors must adhere to program specifications.

There are more than 60 branded beef programs in the United States, but South Dakota Certified Beef is the only program that is backed by a state government, based upon scientific standards for beef quality, and including a rigorous education and testing program for producers and processors.

*Short impact statement* - Added value and premium pricing for products are the main benefits of the program that are being realized by producers and processors. "We know from consumer research that if you make a consistently high-quality product, a majority of consumers are willing to pay for it. There is also a smaller segment of consumers willing to pay for enhanced safety and source verification," said Dr. Duane Wulf, SDSU meat scientist. SDSU research has also led to the development of the South Dakota Certified Tri-tip, adding \$9.80 to each Certified beef carcass.

*Source of Funding*

Smith-Lever 3(b) & (c)  
State

*Scope of impact, identifying which of the following apply to the activities conducted*

(1) State Specific

**Key Theme: Economic Development** “New Wheat Expands Wheat Market”

*Brief description of the activity* – Bread products are a world-wide staple, and Hard Red Winter Wheat is one crop that has helped feed the world. But when used in whole wheat bread or in noodles, the red pigments can make the food product bitter. This bitterness can be address in processing, but does require adding sugar. One solution is to use Hard White Winter Wheat for breads and noodles. Bread made from white wheat is healthier because it does not require the addition of sugar. However, Hard White Winter Wheat varieties historically are not well-suited for planting in the Northern Plains, a primary wheat production area of North America.

South Dakota State University has developed a Hard White Winter Wheat variety that can be planted in the northern wheat production areas of the United States. This variety, named 'Wendy', is known for high protein content, and greater flour extraction because of the hardness of the kernel. It also is low in a certain enzyme that causes discoloration of noodles. And, it has added value when grown in high selenium soils. Buyers in southeast Asia, an area that is deficient in selenium, place a higher value on Hard White Winter Wheat from South Dakota with a high selenium content.

*Short impact statement* - The new variety of Hard White Winter Wheat is a healthier choice for breads because it does not require sugar to be added to the dough. The result of this new variety is a healthier wheat flour, assuring that the United States will be competitive in the growing noodle markets in the United States and southeast Asia; and in the flatbread markets of the Middle East and North Africa. The variety also insures higher yield potential of white wheat than was previously available without sacrificing disease resistance, winter hardiness and noodle making quality.

*Source of Funding*

Hatch  
State

*Scope of impact, identifying which of the following apply to the activities conducted*

(1) State Specific

**Key Theme: Quality of Life** “Ice Storm Response”

*Brief description of the activity* - One of the worst ice storms in the history of South Dakota swept across the state just after the Thanksgiving holiday. More than two inches of rain, followed by freezing temperatures and wind coated power lines. By Monday evening November 28, 2005, power outages were reported across much of the north central part of South Dakota. At the peak of the outage, more than 50,000 households were without power, including entire communities. The state would experience several weeks of bitter cold before power was completely restored to all residents.

The Cooperative Extension Service was immediately active in every community, but especially the 25 counties hardest hit by the storm. The response of each County Extension Office reflected local needs.

In many counties, Extension Centers were designated as Emergency Shelters. Staff in these counties provided 24 hour access to shelters, often maintaining emergency generators, planning and serving meals. As the crisis wore on, CES staff provided education and support in the areas of stress, family and financial management. CES staff helped people who were cold, exhausted, and worried about the impact of the storm on their families and finances. In many cases, citizens sought help from Extension because of an existing relationship. As the crisis unfolded, Extension educators were already recognized as trusted local resource providers.

The Cooperative Extension Service fielded many questions from clients who had never faced a storm of this magnitude. These questions included:

- food safety and preservation
- livestock water requirements
- ice damage to trees and crops
- locating, installing and operating emergency generators
- family stress
- financial strain
- cleanup after pipes burst

To address these issues, Extension quickly developed a web page with answers to many of the common questions. But because clients in many of the affected counties did not have electricity to operate computers, Extension also printed and distributes a series of Extension Extra publications featuring this information.

Extension staff worked with county and state emergency management officials, in some cases contacting each household to confirm residents were safe. Extension provided information to County Emergency Management Offices, Sheriff's Departments, grocery stores, Court Houses, hospitals, nursing homes, tribal health centers and other places that served the emergency needs of local citizens. In other cases, Extension staff worked directly with power companies in support of the repair teams. Many communities reported that County Extension Staff traveled to small towns, visiting with people in cafes and other gathering points, to answer questions about food safety. Extension staff also documented storm damage to help counties qualify for federal emergency disaster funds.

*Short impact statement* - As is often true with natural disasters, entire communities felt the impact of this event. When the power went off, Extension educators stepped in with valuable information to help families, farms and communities weather the storm.

*Source of Funding*  
Smith-Lever 3(b) & (c)

State

*Scope of impact, identifying which of the following apply to the activities conducted*

(1) State Specific

**Key Theme: Youth and Family Development “KidQuest”**

*Brief description of the activity* – Physical inactivity contributes to 400,000 preventable deaths each year, representing 17 percent of all deaths. A sedentary lifestyle is a major risk factor across the spectrum of preventable diseases that lower the quality of life and kill Americans. Poor diet and physical inactivity are rapidly approaching tobacco as the leading cause of preventable death in the United States.

A program called KidQuest was initiated as an After School Program for young people in grades five and six. The program involves a monthly educational session that provides a nutrition component and physical activity. Young people learn the importance of physical activity and new ways to exercise. The young participants are encouraged to select a healthy challenge for the month. The entire class can earn incentives based on the challenges.

*Short impact statement* - Twenty eight percent of the young participants reported an increase in the consumption of fruits and vegetables, and 15 percent reported an increase of activity by one hour or more. Knowledge of high fat foods, and the ability to read a food label also increased. The program was so successful that parents also reported lifestyle changes that reflect their children's new commitment to nutrition and exercise.

*Source of Funding*

Smith-Lever 3(b) & (c)

State

*Scope of impact, identifying which of the following apply to the activities conducted*

(1) State Specific



**Goal 3: Enhance Protection and Safety of the Nation's Agriculture and Food Supply.** (*Previously Goal 2: A safe and secure food and fiber system.*)

1862 Research - X

1862 Extension - X

**Program Description:** A safe and secure food and fiber system.

**Overview:**

The SDSU Cooperative Extension Service and Agricultural Experiment Station have integrated activities to further develop and support a safe and secure agricultural production system. This is accomplished by: 1) helping citizens adopt safe food selection, preparation, service and storage practices; 2) fostering rural-urban co-existence and use of natural resources by refining practices for the safe handling, storage and disposal of pesticides, livestock waste and other possible environmental contaminants; 3) studying the impact of present and future regulations on farms, producers, families and communities; 4) identifying and evaluating new marketing systems for agricultural products; and, 5) providing science-based information regarding the use and safety of transgenic crops. The Cooperative Extension Service and Agricultural Experiment Station have achieved a number of results in support of the goals listed above. These include:

Program: Crop Protection

*Outputs:* SDSU works to identify new and developing pests and diseases which may threaten crop production. Asian soybean rust will be the next plant disease in South Dakota. Extension specialists and educators presented educational meetings, established soybean sentinel plots, and distributed educational materials to all soybean producers. These efforts are described in greater detail as a Key Theme.

*Outcomes:* Soybean producers, commodity organizations, Agricultural Experiment Station scientists and Cooperative Extension Service specialists and educators formed an effective partnership to insure that South Dakota is vigilant and prepared to meet this disease.

*Impacts:* Asian soybean rust did not appear in South Dakota during the 2005 crop season. However, preparation in 2005 will likely lead to more timely scouting and earlier identification when the disease appears, which may be as soon as the 2006 crop season.

Program: Livestock Health and Safety

*Outputs:* SDSU works to assure animal health and food safety, and to provide science-based information to assure consumers of the safety of their food. In some cases, enhancing the protection and safety of food means preventing animal diseases from decimating herds, which may reduce the source of some food. For example, SDSU identified the cause and control options for Mystery Swine Disease, later named Porcine Reproductive and Respiratory Syndrome, or PRRS. This discovery stopped a disease which caused a 30 percent death loss in U.S. swine herds.

*Outcomes:* Research and the development of science-based knowledge to address health problems often occur over a period of many years. From the time the disease was established in 1991, it took another three years for scientists at SDSU and other land grant institutions to develop a control vaccine. Today, the PRRS disease is still a threat, but pork producers have control options and death losses are no longer a looming threat.

*Impacts:* The nation-wide economic impact of controlling Mystery Swine Disease far exceeds \$100 million. SDSU has similar successes in testing for Chronic Wasting Disease in wild game, and in education efforts for other livestock diseases.

Assessment:

The programs of the Cooperative Extension Service and Agricultural Experiment Station have fostered greater understanding of food safety among the citizens of the state, and have added to the growing body of knowledge regarding consumer acceptance of agricultural products, and the safety of transgenic food ingredients. SDSU provides scientific testing of dairy products, processed food, and other foods for overall safety, including the presence of E. coli 157.H7. The Beef Quality Assurance Programs of the Cooperative Extension Service help farmers and ranchers implement production practices that foster the production of safe food. Extension programs also help students learn more about the role genetics play in the production of safe food. Extension specialists and educators, and AES scientists have developed multi-state and interdisciplinary relationships that allow them to share new knowledge, and utilize the strengths of each entity for the overall benefit of stakeholders. The following Key Themes offer greater detail regarding the contributions and value of the land grant system in South Dakota.

**GOAL THREE FUND SUMMARY**

Total Expenditures by Source of Funds

Hatch	222,194
State Match	222,194
FTE	16.02
Smith Lever	403,619
State Match	403,619
FTE	21.40

## **Key Themes for Goal Three**

### **Key Theme: Crop Protection “Asian Soybean Rust”**

*Brief description of the activity* – Asian soybean rust will be the next major plant disease in South Dakota. This plant disease lowers yields and raises production costs where it has appeared around the globe. Because it travels on wind currents, plant scientists believe it is moving toward the soybean production center of the United States. South Dakota ranks eighth nationally in soybean production. This disease represents a substantial threat to future soybean profits. The U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) has confirmed Asian soybean rust on soybean leaf samples from Louisiana and other Gulf states. It is unclear how much of a problem soybean rust will be in the northern Great Plains, but starting in 2005, South Dakota producers had to monitor fields for rust.

SDSU Extension specialists and educators presented educational meetings, established soybean sentinel plots, and distributed educational materials to all soybean producers. These educational efforts reported the potential route of rust spores and described vulnerable stages of soybean growth, scouting techniques, insect control, fungicide application, and crop insurance and marketing implications.

*Short impact statement* – Had Asian soybean rust reached South Dakota in 2005, producers would have been prepared. Soybean rust is another disease, like potato late blight, where playing catch-up is not a good disease management strategy. Even the curative fungicides are not highly effective in a severe outbreak. Multi-peril crop insurance will cover losses from rust if the producer has done the best he could to control the disease. That makes it essential for producers to actively scout fields to monitor for disease development. Soybean producers and commodity organizations, Agricultural Experiment Station scientists, and Cooperative Extension Service specialists and educators formed an effective partnership to insure that South Dakota is vigilant and prepared to meet this threat to the soybean crop, which may likely come in 2006.

#### *Source of Funding*

Hatch Act

Smith-Lever 3(b) & (c)

State

*Scope of impact, identifying which of the following apply to the activities conducted*

(4) Integrated Research and Extension

**Key Theme: Livestock Health and Safety** “Animal Health Investment Pays Long Term Dividends”

*Brief description of the activity* – In the 1980s, pork producers, veterinarians and Extension educators and specialists across the Midwest began to encounter a new disease in swine herds. This disease was unlike anything that had previously been encountered, and attacked the respiratory and reproductive systems of pigs. Within just a few years, 30 percent of all U.S. swine herds were infected with what was called "Mystery Swine Disease," causing losses of \$180,000 per year for large swine production operations.

In 1991, a new viral infectious agent was identified by Agricultural Experiment Station veterinary scientists at South Dakota State University. The disease was named Porcine Reproductive and Respiratory Syndrome, or PRRS. In 1994, a PRRS control vaccine was released commercially, which was based on research conducted jointly by SDSU and the University of Minnesota. Within six months, more than one million doses of the vaccine had been sold.

*Short impact statement* – Twenty years after "Mystery Swine Disease" was first detected, the nation-wide economic impact of controlling this disease far exceeds \$100 million. Discovering the cause of this disease and providing a cure meant the difference for some pork producers who were struggling financially. Had the disease and cure not been identified, pork producers could have lost one third of their feeder pigs, bringing almost certain financial ruin to family farms. The PRRS discovery stands as another example of how the land grant system addresses emerging, critical issues, and over time, provides viable solutions. Because federal base funds had established the CES and AES animal health system, land grant universities were able to respond quickly to this emerging threat.

*Source of Funding*

Hatch  
Smith-Lever 3(b) & (c)  
State

*Scope of impact, identifying which of the following apply to the activities conducted*

(4) Integrated Research and Extension

**Goal 4: Improve the Nation's Nutrition and Health.** (Previously Goal 3: A healthy, well-nourished population.)

1862 Research - X

1862 Extension - X

**Program Description:** A healthy, well-nourished population.

**Overview:**

The SDSU Cooperative Extension Service and Agricultural Experiment Station work jointly to foster and support the continued development of a healthy, well-nourished population. This is accomplished by: 1) providing information regarding healthy food choices, budgeting for food purchases, and proper diet; 2) enhancing the nutrition and health benefits, and consumer acceptance of agricultural products; 3) conducting agricultural safety training; and also assisting in adapting farms to operators with disabilities; and 4) conducting health maintenance programs focusing on preventative health care strategies.

The Cooperative Extension Service and Agricultural Experiment Station have achieved a number of results in support of the goals listed above. These include:

Program: Health and Wellness

*Outputs:* SDSU has made substantial contributions to the area of human diet and health. During this reporting period, a major Extension program emphasis was to help senior citizens make informed choices regarding coverage options under Medicare Part D, substantially lowering prescription costs for many older Americans. Each County Extension Office in South Dakota served as an educational resource as seniors evaluated their options and made decisions for future prescription coverage. These efforts are described in greater detail as a Key Theme.

*Outcomes:* With the assistance of Extension-trained volunteers, thousands of South Dakotans were counseled. Senior citizens were able to narrow down prescription plan options and select the one that best matched their needs.

*Impacts:* One-third of South Dakota's population will select prescription coverage under Medicare Part D.

Program: Food Quality

*Outputs:* SDSU has made substantial contributions to the area of human nutrition and health. Extension programs offer educational guidance for diet and exercise. Also, Agricultural Experiment Station scientists work to develop and enhance nutritional food sources. In one example, scientists are working to increase selenium in South Dakota crops, creating grains that are of higher value in parts of the world where human and livestock diets are deficient in this important element. These efforts are described in greater detail as a Key Theme.

*Outcomes:* Foods are being developed that have increased levels of healthful properties, nutrients, minerals, or in some cases elements with medicinal properties. By growing crops in high-selenium soils, scientists have learned that it is possible to elevate selenium levels in crops.

*Impacts:* High-selenium wheat hold the promise of opening new, premium markets for South Dakota specialty wheat. This crop may add an important nutrient to selenium-deficient diets around the world.

Assessment:

The programs of the Cooperative Extension Service and Agricultural Experiment Station have improved the diet and nutrition of many South Dakotans, fostered greater safety among rural residents, enhanced the nutritional value of food, and helped clients cope with disabilities and continue to farm. Additional programs on food selection and choice, insurance and preventative health care have improved the quality of life for many South Dakotans. Extension specialists and educators, and AES scientists have developed multi-state and interdisciplinary relationships that allow them to share new knowledge, and utilize the strengths of each entity for the overall benefit of stakeholders. The following Key Themes offer greater detail regarding the contributions and value of the land grant system in South Dakota.

**GOAL FOUR FUND SUMMARY**

Total Expenditures by Source of Funds

Hatch	180,098
State Match	180,098
FTE	21.46
Smith Lever	310,476
State Match	310,476
FTE	16.46

## Key Themes for Goal Four

**Key Theme: Health and Wellness** “Extension Helps Seniors Make Medicare Part D Decisions”

*Brief description of the activity* – All individuals currently enrolled in Medicare must make a choice regarding their prescription drug coverage by May 15, 2006, or face penalties for enrolling in the Medicare Prescription Drug Program at a later date. Many senior citizens do not have family, additional support systems or resources to assist them in making an informed choice about their options. This can be a highly stressful situation that affects not only health care, but also financial stability.

Each County Extension Office in South Dakota served as a local information and education resource as seniors evaluated their options and made decisions for future prescription coverage. The SDSU Cooperative Extension Service partnered with several state and federal entities, including the Social Security Administration, Center for Medicare services, Medicare Assistance Program, and Senior Health Information and Insurance Education Program, to help disseminate information regarding prescription program options. In addition, Extension trained volunteers to assist in reaching thousands of seniors faced with Medicare prescription program decisions. Extension educators worked one-on-one with clients who needed computer access, helping them narrow down plan options based on prescription drug needs, location of pharmacies, and residence. Extension educators also assist Medicare recipients and their families with computer data entry and web information.

*Short impact statement* – By May 15, 2006, one-third of South Dakota's population will have selected coverage options under Medicare Part D. There are individual stories from across the state that show citizens have been able to save substantial sums of money on prescriptions, simply by investigating options and making informed choices. For example, 12 individuals in one county will save \$21,000 in drug costs annually, and \$2,000 in premiums and deductibles. In another county, four individuals saved a combined total of \$7,200 on annual drug costs.

*Source of Funds*

Smith-Lever 3(b) & (c)  
State

*Scope of impact, identifying which of the following apply to the activities conducted*  
(1) State Specific

**Key Theme: Health and Wellness** “Worksite Wellness”

*Brief description of the activity* – In 1991, 12.8 percent of South Dakotans were obese. By 2001, that number increased to 20.6 percent. Health complications arising from obesity are also increasing. Medical expenses in 1998 associated with obesity-related treatments represented 9.1 percent of total U.S. medical expenditures. Employers have a vested interest in health related programs, due to rising health care costs and other effects that poor health can have on job performance and employee morale.

The South Dakota Cooperative Extension Service created a worksite wellness program for individual employees in the workplace. The program, now in its third year, involves monthly educational presentations on various nutrition and wellness topics provided during the lunch period. The program also involves the opportunity for individuals to schedule a one-on-one session for a nutritional screening and to receive information to assist in making healthy lifestyle changes. The program was piloted in one business, and is now available statewide.

*Short impact statement* – The Workplace Wellness program has impressive results. Eighty-percent of participants wanting to loose weight attained their goal. Six months after completion of the program, 69 percent reported increased fruit and vegetable consumption, and 50 percent reported a decline in sedentary days. In addition, 69 percent of participants decreased their fat consumption, and 92 percent reported an improved understanding of portion size.

*Source of Funds*

Smith-Lever 3(b) & (c)  
State

*Scope of impact, identifying which of the following apply to the activities conducted*

(1) State Specific

**Key Theme: Food Quality/Nutraceuticals** “Selenium Enrichment Adds Value to Wheat”

*Brief description of the activity* – Parts of the world suffer from a deficiency of selenium, creating health problems for humans and livestock. South Dakota has high levels of selenium that occurs naturally in certain soils. In fact, selenium levels are so high, selenium poisoning can be a problem. SDSU chemists earned worldwide acclaim as pioneers in biochemistry and toxicity when they traced livestock poisoning to selenium.

Agricultural Experiment Station research has turned the problem of too much selenium into an economic opportunity. Scientists are examining the effects of different varieties and management practices on selenium content in wheat.



*Short impact statement* - By combining management and targeted wheat varieties, South Dakota producers can "harvest" the selenium from their soil in their wheat crop. Selenium-rich wheat earns premium prices in niche markets. Ultimately, this research will turn fields plagued with selenium toxicity into land that produces premium crops.

*Source of Funds*

Hatch Act

State

*Scope of impact, identifying which of the following apply to the activities conducted*

(1) State Specific

**Goal 5: Protect and Enhance the Nation's Natural Resource Base and Environment.** *(Previously Goal 4: Greater harmony between agriculture and the environment.)*

1862 Research - X

1862 Extension – X

**Program Description:** Greater harmony between agriculture and the environment.

**Overview:**

The SDSU Cooperative Extension Service and Agricultural Experiment Station work jointly to foster and support greater harmony between nature and the environment. This is accomplished by: 1) creating livestock housing and management practices that are environmentally sound, 2) identifying appropriate pesticide uses that preserve natural resources while enhancing agricultural production, 3) monitoring the quality of South Dakota's water; and, 4) assuring that fish, wildlife and agricultural production can co-exist. The Cooperative Extension Service and Agricultural Experiment Station have achieved a number of results in support of the goals listed above. These include:

Program: Environmentally Sound Livestock Management Practices

*Output:* SDSU works closely with state and federal agencies to document and evaluate the impact of livestock production on the environment. South Dakota's 1862 and 1994 land grant institutions offered Extension programs that improved rangeland management skills of landowners and grazing permit holders on federal lands.

*Outcome:* Extension programs helped ranchers and land managers improve their skills in rangeland monitoring and restoration, forage production, and prairie dog control.

*Impact:* Land managers for tribal lands, federal lands and privately owned rangeland have improved management skills.

Program: Interaction Between Agriculture and Natural Resources

*Output:* From private water wells and fields, to parks, streams and lakes, South Dakota's natural resources are vulnerable to pollution and degradation from a host of human activities. Protecting natural resources often means establishing acceptable limits of exposure to chemicals and pollutants. SDSU research established how much phosphorus can be applied through the spreading of manure of fields.

*Outcome:* Phosphorus regulations for concentrated animal feeding operations were established by the South Dakota Department of Environment and Natural Resources as a direct result of research at South Dakota State University.

*Impact:* By understanding how acceptable nutrients may overload the soil and become toxic, society is able to protect natural resources from practices which previously were seen as impact neutral.

Assessment:

The programs of the Cooperative Extension Service and Agricultural Experiment Station have helped agricultural producers be good stewards of the state's natural resources, while at the same time strengthen the potential for agricultural profitability in South Dakota. Livestock waste management programs of the Cooperative Extension Service have helped producers understand the various permits required for livestock production, as well as facility design and location, combined with proper feeding can help minimize the impacts of livestock concentration on the environment. Agricultural Experiment Station scientists have further defined how wildlife and agriculture can co-exist. SDSU Analytical Service Labs help producers determine soil fertility and available plant nutrients, and water quality, leading to greater understanding and management of agricultural chemicals in the environment. Extension specialists and educators, and AES scientists have developed multi-state and interdisciplinary relationships that allow them to share new knowledge, and utilize the strengths of each entity for the overall benefit of stakeholders. The following Key Themes offer greater detail.

GOAL FIVE FUND SUMMARY

Total Expenditures by Source of Funds

Hatch	163,105
State Match	163,105
FTE	31.23
Smith Lever	1,148,762
State Match	1,148,762
FTE	60.89

## Key Themes for Goal Five

### **Key Theme: Environmentally Sound Livestock Management Practices “Rangeland Management to Protect the Environment”**

*Brief description of the activity* – Rangeland resources in western South Dakota are often used according to regulations, use agreements, and/or producers economic goals. These decisions don't always consider environmental factors such as range condition, rainfall, and ecological site. There has been limited use adoption of practices that are both ecologically sustainable and economically viable. This has the potential to degrade the environment and economic future of rangeland areas and communities.

The SDSU Cooperative Extension Service, in cooperation with the Oglala Lakota College Agriculture and Natural Resource Department, a 1994 land grant institution at Pine Ridge, South Dakota, developed a series of educational programs to address range resource management issues and opportunities. These programs were based on the statewide needs assessment process, supported by local focus groups and written surveys. Workshops were offered dealing with forage production, crop production and integrated pest management.

At the annual Farm and Ranch Day, more than 100 producers and federal agency representatives attended training sessions on prairie dog management, rangeland monitoring, GIS/GPS inventory, and related government programs. The Pine Ridge Extension Office organized a Prairie Dog Task Force to examine local control efforts, agency collaboration, and research and funding opportunities.

Additional workshops were offered on rangeland restoration forage production and monitoring. Follow-up visits were made to participating ranches to discuss rangeland condition, grazing systems and sustainable practices. Study plots were established to demonstrate seasonal forage production and range condition changes due to grazing pressure.

*Short impact statement* - These educational programs benefited rangeland that is privately owned, tribal land, and federal land allocated for grazing. Producers updated their management plans and range inventories, and are examining options for changing grazing rotations to improve species diversity. Thirty producers received new or renewed private applicator certificates, and applied the prairie dog control techniques taught in the rangeland management workshops on their own ranch operations. Range management workshop participants also used tools received in the seminar to choose, slip and weigh sample plots to collect forage production data on their own operations. Producers also used the workshop materials to apply for assistance in conducting a rangeland inventory and grazing system for their allocated lands.

*Summary of Funding*  
Smith-Lever 3(b) & (c)  
State

*Scope of impact, identifying which of the following apply to the activities conducted*

(1) State Specific

**Key Theme: Interaction Between Agriculture and Natural Resources “Public Opinions Regarding Biotechnology”**

*Brief description of the activity* – Input from the public remains one of the most valuable ways to determine research priorities in the Agricultural Experiment Station. This information is also shared with the Cooperative Extension Service. That's why the AES Rural Life and Census Data Center conducts surveys of South Dakotans, asking people for their opinions on a variety of issues. Science has made a number of advances that impact food production, but perhaps none raise as many questions as the use of biotechnology.

From 2000 to 2004, SDSU was the lead institution of the Consortium to Address the Social, Ethical and Economics Aspects of Agricultural Biotechnology. The consortium included land grant institutions in South Dakota, North Dakota, Iowa, Minnesota and Wisconsin. Surveys of agricultural producers in these states indicated that transgenic crops were grown based on economic concern and practicality. The survey also reflected the concerns of producers about the marketability of these crops.

A majority of respondents believed that transgenic crops pose no health risk for consumers, but they felt that consumers were not adequately informed about genetically modified crops. Half of the respondents also believed that farmers were not adequately informed about domestic and export market risks of transgenic crops.

*Short impact statement* - Survey results are used by public and community decision makers to identify core issues and make public policy decisions.

*Source of Funding*

Hatch Act

State

*Scope of impact, identifying which of the following apply to the activities conducted*

(1) State Specific

**Key Theme: Interaction Between Agriculture and Natural Resources “Research Guides Phosphorus Regulations”**

*Brief description of the activity* – Though not a threat to human health, phosphorus can cause algae blooms in lakes and ponds, depleting oxygen to the extent that fish kills can result. Agronomic practices in South Dakota have led to an increase in soil test phosphorus (STP) over the past 40 years. From 1985 to 2000, the average STP level from manured fields doubled, with the average being higher than needed for optimal crop growth.

SDSU scientists studied the relationship between soil test phosphorus and phosphorus loss in surface runoff.

*Short impact statement* - Phosphorus regulations for concentrated animal feeding operations were established by the South Dakota Department of Environment and Natural Resources as a direct result of research at South Dakota State University. The regulations allow for absolutely no further spreading of manure on soils once the level of soil-test phosphorus reaches a level of 100 parts per million. At that level, Vienna soil is 25 percent saturated with phosphorus. Previous research indicated that 25 percent phosphorus saturation is an environmentally critical level for sensitive water sources.

*Source of Funding*  
Hatch Act  
State

*Scope of impact, identifying which of the following apply to the activities conducted*  
(1) State Specific

## **Stakeholder Input Process**

### **A. Actions taken to seek stakeholder input that encourages their participation.**

A key component of the FY 2000-2004 Plan of Work, extended through 2005-06, called for the South Dakota State University College of Agriculture and Biological Sciences to solicit formal stakeholder input in many forms, from many sources, and at many locations. Methods of inviting stakeholder input included meetings or other communication with: Agricultural Experiment Station Research Farm Advisory Boards; Research Review Meetings with agricultural check-off groups including the South Dakota Soybean Research and Promotion Council, South Dakota Corn Utilization Council, South Dakota Beef Industry Council, South Dakota Oilseeds Council, South Dakota Pork Producers Council, South Dakota Wheat Commission, and others.

Input was also sought out from state agricultural commodity groups including Ag Unity, the South Dakota Pork Alliance, the South Dakota Stockgrowers/Cattlemen, and the South Dakota Veterinary Medical Association; and from meetings with organizations that fund research such as the National Institutes of Health, U.S. Department of Energy, National Science Foundation, NASA, Environmental Protection Agency, and the National Centers for Disease Control and Prevention. In addition, stakeholder input was solicited from governmental agencies, including: the Office of the Governor, the South Dakota Department of Agriculture, South Dakota Department of Environment and Natural Resources, South Dakota Game, Fish and Parks, South Dakota Department of Education and Cultural Affairs, Office of the State Veterinarian, Social Services, Job Service, National Agricultural Statistics Service, 1994 Institutions, and others.

In addition, stakeholder input was sought at SDSU field day tours; SDSU agricultural meetings; Community Leader Meetings throughout the state; meetings with the South Dakota Board of Regents, South Dakota Legislature, and other elected officials and boards; and events open to the public such as the South Dakota State Fair and DakotaFest. Additional input was solicited during comprehensive CSREES Departmental and Institutional Reviews, which span teaching, research and Extension activities.

**Stakeholder input specifically for projects involving McIntire-Stennis funds** was sought from the South Dakota Nurseryman's Association, the South Dakota Parks and Recreation Association, the U.S. Forest Service, and also from special project-oriented groups like the Mortensen Group. This group works specifically on the Mortensen Ranch project, and includes NRCS, local RC&D groups, and other local entities.

County Extension Advisory Boards are required by South Dakota law, and provide citizen input, guidance, and direction for county programming that target priority needs and issues, and are appointed by County Commissioners. Membership on this board is required by state statute to represent the racial population mix of the county and of the various interest groups served by Extension.

The State Extension Advisory Board provides guidance and direction to the Cooperative Extension Service, and informally to the Agricultural Experiment Station. Members of this board are elected from each County Extension Advisory Board, and the 1994 land grant institutions.

On-going Stakeholder Input is often sought during special planning meetings. For example, the Sun Grant Initiative planning meetings in August 2002 and November 2004 sought valuable feedback from groups representing energy development, community development, regional land grant scientists and Extension leaders, and other issue-oriented stakeholders.

#### B. Process used to identify individuals and groups who are stakeholders and to collect input.

While the existing channels of stakeholder input remained constant, South Dakota State University's College of Agriculture and Biological Sciences has expanded its stakeholder input procedure for this planning and reporting period, enhancing the opportunities for South Dakotans to offer suggestions and requests for research and educational programs. The expanded stakeholder input process relied heavily on the five year Cooperative Extension Service assessment planning data.

The revised system allowed stakeholder input to be directed across the broad scope of the College of Agriculture and Biological Sciences and to activities supported by Smith Lever, Hatch, McIntire-Stennis, and other funds. Stakeholder input was not directed exclusively to the Cooperative Extension Service or Agricultural Experiment Station. The multidisciplinary input system used a variety of techniques that included: direct input, brainstorming, surveys and questionnaires, nominal group technique and other appropriate methods.

An important change during this planning period was the establishment of 13 Field Education Units representing all parts of South Dakota. Each unit is comprised of 1 to 9 counties. A 14<sup>th</sup> on-campus stakeholders' input session was dedicated to soliciting input from SDSU students, faculty and other Regental constituents. Stakeholders from each Field Education Unit across the entire state were identified, with care given to include any group or audience that may be or previously have been underrepresented or underserved. An invitation was issued inviting representatives from each of the identified stakeholder groups to participate in the program review and development planning session. A series of general news releases was issued inviting all citizens to participate in the process, even though they may not have been directly contacted.

The missions of County Extension Advisory Boards and State Extension Advisory Board continued, and three new advisory boards were created, including:

*Field Education Unit Advisory Boards* – these provide guidance and direction for multi-county educational programs, and are elected to represent County Extension Advisory Boards.

*State-Wide, Long Range Planning Board* – the Extension Vision initially called for this board to solicit and coordinate input from multiple, statewide constituencies to ensure that state priorities and goals are being addressed through the Cooperative Extension Service. Members are appointed by the President of South Dakota State University. Former South Dakota Cooperative Extension Service administration determined that this board duplicated the function of the State Extension Advisory Board. At the recommendation of the president of South Dakota State University, this portion of the Extension Vision was not implemented.

*Campus Resource Council* – this board identifies SDSU resources available to the Cooperative Extension Service, coordinates program delivery and provides efficient access to educational expertise and opportunities. Members are appointed jointly by the SDSU Vice President of Academic Affairs, Director of the Cooperative Extension Service, and Dean of the College of Agriculture and Biological Sciences. It includes representatives from SDSU academic colleges and other campus units.

#### C. How collected input was considered.

Administrators evaluated all requests and comments from stakeholders to determine if clear patterns of needs exist, and if resources can be directed to the client requests. CES educators, specialists, and AES scientists actively sought out input to insure that research and education programs are fine-tuned to the current needs of stakeholders.

### **Program Review Process**

There have been no significant changes to the program review process, as described in the current Integrated Five-Year Plan of Work, extended to include 2005-06, for South Dakota.

### **Evaluation of the Success of Multi and Joint Activities**

During the planning period covered by this report, the SDSU Cooperative Extension Service, working closely with the South Dakota Agricultural Experiment Station, changed its program planning methodology for all five goal areas to enhance South Dakota State University's focus on stakeholder input. This change is outlined in great detail in the Stakeholder Input section of the Plan of Work.



During Spring 2000, Needs Assessment Meetings were held in each of the 13 South Dakota Field Education Units. These meetings facilitated stakeholder input from all audiences, including those which may have been previously underserved. The result of the meetings were a series of recommendations for key programs for each of the five goal areas. These recommendations were reported by individual Field Education Unit, but in many cases, the programs requested were in statewide demand.

Based on stakeholder input, programs were developed to fulfill the “multi-philosophy.” Many of the programs included of the following components: multi-state, multi-discipline, multi-functional, or multi-institutional approaches. To the greatest extent possible, specific programming relationships with the 1994 Institutions in South Dakota were either strengthened, or initiated if none existed in the requested programming areas. The “multi-philosophy” enhanced the efficiency of program delivery. It also enhanced client access to new ideas and concepts.

Funds were targeted to programs that included a “multi” component and addresses specific outcomes and impacts, as requested by stakeholders during the Needs Assessment Meetings and from outer sources of input.

Ultimately, these programs did address the critical issues of strategic importance, as identified by the stakeholders, including those which may have been underserved or underrepresented.

### **Multistate Extension Activities**

<u>Title of Planned Program/Activity</u>	<u>Actual Expenditures for FY 2005</u>
Goal 1	127,444
Goal 2	54,619
Goal 3	59,171
Goal 4	45,516
Goal 5	168,408

### **Summary of Multi-State Extension Activities**

The South Dakota Cooperative Extension Service works closely with other states to provide educational programs. Examples of programs include: Coordinated innovative education on Soybean Cyst Nematode in the North Central Region, Coordinated Resource Management, the Midwest Plan Service, Integrated control of white mold of soybeans in the North Central States, Soil and Plant Analysis Methods and Interpretation for Nutrition Management, National Fusarium head blight initiative – chemical and biological control, Pork Industry Handbook, the Range Beef Cow Symposium, Bootstraps, the National AgrAbility Project, and the Sun Grant Initiative.

Additional programs include: The Dairy Forage Conference, the South Dakota Dairy Association and Dairy Fieldmen’s Convention, 10-state FNP Marketing Committee, Tri-State Child Care Providers Conference, North Central Cheese Industry Association, Water Quality Resource Strategy and Coordination, Dakota Ram Performance Test, AKSARBEN Youth Livestock Show, the Tri-State 4-H Leader’s Forum, Purple Loosestrife Management Committee, and the Four Plains States Conferencing Program Evaluation.

Other programs include: the Pipestone Lamb and Wool Program, Tri-State Fertilizer Work Group, Agvise Soil Testing Advisory Board, European Corn Borer Moth Flight Tracking Project, Area Drainage Conference, Canola Regional Variety Trials, Flax Regional Variety Trials, and the Ag Engineering & Industry Training Symposiums.

In addition, there are many informal cooperative programs with other states that help extend educational information to stakeholders. These programs exist on the county and state level.

## **Integrated Research and Extension Activities**

### **Integrated Activities (Hatch Act Funds)**

<u>Title of Planned Program/Activity</u>	<u>Actual Expenditures for FY 2005</u>
Goal 1	527,677
Goal 2	0
Goal 3	7,219
Goal 4	13,780
Goal 5	31,292

### **Integrated Activities (Smith Lever Act Funds)**

<u>Title of Planned Program/Activity</u>	<u>Actual Expenditures for FY 2005</u>
Goal 1	217,333
Goal 2	93,143
Goal 3	100,905
Goal 4	77,619
Goal 5	287,190

### **Summary of Integrated Activities**

The Cooperative Extension Service and Agricultural Experiment Station at South Dakota State University’s College of Agriculture and Biological Sciences collaborate to develop new knowledge, and distribute it to the people of South Dakota, the region and the nation. SDSU follows the traditional land grant model in that the AES is primarily responsible for the development of new knowledge; CES is primarily responsible for dissemination and application of the knowledge, and Academic Programs are primarily responsible for undergraduate and graduate education. These three entities have specific missions, yet coordinate efforts to maximize resources and address stakeholder needs. Whereas AES and CES efforts are integrated, one entity often takes the lead role.

In Goal One, the Agricultural Experiment Station crop programs in Breeding, Genetics, and Molecular Biology; as well as Plant Physiology and Nutrition; and Alternative Crop Enterprises, provide information and research linkages to Cooperative Extension Service programs in Crop Management, Disease Control and Pest Management; as well as Integrated Management of Livestock, Crop and Conservation Systems. Similarly in livestock, AES programs in Breeding, Genetics and Molecular Genetics; and Forage/Range Management provide information and research linkages to CES programs in Livestock Management, Alternative Livestock Enterprises, and Food Safety and Structures.

In Goal Two, AES programs in Renewable Energy; Human Stress; Population and Human Health; Marketing and Decision Making Data; and Seed Marketability and Control provide information and research linkages to CES programs in Community Planning and Economic Development; Human Resource Development; Leadership Development; Youth Development and 4-H; Resource Management; Strengthening Family Relationship and Roles; and, Communication Systems and Technology.

In Goal Three, AES programs in Pesticide Use Standards; Transgenic Food Safety; Food Quality and Ag Product Marketing Systems provide information and research linkages to CES programs in Food Safety, Preservation and Training; and, Pesticide and Livestock Waste Management.

In Goal Four, AES programs in Nutrition and Food Science; Food Product Development; and, Consumer Research, provide information and research linkages to CES programs in Diet and Nutrition; EFNEP and FNP; Consumerism and Human Health.

In Goal Five, AES programs in Environmental Impact of Chemical/Fertilizer Management; Water Movement; Wildlife and Fisheries Management; Wetland, Forest, Prairie and Riparian Research; and Analytical Services testing of soils, water and plants provide information and research linkages to CES programs in Precision Farming; Pesticide and Fertilizer Use and Management; Livestock Waste; and Water Quality.

In addition, the Stakeholder Input process solicits information for the Cooperative Extension Service and Agricultural Experiment Station. These two agencies truly provide integrated services to South Dakotans.