**PLAN OF WORK**

# Annual Report

***SOUTH DAKOTA STATE UNIVERSITY***
***Federal Fiscal Year 2004***
***October 1, 2003 - September 30, 2004***

## 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$^{th}$ in the nation, with 764,309 people (2003 Census Estimate). More than one-third of the population can be found in the ten largest counties, which represent the most active growth in population, income and economic development. Minnehaha County alone has 20 percent of the state's population. The remaining 56 counties have substantially lower levels of population growth, if any, 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, but in 1999, the figure was reduced to 9.3 percent. The U.S. Department of Agriculture's Economic Research Service reports that in 2002, the average annual income in South Dakota was $26,967. Statewide unemployment is consistently at or below three percent. 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 reservations for Native Americans. The Native American population represents 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. Sixty-eight percent of all farms earn less than $100,000 per year, while 20% earn between $100,000 and $249,999 each year. Eight percent earned $250,000 to $499,999, and four 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 19th Century. Numerous types of stress continues 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. To solidify this concept, the Northern Plains Biostress Laboratory was dedicated in 1993. 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 are also located at the SDSU West River Ag Center at Rapid City. The West River Center serves as the primary host for AES programs west of the Missouri River. Project leaders are also located at the Dakota Lakes Research Farm near Pierre (central SD) and at the Southeast South Dakota Research Farm near Beresford. These two 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.

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 48,000 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 all 64 organized South Dakota Counties. An individual Memorandum of Agreement with each of the 64 counties 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 2004, 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 2004 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. This gives 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. During this reporting period, one area of emphasis in South Dakota was rangeland management and grazing. Scientists worked to understand the factors that predict rangeland production, and Extension staff worked to transfer this information to livestock owners and grazing managers. These efforts are described in greater detail as a Key Theme.

*Outcome:* The Cooperative Extension Service, working closely with the scientists of the Agricultural Experiment Station, equipped landowners with principles of grazing management that are environmentally positive and economically attractive. Ranchers and land managers learned how to use prediction models to estimate pasture production. This is especially critical during years of drought, leading to reduced forage production.

*Impact*: Concepts of grassland resource management have been taught to owners and operators that manage more than 200,000 acres, and more then 20,000 head of livestock. Producers now understand the impact of stocking rates, and can project net returns, leading to decisions that strengthen the profitability of the beef enterprise. Improved stewardship of the grassland resource benefits more than just the landowner and livestock producer. It also is a benefit to wildlife, and helps support and sustain the local ecosystem.

Program: Crop Systems

*Output:* SDSU and the land grant system offers 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 is a national leader in the development of no-till and precision farming systems, and has contributed significantly to the growing body of knowledge for these systems. In addition, SDSU continues to develop 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 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. SDSU scientists led national efforts to create a soybean that is resistant to Bean Pod Mottle Virus. Scientists also developed a Hard White Winter Wheat variety that is high in protein.

*Impact:* 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. The new Hard White Winter Wheat variety holds the promise of healthier bread and Asian noodles, and is gaining attention of flour buyers in Asia, Africa and the Middle East.

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. During this reporting period, SDSU also brought together land grant experts to provide science-based answers to livestock development questions. In many communities, emotions were running high as livestock producers attempted to expand their operations. SDSU provided information that addressed public issues involving agricultural growth, urban expansion, and rural community development. These efforts are described in greater detail as a Key Theme.

*Outcome:* SDSU is a trusted source of information for all aspects of livestock production. When city, county and state governmental entities were faced with growing questions about livestock production, SDSU provided science-based information to give decision makers an effective way to evaluation community opportunities.

*Impact:* Expanding livestock industries affect communities. SDSU has played an important role by providing reliable, science-based information on topics related to animal agriculture. The information helps inform the public, but also helps producers who want to build or expand livestock enterprises to do it in a way that causes as little concern as possible to their neighbors.

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 | 1,587,145 |
| State Match | 2,268,427 |
| FTE | 177.3 |
| | |
| Smith Lever | 838,285 |
| State Match | 838,285 |
| FTE | 49.41 |

## Key Themes for Goal One

**Key Theme: Management Systems** "Predicting Rangeland Production"

*Brief description of the activity* - Range pastures are often one of the first resources impacted by drought. As pastures dry up, cattle are reduced, and local economies feels the pressure. Now, scientists have developed an easy to use method to predict the growth of plants in range pastures, giving beef producers another tool to manage stocking rates and extend the forage production capacity of rangeland.

Relying on more than 50 years of data from the nation's very first range research station at Cottonwood, South Dakota, scientists evaluated the long-term grazing effects of forage production, animal performance and economic return. In the wake of the 2002 drought, they searched for clues that could help beef producers make management decisions. What they found came down to two variables: moisture and temperature.

When nighttime temperatures drop below 30 degrees Fahrenheit in the middle of May, plants have to respond to deal with the cold weather, causing them to deplete energy that will not be available for growth. Precipitation alone does not correlate directly to forage production on pastures in good to excellent condition, because such pastures have a greater mix of grasses and a more complex ecosystem.

The study re-enforced the concept that lightly grazed pastures can best respond to drought. But, it went a step further and provided an easy to use system for producers to use their thermometer and rain gauge to predict pasture forage production, and adjust stocking rates accordingly.

*Short impact statement* - The study develops information on average daily gain, gain per acre, and net return per acre. With that, producers will be able to understand, given a certain stocking rate, what are the net returns, and make decisions that strengthen the profitability of their beef enterprise.

*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: Management Systems** "South Dakota Grazing School"
*Brief description of the activity* – The biggest problem faced by South Dakota's vast grasslands is that of overuse and overgrazing. Livestock owners, often trying to stretch limited pastures under drought conditions, often allow cattle to graze for longer periods of time. In other cases, more livestock may be allowed to graze than is recommended for the amount and condition of available forage. The South Dakota State University Cooperative Extension Service, collaborating with the South Dakota Grasslands Coalition and National Resource Conservation Service/Resource Conservation and Development, initiated the South Dakota Grazing School. Participants spend much of their class time in the pasture, applying what they have learned. The programs vision is to equip landowners with principles of grazing management that are environmentally positive and economically attractive.

*Short impact statement* - Concepts of grassland resource management have been taught to owners and operators that manage more than 200,000 acres, and more then 20,000 head of livestock. Improved stewardship of the grassland resource benefits more than just the landowner and livestock producer. It also is a benefit to wildlife, and helps support and sustain the local ecosystem. The South Dakota Grazing School has provided the focus for continually improving collaboration among SDSU, the South Dakota Grasslands Coalition, NRCS/RC&D,s and several wildlife organizations. As a direct result of this training program, a Range Management Outreach Coordinator was hired. Commitments from cooperating organizations include more than $20,000 annually for support of this position.

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*Source of Funding*
Smith-Lever
State – State Funds
Other – Cooperating organizations, SD Grasslands Coalition, National Resource Conservation Service/Resource Conservation and Development

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

**Key Theme: Crop Systems** "Hard White Winter Wheat Opens New Markets"
*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 addressed in processing, but requires 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 – State Funds
Commodity

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

**Key Theme: Crop Systems** "Land Grant System Helps Sunflower Growers"
*Brief description of the activity* – South Dakota is the second largest producer of sunflowers in the nation. The plant is well suited for the Northern Plains climate, fits a typical crop rotation, and is drought tolerant. Sunflower is a major commodity in central South Dakota. Sully County, for example, grows more sunflowers than any other county in the nation. Yet this plant has a host of pests which threaten production each year. The land grant system of teaching, research and extension has helped address sunflower production issues ranging from pest control to genetics.

Just as sunflower production can best be described in terms of cropping systems, the support offered by South Dakota's land grant university also is best described as a system. Agricultural Experiment Station (AES) scientists like SDSU Oilseed Breeder Kathy Grady uses traits such as yield, standability and oil quality to develop new sunflower varieties. Producers grow hybrids, so Grady develops germplasm which is made available to seed companies as "parents" for the hybrids. Oil concentration and composition are emerging issues in sunflower breeding. New varieties of sunflower with a higher proportion of oleic, monounsaturated fatty acids and a lower proportion of polyunsaturated fatty acids are being developed. This creates an oil that is healthier for human consumption. Grady's research also focuses on developing lines with disease or

insect resistance. Grady also conducts annual yield trials, which are available to the public in reports published by the South Dakota Cooperative Extension Service.

Cooperative Extension Service (CES) specialists and educators are often the first contact when sunflower growers have questions, or face a particularly difficult weed, insect or disease. Extension Entomologist says one of the newest threats is pale-stripped flea beetle. It has not been a problem in South Dakota until 2004. Now, if the beetles attack early when seedlings are just sprouting, they can kill the entire crop. Extension Plant Pathologist Marty Draper says other emerging threat is Sclerotinia Head Rot. In addition to being infected through airborne spores, sunflower plants can pick up Sclerotinia through the roots. It occurs infrequently and is unpredictable. In the late 1990s, Sclerotinia caused nearly 90 percent crop loss in some counties. And of course, there are weeds. Because sunflower is a broadleaf, there is little opportunity to use post-emergence broadleaf weed control products. SDSU Extension Weed Specialist Leon Wrage says kochia, foxtail and redroot pigweed are major weeds in the sunflower field. Wrage says it is not uncommon to see yield reductions of 500 pounds per acre because of weeds. "In dry years, some fields have to be abandoned," he said. Extension works with producers to control crop threats and help assure a profitable crop. At South Dakota State University, as at many other land grants, AES scientists and CES specialists also work closely with classroom-based faculty.

*Short impact statement* – Sunflower producers believe that the coordinated work done by South Dakota Agricultural Experiment Station scientists and the South Dakota Cooperative Extension Service is very useful to growers. "They are one of the first sources I and other producers turn to," said Sully County farmer Tom Young. "If there is something out here we don't understand, we usually contact our local county educator or one of the Extension specialists. They might not have all the answers immediately, but they have come up with some good suggestions. They have a good base of knowledge, and that's what we need."

*Source of Funding*
Hatch Act
Smith-Lever 3(b) & (c)
Commodity – SD Oilseeds Council, National Sunflower Association
State
Other – Sclerotinia Initiative, funded by USDA-ARS

*Scope of impact, identifying which of the following apply to the activities conducted*
(1) State Specific
(4) Integrated Research and Extension

**Key Theme: Crop Systems** "Bean Pod Mottle Virus"
*Brief description of the activity* - Until five years ago, viruses in Midwest soybean fields did not occur. Today, South Dakota soybean producers must deal with bean pod mottle virus, a new disease that can cause loses of up to 50 percent. Just a few hundred miles away, Iowa soybean producers now face as many as four new viruses. The common

vector is the bean leaf beetle. Land grant scientists across the Midwest, including those at South Dakota State University, are working to develop new varieties that incorporate resistance or tolerance to bean pod mottle before the disease becomes widespread. SDSU Soybean Breeder Roy Scott chaired a national study group of soybean breeders. Six other universities are searching for resistance or tolerance to the virus, not only in soybeans but also in wild plant species. From Wisconsin, to Iowa, to Nebraska, scientists have not yet found soybean lines with resistance, but some are finding levels of tolerance. "Tolerance" to plant breeders means the ability of a plant to produce yields despite pressure from the disease.

*Short impact statement* - The long term solution is to have soybean plants that are resistant to bean pod mottle virus. Working together, land grant scientists are pursuing answers that will assure the long-term profitability of soybean production.

*Source of Funds*
Hatch Act
Commodity – SD Soybean Research and Promotion Council, the North Central Regional Soybean Program, the SD Crop Improvement Association
State

*Scope of impact, identifying which of the following apply to the activities conducted*
(4) Integrated Research and Extension

**Key Theme: Livestock Systems** "Early Weaning Means More Profit"
*Brief description of the activity* – The traditional way of raising beef calves involves weaning in November. Under this system, cows are still providing milk as weather becomes colder. They eat more to produce milk and fight the cold. The result is that these cows often loose body condition, which may effect rebreeding in the summer. Animal scientists in the Four-State Ruminant Consortium studied the effects of weaning dates and retained ownership in adding value to cow/calf production systems. The consortium includes South Dakota State University, the University of Wyoming, North Dakota State University, and Montana State University. A study was conducted to evaluate beef cattle production systems that have the potential to return more to ranchers in the four-state region, as well as local feeding operations, and those producing and marketing local feed resources. The project compared early versus normal weaning and retained ownership systems to determine economic return to capital across weaning dates and retained ownership systems, forage utilization in late summer and fall, cow weight and body condition score changes in late summer and fall, and calf performance and health.

*Short impact statement* - Weaning calves in August rather than November provides several economic and animal health benefits. Early-weaned calves fared better and experienced less weaning stress. They had a higher average daily gain during backgrounding than normal weaned calves, and also converted feed to gain more efficiently during the backgrounding

period. As for the cows, early weaning helped them maintain, if not gain, body condition scoring during the fall.

*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*
(3) Multistate Extension
(4) Integrated Research and Extension

**Key Theme: Livestock Systems** "Livestock Development in South Dakota"
*Brief description of the activity* - South Dakota State University marshaled a broad range of resources from the Agricultural Experiment Station and Cooperative Extension Service to provide science-based answers to questions regarding rural agricultural growth and development. This took the form of a printed publication titled Livestock Development in South Dakota. The publication answered questions frequently asked by the public about issues and needs affecting agricultural growth, urban expansion, and rural community development in this state. The publication addressed the comparative advantages of agriculture in South Dakota, farm size, CAFOs, employment, and impact on local communities. It also addressed environment and health, regulations and permitting, nutrient management, water quality and pollution from dust, odor and gasses. The publication summarized odor reducing technologies, setbacks, and issues involving pests, such as flies, birds and rodents.

*Short impact statement* - Expanding livestock industries affects communities. SDSU has played an important role by providing reliable, science-based information on topics related to animal agriculture. The information helps inform the public, but also helps producers who want to build or expand livestock enterprises to do it in a way that causes as little concern as possible to their neighbors.

SDSU economist Evert Van Der Sluis said, "It's a public policy debate that we have to try to help resolve by including science-based facts. …This is not just an agricultural issue. It has to do with property rights. These are very important issues that we as a society must make decisions about, not just for our generation but for future generations. Probably we must strike a balance between some extremes."

*Source of Funds*
Hatch Act
Smith-Lever 3(b) & (c)
State

*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 qualify 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) mobilizing 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, 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. One area of particular interest is value added product development. SDSU is leading efforts to use an ethanol by-product as an ingredient in pet food. In addition, SDSU works with communities to develop and train leaders who can initiate and sustain economic development. 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:* Sustainability in rural communities lies within the individual members of each community. SDSU Extension implemented a community leader training program that builds partnerships, strengthen communities, and achieve successful community change. In addition, SDSU has established the scientific foundation for using DDG, a by-product

of the ethanol industry, in pet food. This opens substantial market opportunities because the United States ranks first in the world in pet ownership.

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 minority populations by providing educational information in Spanish. These efforts are described in greater detail as a Key Theme.

*Outcomes:* While less than one percent of the farms in South Dakota are owned by persons of Hispanic heritage, the state is experience a growing number of Hispanic agricultural workers. South Dakota State University now produces diary and other publications in English and Spanish, meeting the growing information demands of Hispanic farm workers.

*Impacts:* SDSU's Spanish-language publications are consistently the most requested on the Cooperative Extension Service web site, and are downloaded more often than any other publications. Extension has issued West Nile publications in Spanish. South Dakota was the third hardest-hit state, and the Spanish language publications reflected Extension's commitment to providing critical education to the entire population.

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:* Youth play sports to have fun, but too often parents and coaches want them to win at all costs. 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, 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 | 216,880 |
| State Match | 43,350 |
| FTE | 17.1 |
| | |
| Smith Lever | 403,619 |
| State Match | 403,619 |
| FTE | 23.79 |

## Key Themes for Goal Two

**Key Theme: Economic Development** "Pet Food Can Add Value to Corn"
*Brief description of the activity* - Each bushel of corn used for ethanol produces 17 pounds of dried distillers grains (DDG). The logical use for DDG is to feed it to animals as a high protein feed. DDG is currently being used in cattle feedlots and dairy operations, and already is adding value to corn and ethanol. A new market is now on the horizon for DDG, the pet food industry. The United States ranks first in the world in pet ownership, with 77 million cats and 61 million dogs. Supermarket and drug store scanner data suggest that the largest rate of growth in dog and cat food is in the Plains states of South Dakota, North Dakota, Nebraska, Kansas, Missouri, Iowa and Minnesota. This is the same region that produces ethanol and DDG. South Dakota State University scientists examined DDG as a protein source for pet food. Working in a laboratory environment, DDG was used to produce a variety of puffed dog food products with DDG content ranging from five to 50 percent. The 20 to 30 percent range was found to be

ideal. Anything beyond 30% negatively impacts the ability to produce a well-formed product.

*Short impact statement* - DDG research provides the pet food industry with a new source of protein, and a new value-added opportunity for corn growers.

*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** "Community Leadership Development"
*Brief description of the activity* – Sustainability in rural South Dakota lies within the individual members of each community. Pride and persistence are common traits that have been the basis of survival. But many rural communities now struggle to maintain fundamental services at an economically feasible cost. Economic development is necessary for rural growth, but progress is short-lived without local leaders who can initiate and sustain the progress. Community members who possess good leadership skills are the foundation for sustained rural communities. The South Dakota State University Cooperative Extension Service created a community leadership development program, designed to train people to become leaders and work to sustain their communities. The program consists of nine learning modules which include: identifying leaders within, identifying community assets, managing groups for results, making meetings work better, managing conflict, building strategic partnerships, moving from talk to action, valuing evaluation, and communicating for change. The program includes a practicum on facing the challenges of racism and race relations. Participants also learn how to construct a community plan for the future, relying on strategic planning.

*Short impact statement* - Participants in the Community Leadership Development Program have learned how to improve communication, be effective leaders and team members, manage conflict, build partnerships to strengthen communities, and achieve successful community change.

*Source of Funding*
Smith-Lever 3(b) & (c)
State
Other – Northwest Area Foundation, Pew Foundation

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

**Key Theme: Quality of Life** "Extension Meets Spanish Language Needs"
*Brief description of the activity* - While less than one percent of the farms in South Dakota are owned by persons of Hispanic heritage, the state is experience a growing number of Hispanic agricultural workers. "Many Hispanics come to South Dakota to work for large agricultural enterprises such as livestock or dairy operations, says Jerry Warmann, director of the South Dakota State University Cooperative Extension Service.

SDSU now provides Extension dairy information in both English and Spanish. Extension's first Spanish-language offerings include a series of dairy publications written by SDSU Extension Dairy Specialist Alvaro Garcia. A native of Uruguay, Garcia is bilingual in English and Spanish. "There is clearly a need for information in Spanish within the dairy industry," Garcia says. "I regularly get calls from Spanish-speaking individuals requesting information.

In addition, Extension has issued West Nile publications in Spanish. South Dakota was the third hardest-hit state, and the Spanish language publications reflected Extension's commitment to providing critical education to the entire population.

*Short impact statement* - SDSU's Spanish-language publications are consistently the most requested on the Cooperative Extension Service web site. "They are downloaded more often than any other publications. By offering publications in both English and Spanish, we in Extension are responding to the information needs of a new audience," Garcia said.

"Providing information in Spanish benefits the workers and their families directly, and it also benefits their employers and the communities," said CES Director Warmann.
*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** "Putting Fun Back Into the Game"
*Brief description of the activity* – Some 43 million children in the United States play organized sports. They play to have fun, spend time with friends and learn new skills. But too often their parents and coaches want them to win, sometimes at all costs. As a result, up to 70 percent of children in organized sports quit before the age of 12.

"They quit because they stopped having fun and they felt too much pressure. That's too bad, because sports provide an excellent environment for positive character development," according to Dr. Ann Michelle Daniels, SDSU Extension Family Life, Parenting and Child Care Specialist.

South Dakota State University, in cooperation with Pennsylvania State University, developed a program called "Putting Youth Back Into Sports." It is a training curriculum that seeks to teach parents and coaches how to put the fun back in youth sports.

"Putting Youth Back Into Sports" teaches the tools to support that effort – practical suggestions based on current research in child development and youth sports issues. It contains science-based information about a range of issues including youth development, moral development, achievement motivation, and conflict resolution. The program addresses all aspects of youth sports, including youth-parent, coach-parent, and coach-youth relationships. It also discusses how community organizations, including the news media and local businesses can influence youth sports.

*Short impact statement* - "The program teaches coaches how to let the kids have fun and have an enjoyable experience while they're learning the skills," said Jason Parker, president of the Brookings, South Dakota Soccer Association.

"Sports allow children to learn about things like fair play, commitment, teamwork, perseverance, and sportsmanship. The Putting Youth Back Into Sports program is a valuable tool to encourage parents, coaches and community organizations to foster those learning experiences in children," said Adam Vinatieri, kicker for the three-time Super Bowl Champion New England Patriots.

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

*Scope of impact, identifying which of the following apply to the activities conducted*
(3) Multistate Extension

**Key Theme: Youth and Family Development** "We Are All Relatives – A Character Counts! Program"
*Brief description of the activity* – The Character Counts! Program works to fortify America's young people with consensus ethical values called the Six Pillars of Character, including trustworthiness, respect, responsibility, fairness, caring and citizenship. South Dakota has a large Native American population, which also has strong traditions and emphasis on character traits of wisdom, bravery, generosity and fortitude.

The SDSU Cooperative Extension Service created "We Are All Relatives," as a companion program to Character Counts! It connects the American Indian culture to the Six Pillars of Character. Exposing young people to the Native American heritage of our state and nation helps them understand the differences and similarities between cultures that are very much alive today. Audiences included teaching staff, prevention counselors, and teens. Educators order sample lessons from the grade level of their choosing. Sample lessons include: Grade K-1 Why Bees Can Sting (Fairness/Wisdom), Grade 2-3 All My Relatives (Citizenship/Wisdom), Grade 4-5 Giveaway

(Caring/Generosity), Grade 6-8 Success with Honor (Trustworthiness/Fortitude), and Grade 9-12 White Buffalo Calf Woman (Citizenship/Generosity).

*Short impact statement* - Evaluations have documented a true need to get to know more about each other's cultures. More than 300 school staff at locations across the state have completed the 1-day training in "We Are All Relatives." Youth and adults now not only learn the six pillars of character, but also gain a greater appreciation for cultural diversity and value.

*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 contaminates; 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. SDSU also has studied current handling methods for biotech crops in an effort to determine whether infrastructure exists to segregate these crops. These efforts are described in greater detail as a Key Theme.

*Outcomes:* Soybean Cyst Nematode (SCN) is the most damaging pest of soybean in the United States. Nationally, annual losses can top $1 billion. In South Dakota, 32% of the soil samples analyzed tested positive for SCN. To deal with this pest, SDSU scientists have developed soybean production systems based on crop rotations and new SCN-resistant varieties.

*Impacts*: Soybean producers now have proven methods to reduce SCN populations and maintain profitable soybean yields. The new SCN-resistant varieties had yield increases ranging from 25 to 48% over the standard varieties.

Program: Food Safety

*Outputs:* SDSU works to improve food safety and provide science-based information to assure consumers of the safety of their food. This is accomplished through numerous projects. For example, the SDSU Animal Disease Research and Diagnostic Laboratory offers a rapid test for Chronic Wasting Disease. This test allows hunters to quickly determine if the animal they harvested has the disease. SDSU also played a leadership role during the discovery of BSE in the United States, by interpreting and transferring science based information to consumers who are the general public. These efforts are described in greater detail as a Key Theme.

*Outcomes:* As BSE dominated headlines across the nation, SDSU Extension responded with the immediate production of two 30 minute television programs to answer questions about the disease, food issues and the impact on consumers, human health issues, and the overall impact on American agriculture.

*Impacts:* The Today's Ag program was broadcast nationally on RFD-TV, which is carried on DirecTV and Dish Network. RFD-TV has 30 million subscribers. One month after the first case of BSE was confirmed in the United States, demand for beef remained high, and actually rose. Wholesalers bought the third-largest amount of beef in a one week period in mid-January since 1990. This was a solid indicator that American consumers evaluated information about Mad Cow Disease and chose to continue eating beef.

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 | 215,486 |
| State Match | 37,153 |
| FTE | 14.4 |
| | |
| Smith Lever | 372,571 |
| State Match | 372,571 |
| FTE | 21.96 |

## Key Themes for Goal Three

**Key Theme: Crop Protection** "Soybean Cyst Nematode Control"
*Brief description of the activity* – Soybean Cyst Nematode (SCN) is the most damaging pest of soybean in the United States. Nationally, annual losses can top $1 billion. The pest is so small that farmers may not even know that their fields are infested. Up to 30% undetected yield loss can occur with no obvious above-ground symptoms. In South Dakota, 32% of the soil samples analyzed tested positive for SCN. Once it becomes established in a field, there is no practical way to completely eliminate it. Soybean Cyst Nematode is a substantial threat to soybean production and profitability.

To deal with this pest, SDSU scientists have developed soybean production systems based on crop rotations and new SCN-resistant varieties. Heavily infested soybean fields planted to alfalfa will experience up to a 90% decrease in Soybean Cyst Nematode populations in three growing seasons. By the sixth growing season, SCN levels drop below detection levels. Rotation alone may not control the pest. To further assist soybean producers, SDSU developed Soybean Cyst Nematode-resistant soybean varieties. The new SCN-resistant varieties had yield increases ranging from 25 to 48% over the standard varieties. As an added benefit, SCN population densities were greatly reduced in the fields with resistant varieties.

*Short impact statement* – Once the Soybean Cyst Nematode becomes established in a field, it is there to stay. Soybean production systems developed by SDSU combine rotation with new pest-resistant varieties. As a result, soybean producers now have proven methods to reduce SCN populations and maintain profitable soybean yields.
*Source of Funding*
Hatch Act
Commodity – SD Soybean Research and Promotion Council
State

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

**Key Theme: Food Safety** "Television Programs Address Consumer Concerns about BSE"

*Brief description of the activity* – Since the discovery of BSE in the United States, Mad Cow Disease has dominated world headlines, threatened American beef prices, and caused consumers to pay closer attention to the safety of their food. BSE in North America is truly one of the biggest events to impact American agriculture in more than a decade. Within two weeks of the first confirmed case of BSE in the United States, the South Dakota State University Cooperative Extension Service produced a special edition of Today's Ag, a nationally syndicated television program. The program was titled "The Science and Facts about Mad Cow Disease." This was the first time that a national program relied on science to answer some of the most pressing questions about BSE, what it means to the economy, and what it means to consumers. This television program provided an overview of BSE, including new developments in research and detection; it featured a medical doctor describing the actual risk to consumers from BSE; it explained how the food eaten by cattle determines the risk of BSE; and how scientists at land grant universities are working to assure the safety of American food.

In addition, the SDSU Cooperative Extension Service also immediately produced a special edition of On Call, a medical program airing on South Dakota Public Television. This program featured physicians, medical specialists and veterinarians discussing Mad Cow Disease and variant Creutzfeldt-Jakob disease in humans.

*Short impact statement* – Both the Today's Ag program and On Call program received high praise from state and national beef leaders for providing a factual response to the situation. These television programs, combined with the educational efforts of land grant scientists and Extension specialists and educators, provided science-based information to consumers who were uncertain of how this new disease would affect their families. One month after the first case of BSE was confirmed in the United States, demand for beef remained high, and actually rose. Wholesalers bought the third-largest amount of beef in a one week period in mid-January since 1990. This was a solid indicator that American consumers evaluated information about Mad Cow Disease and chose to continue eating beef. The Today's Ag program was broadcast nationally on RFD-TV, which is carried on DirecTV and Dish Network. RFD-TV has 30 million subscribers.

*Source of Funding*
Smith-Lever 3(b) & (c)
Commodity – beef checkoff funds
State

*Scope of impact, identifying which of the following apply to the activities conducted*
(3) Multistate 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: Improving Nutrition
*Outputs:* SDSU has made substantial contributions to the area of human diet and health. In one project, meat scientists cooked more than 1,400 steaks on a gas grill to determine the best method of preparing steak. A taste panel of 12 people trained in sensory testing evaluated the steaks for tenderness, juiciness, and beef flavor intensity, as well as seasoning and the presence of off-flavors. These efforts are described in greater detail as a Key Theme.

*Outcomes:* SDSU scientists have created new or improved foods, many of which have improved health and/or nutritional properties. Scientists discovered that the best way to grill a steak is as simple as flipping it every 2-3 minutes.

*Impacts:* Because of SDSU research, consumers have better food preparation techniques, and expanded food choices. This translates into improved selection of available foods, leading to better nutritional opportunities for stakeholders.

Program: Improving Health
*Outputs:* SDSU has made substantial contributions to the area of human health. A major emphasis has been on the control of mosquitoes, and the transmission of West Nile Virus. SDSU distributed more than one million copies of mosquito control and prevention publications, in addition to commercial and private pesticide applicator training, and educational programs for mosquito control at the community level. SDSU also offers food safety courses for food service professionals in rural areas. South Dakota law requires at least one individual in each food service establishment to be a Certified Food Service Manager. These efforts are described in greater detail as a Key Theme.

*Outcomes:* In 2003, there were 1,041 reported human cases of West Nile Virus in South Dakota, compared with just 51 cases in 2004. Also, nearly 700 food service professionals in rural areas of the state have completed certification or recertification courses, which not only helped maintain healthy and sanitary food service facilities, but allowed food service establishments to remain in compliance with state and federal laws.

*Impacts:* Because of SDSU educational programs, citizens understand how to protect against mosquito-borne illnesses. Consumers are assured their food will be safe at restaurants and other food service establishments.

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 | 154,662 |
| State Match | 36,735 |
| FTE | 15.3 |
| | |
| Smith Lever | 310,476 |
| State Match | 310,476 |
| FTE | 18.3 |

## Key Themes for Goal Four

**Key Theme: Improving Nutrition** "A Better Way to Grill Beef"

*Brief description of the activity* – Eighty-one percent of American families own a grill, and use it at least 22 times during the grilling season. Gas grills make up 63% of all the grills owned, but most of the existing research and cooking instructions pertain to charcoal grills. Many grillers find themselves relying on "persistent myths" regarding the best way to cook a steak. The result is a good steak that is cooked badly, impacting the consumers opinion about the quality of beef. In order to determine the best method of cooking steak on a gas grill, South Dakota State University barbecued more than 1,400 steaks. A taste panel of 12 people trained in sensory testing evaluated the steaks for tenderness, juiciness, and beef flavor intensity, as well as seasoning and the presence of

off-flavors. The scientific process "debunked some persistent myths. Here are the highlights:

- Steaks that were flipped often (every 2-3 minutes) during cooking received higher scores on juiciness than those flipped once.
- Steaks that were started on high heat and finished on low cooked in a shorter time, but there were no differences in tenderness, juiciness, flavor intensity or overall desirability between them and steaks cooked at a constant medium heat.
- Keeping the grill lid open resulted in longer cooking times, but palatability ratings were the same as steaks cooked with the lid closed.

Overcooking interferes with palatability, and destroys more vitamins. "People may want to cook their steak thoroughly for food safety reasons, but that is unnecessary," according to SDSU Meat Scientist Dr. Duane Wulf. "With steaks you only need to worry about contamination on the outside. Muscle is basically sterile. Any bacteria that are present come from the environment during processing and handling, and the risk that they will enter the inside of the steak is minute. Steak is different from ground beef, where everything is mixed together and must be cooked to 160 degrees throughout."

*Short impact statement* – The new gas grilling guidelines provide tested cooking methods that are designed to enhance the flavor of the steak. By following these simple steps, grillers can be assured that their backyard barbecue is consistently a culinary delight.

*Source of Funds*
Hatch Act
Smith-Lever 3(b) & (c)
Commodity
State

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

**Key Theme: Improving Health** "Undergrad Student Creates Value-Added Dairy Product"
*Brief description of the activity* – SDSU encourages undergraduate students to become involved in research, and apply science to current needs and issues. One student, working toward degrees in Dairy Manufacturing and Dairy Production, identified the opportunity to use retentate byproduct to create a new dairy snack. The SDSU undergraduate student, working under the supervision of her faculty advisor, determined that retentate byproduct was going to waste during the production of a dairy-based carbonated drink. By combining retentate with casein, whey proteins and other compounds, she created a firm, stable gel.

This gel will be the foundation for a healthy, snack-type dairy product. The product would be similar to yogurt but sweeter and less acidic. It would be somewhat like a pudding, but without the starch base. It would just be the milk product itself. The next

step is to add flavors and conduct sensory tests. A South Dakota-based company has expressed interest in manufacturing and selling the product commercially.

*Short impact statement* – The real impact this undergraduate research project is its impact on the student. Prior to starting this project, she had 130 credit hours of all A's, and was very involved in extracurricular activities. The hands-on approach to research gave her "the opportunity to use problem-solving skills." Her faculty advisor confirms that the project helped her learn how to approach a problem and apply the scientific method.

The student has graduated in May 2004 and currently is a quality control specialist at a Minnesota cheese plant.

*Source of Funds*
Hatch Act
Local - tuition
Other – Griffith Undergraduate Research Award grant

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

**Key Theme: Improving Health** "Better Mosquito Control Helps Prevent West Nile Virus"
*Brief description of the activity* – In 2003, there were 1,041 reported human cases of West Nile Virus in South Dakota, and 14 deaths. West Nile Virus is transmitted by mosquitoes that feed on infected hosts. The main vector in South Dakota is the Culex tarsalis mosquito. Little has been known about the actual breeding behavior of the Culex tarsalis mosquito in the Northern Great Plains, making it difficult to effectively control. SDSU biologists and an undergraduate Wildlife and Fisheries Science student studied the breeding behavior of Culex tarsalis mosquitoes. They studied 35 potential breeding sites in natural and urban settings, representing a variety of habitats which previously had been thought to attract mosquitoes. These are the same type of sites that previously had been targeted by mosquito control programs. While the study found plenty of mosquito larvae, there were very few Culex tarsalis larvae. This finding has proven to be a key to understanding the lifecycle of the deadly mosquito, and controlling it. While most mosquitoes prefer stale water in shaded areas, SDSU scientists learned that Culex tarsalis mosquitoes prefer fresh water in sunlight. The study was replicated through similar research in California.

*Short impact statement* - New mosquito control recommendations are being developed for the Culex tarsalis species of mosquito. Control programs are now encouraged to also seek out water bodies that have recently been replenished or has a fresh water component, and has been standing for more than a week, which is long enough for mosquitoes to lay eggs. Timing is also important. During late summer when little if any fresh water can be found for breeding, Culex tarsalis mosquitoes will resort to stale water which may have been shunned earlier in the season.

*Source of Funds*
Hatch Act
State
Local - tuition
Other – Joseph F. Nelson undergraduate mentorship

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

**Key Theme: Improving Health** "West Nile Cases Drop Dramatically"
*Brief description of the activity* – Since 2002, the Centers for Disease Control and Prevention have reported that West Nile Virus has been a significant cause of human illness in the United States. The most serious manifestation of West Nile Virus is fatal encephalitis in humans and horses, and well as mortality in certain domestic and wild birds. In 2003, South Dakota had 1,041 human cases and 14 deaths, ranking as the third hardest hit state in the nation. On a per capita basis, South Dakota ranked number one. Working with the South Dakota Department of Health, South Dakota Department of Agriculture, and other state and federal agencies, the South Dakota State University Cooperative Extension Service implemented an aggressive educational campaign to help South Dakotans avoid and control mosquitoes.

The Cooperative Extension Service distributed more than one million copies of mosquito prevention and control publications. Youth activity books were translated into Spanish and made available nationwide by Extension en Espanol on its web site. South Dakota's West Nile Virus materials have also been used in California, Arizona and New Mexico. In cooperation with the South Dakota Department of Agriculture, Extension provided educational programs for the certification of approximately 2,000 commercial applicators and 4,500 private applicators. Certification of applicators and development of community mosquito control programs have been integral parts of the statewide educational effort on West Nile Virus. In addition, On Call, the weekly Extension television program about medicine focused one entire program on West Nile issues. Later in the summer, Extension and South Dakota Public Broadcasting produced a live call-in television program to address current issues. Throughout the spring, summer and fall, Extension specialists issued a series of print and broadcast news stories, all targeted at describing the current mosquito situation, and offering control instructions.

*Short impact statement* - The number of human cases of West Nile Virus dramatically dropped from 2003 to 2004. In 2003, there were 1,041 cases and 14 deaths. In 2004, there were just 51 cases and 1 death.

*Source of Funds*
Smith-Lever 3(b) & (c)
State
Other – community and state funds targeted at mosquito prevention and control

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

**Key Theme: Improving Health** "Safe Food Handling"
*Brief description of the activity* – Food-borne diseases cause 76 million illnesses, 325 hospitalizations, and 5,000 deaths in the United States each year. South Dakota saw a 60 percent increase in enteric diseases, which are often associated with food-borne illness. A majority of cases can be traced to public eating establishments. The increased consumption of restaurant food has been accompanied by an increased risk of illnesses transmitted by food handlers. Handling food safely is not only a health issue, it is also good business. The average household spends nearly $900 per person each year on food eaten away from home.

Since 1997, South Dakota law required at least one individual in each food service establishment to be a Certified Food Service Manager. The South Dakota Department of Health approved the ServSafe ® course as the curriculum of choice for this certification. The Department of Health approves all ServSafe ® instructors. Organizations currently holding instructional certification include: the South Dakota Retailers Association, the SDSU Cooperative Extension Service, and other private companies and academic programs. SDSU CES and the South Dakota Retailers Association are establishing a Memorandum of Understanding which reflects Extension support of business opportunities.

ServeSafe ® and other food safety courses address food-borne illness risks associated with the mishandling of food through the entire food preparation system, literally starting at purchasing through serving leftovers. The course is a minimum of 8 hours long, followed by a protocol exam requiring a score of at least 75 percent to pass.

In addition to offering courses to all types of licensed food service establishments, Extension provides direct education programs for institutionalized food service operations to maintain their specific certification requirements. These facilities have a separate national organization that has specific requirements for certification.
CES involvement is in rural South Dakota. The state health department identified a need for certification courses to be delivered in more rural and remote parts of the state, as well as the need for a recertification process. Extension offers certification courses have in 12 smaller communities for 431 food service personnel. Recertification has been offered in 15 smaller communities to 280 people.

*Short impact statement* – The safety of our food in South Dakota and across the nation is vital to the agricultural, processing and retail industries, as well as to consumers. Safe food delivery is critical in context with the potential threats to the world food supply. As food safety trainers and educators work together across the state, their efforts provide a unified network in meeting the food safety needs of the people of South Dakota.

*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

## 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: Wildlife Management
*Output:* SDSU works closely with state and federal wildlife agencies study wildlife in the region, and provide science-based information to assist in wildlife management. SDSU programs include efforts to better understand the mountain lion and Merriam's wild turkey. These studies document the survival rate, reproduction and range of both species.

*Outcome:* Wildlife managers now have a better understanding not only of the range of these animals, but also the factors that influence their survival. In addition, scientific observation has documented how these two species co-exist with humans and domestic animals.

*Impact:* Both species live primarily in the Black Hills of South Dakota. As more humans and domestic animals move into this scenic area, wildlife managers now understand how to help wildlife co-exist. In addition, the growing population of wild turkeys offers additional recreational opportunities to the region for hunters and game observers.

Program: Natural Resource Management

*Output:* From open pit mines, to streams and lakes, South Dakota's natural resources are vulnerable to pollution and degradation from a host of human activities. During the 200 years since the Lewis and Clark expedition explored the west via the Missouri River, the waterway has been a source of commerce, recreation, electricity, and controversy. Fifty years ago, hydroelectric dams literally changed the course of the river. Today, the Missouri River is in decline, and struggling to carry the burden placed on it by man and nature. SDSU scientists, working with specialists from across the nation, conducted a two-year study of the river as a system. SDSU scientists have also studied fecal contamination in streams, lakes and groundwater to develop a science-based system of identifying the original source of pollution. Extension specialists have developed training programs based on a holistic approach to rangeland management.

*Outcome:* The Missouri River task force recommended the concept of adoptive management to the U.S. Army Corps of Engineers. Working with state and federal agencies, SDSU scientists have developed a set of measures to determine if water problems are developing. Using DNA fingerprinting technology, SDSU can identify the specific source of water pollution. And, multi-state training programs on sustainable livestock production systems on rangelands were offered to educators specializing in livestock, agronomy and farm management.

*Impact:* The Army Corps of Engineers has incorporated adaptive management into its environmental impact statement for the Missouri River. A wide range of political and natural resource groups have also endorsed the scientific report. They all see the value in an unbiased, objective document that synthesized the entire river from headwaters to mouth. Local communities have strong local education resources available from Extension and the National Resource Conservation Service. Local educators are trained to help rangeland managers apply holistic management systems in support of profitability for the entire operation.

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 | 230,965 |
| State Match | 38,506 |
| FTE | 23.7 |
| | |
| Smith Lever | 1,179,809 |
| State Match | 1,179,809 |
| FTE | 69.54 |

## Key Themes for Goal Five

**Key Theme: Wildlife Management** "Topeka Shiner No Longer Endangered in South Dakota"
*Brief description of the activity* – In the 1990s, the Topeka shiner, a two-inch long minnow, had vanished from 90 percent of its historic range, and was added to the Federal Endangered Species List. But this little fish didn't go the way of the Passenger Pigeon and Wooly Mammoth. Science and conservation have helped this fish make an incredible come-back, while strengthening the streams it calls home. South Dakota State University scientists documented how urbanization, residential development on farm land and intensive agriculture in more populous states increased sediment load, degrading streams below the point where the Topeka shiner minnow can survive. Previously, the presence of Topeka shiners indicated that a stream had little sediment, abundant invertebrate prey species, normally a gravelly stream bed, groundwater flow, and stable and grassy banks. One important result of this on-going effort is the development of NRCS criteria for dugout construction that will meld the use of this type of livestock watering system with better fish and wildlife conservation.

*Short impact statement* - The impact of the research and conservation effort, leading to the removal of the Topeka shiner from the Federal Endangered Species List in South Dakota, has many benefits, according to Dr. Charles Berry, head of the SDSU Topeka shiner research team. First, it acknowledges the proactive conservation activities that the state has undertaken. Second, there is an economic benefit because the costs of designating critical habitat might have exceeded the costs of existing conservation activities. Third, fewer regulations are in effect for South Dakota agencies, landowners, and researchers. But most importantly, this small minnow has been restored to its important role in the South Dakota ecosystem.

*Summary of Funding*
USGS
State

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

**Key Theme: Natural Resource Management** "The Recovery of the Missouri River"
*Brief description of the activity* – The Missouri River is in decline. Since the Lewis and Clark Corps of Discovery first traveled the river in 1804, man has used and changed the river. The biggest change to the river occurred nearly 50 years ago when a system of federal dams were installed to control flooding, and provide electric generation, and enhance recreational opportunities. Today, there are 67 native fish species living along the main stem of the river; 51 are listed as rare, uncommon, and/or decreasing across all or part of their ranges. Nearly 3 million acres of natural habitat has been altered through channelization, levee building, commercial development, farming and other human activities. Upstream states battle with downstream states over the distribution of the benefits the river still offers. In 1999, the Corps of Engineers reported total commercial barge traffic at a record peak of 9.25 million tons. The navigational benefits of the river are pegged at $9 million a year, with recreational benefits at $85 million a year.

The U.S. Army Corps of Engineers commissioned a study by the National Research Council (NRC) of the entire river system. Twelve nationally recognized specialists in ecology, biology, engineering, agriculture, and law were named to conduct a two-year study of the river. This was the first project in which non-stakeholders reported on the entire Missouri from its headwaters to its mouth.

Adaptive management is the centerpiece of the committee's report. "The river is an ecosystem, it can't be looked at piecemeal," said Dr. Carter Johnson, one of the scientists who conducted the study. Johnson is a professor of ecology at South Dakota State University. "Since the 1800s, there have been committees and boards that have tried to manage the river. They failed because they only thought of their part of the river." The trend continues today, when it seems river management is based on lawsuits. Johnson and the NRC report encourage the Corps of Engineers to manage the river as a system, balancing the needs of recreation, wildlife and commercial uses.
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*Short impact statement* - The Army Corps of Engineers has incorporated the recommendation for adaptive management into its environmental impact statement. A wide range of political and natural resource groups have also endorsed the scientific report. They all see the value in an unbiased, objective document that synthesized the entire river from headwaters to mouth. Johnson said "Everybody will have to give a little to help the Missouri River system recover, but when it does, then everybody in the country – and the river, too – will be the better for it."

*Source of Funding*
Hatch Act
Special Research Grant – Environmental Protection Agency, U.S. Army Corps of Engineers
State

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

**Key Theme: Natural Resource Management** "E. Coli Tracks Sources of Pollution"
*Brief description of the activity* – Fecal matter from animals and humans often ends up in lakes, streams and groundwater, carrying with it many disease-causing agents. It is easy to identify the presence of fecal contamination, but much more difficult to determine where it originated. Knowing the origin would greatly improve the chances of successful water quality management. Scientists at South Dakota State University, using Antibiotic Resistance Analysis (ARA), isolated E. coli bacteria from human and animal feces and look for patterns of resistance to antibiotics for each E. coli strain. E. coli found in water samples can then be compared to this database of resistance patterns and the possible source of contamination identified.

Because different species are exposed to different types and amounts of antibiotics in their foods and from medication, their gut bacteria will show different levels of antibiotic resistance. Studying the antibiotic resistance patterns of E. coli isolates can help identify the host in which the bacteria developed. "Each species has what we call an antibiotic resistance profile. It's like a fingerprint of antibiotic resistance," says SDSU associate professor of biology/microbiology Nels Troelstrup.

*Short impact statement* - A database of antibiotic resistance profiles for humans and eight source animals is being developed for South Dakota. Such a database can be used to monitor water quality and specifically target contamination sources.

*Source of Funding*
Hatch Act
State
Other – SD Department of Environment and Natural Resources

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

**Key Theme: Natural Resource Management** "Sustainable Production Systems in the Great Plains"
*Brief description of the activity* – When management issues arise on farms and ranches, operators often address the immediate problem. However, a holistic approach to management allows operators to not only address the issue at hand, but also consider the implications for other areas of the enterprise.

With funding from the USDA's Sustainability Research and Extension grant program, the South Dakota Cooperative Extension Service implemented a two-year training project titled "Training in Sustainable Livestock Production Systems on Rangelands of the Western Dakotas." The program takes a holistic approach to grazing livestock enterprises. It involves family issues, community culture, animal health, range management, and many other issues that support the profitability of the operation, and happiness of the operators and family.

The program involved a partnership between North Dakota and South Dakota. Participants are Extension educators and NRCS personnel from the two states. Sixty trainers and participants are involved in the training. SDCES participation includes livestock, agronomy, and farm management educators from all portions of the state. In addition to technical training and adult education skill building, several participant teams will cooperate to provide producers with a detailed business and management plan for their operation.

*Short impact statement* - As a result of the training program, local communities have an even stronger community based educational resource in Extension and NRCS field staff. Upon completing the training, Extension educators said they learned there are enhanced educational opportunities by, "addressing short term issues initially, and then following up with a client on longer term issues." Others said the program, "reinforced the holistic approach to the big picture," and taught them to "think outside the box, looking more at solutions and the root of the problem instead of quick fixes."

*Source of Funding*
Smith-Lever 3(b) & (c)
State – USDA SARE Grant
Other

*Scope of impact, identifying which of the following apply to the activities conducted*
(3) Multistate Extension

## 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 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/Cattlewomen, 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 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 14th 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 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

| Title of Planned Program/Activity | Actual Expenditures for FY 2004 |
|---|---|
| Goal 1 | 82,152 |
| Goal 2 | 39,555 |
| Goal 3 | 36,512 |
| Goal 4 | 30,427 |
| Goal 5 | 115,621 |

**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, the Sun Grant Initiative, and the *Today's Ag* television program.

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)**

| Title of Planned Program/Activity | Actual Expenditures for FY 2004 |
|---|---|
| Goal 1 | 495,600 |
| Goal 2 | 0 |
| Goal 3 | 10,251 |
| Goal 4 | 0 |
| Goal 5 | 80,250 |

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

| Title of Planned Program/Activity | Actual Expenditures for FY 2004 |
|---|---|
| Goal 1 | 209,571 |
| Goal 2 | 100,905 |
| Goal 3 | 93,143 |
| Goal 4 | 77,619 |
| Goal 5 | 294,952 |

**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.