

PLAN OF WORK
Annual Report

SOUTH DAKOTA STATE UNIVERSITY
Federal Fiscal Year 2001
October 1, 2000 - September 30, 2001

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 46th in the nation, with just over 754,000 people (2000 Census). 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 that exist 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 1999 U.S. Census Estimate indicated that South Dakota ranked 50th in average annual income, which in 1998 was \$ 23,715. 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 holding 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, 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 \$17.1 billion in 2000. Fifty-four percent of all farms earn less than \$50,000 per year, while 23% earn between \$100,000 and \$499,999 each year. This indicates there are two types of agriculture being conducted in South Dakota...large-scale and small-scale agriculture. The number of acres per farm continue to increase, while the number of farms decrease. Currently, there are 32,500 farms that average 1,418 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. In 1998, the South Dakota Board of Regents established the Biostress Center of Excellence which has primarily been a teaching function, a focused academic program aimed at problem solving. This recognition has reinforced our commitment to the Biostress philosophy.

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 pasture 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.

The Cooperative Extension Service has offices located in all 66 South Dakota Counties. 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 2001, 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 2000 Annual Report of Accomplishments and Results

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 research-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: Crop Systems

Output: Crop cultivars, germplasm and inbred lines developed and released for soybean, spring wheat, winter wheat, flax, white corn, oats, flax, sunflowers, and other appropriate crops. A landmark accomplishment, described in detail as a Key Theme, was SDSU's efforts leading to the release of seven scab-tolerant spring wheat varieties.

Outcome: The SDSU crop breeding program provides varieties adapted to South Dakota growing conditions. In the case of scab-tolerant spring wheat, SDSU has selected genetic material based on scab resistance and desirable agronomic characteristics.

Impact: The newly released spring wheat varieties have improved scab tolerance and yield by two to three bushels per acre. Because of the new varieties, wheat producers have experienced substantially lower losses due to scab. In 2001, South Dakota harvested 1.65 million acres of spring wheat, with a net profit to growers exceeding \$10 million.

Program: Livestock Systems

Output: SDSU programs literally extend from the farm gate to the consumer's plate, ranging from programs that evaluate how to improve the health of livestock, to programs that help assure quality products emerge from accepted production practices, to new ways to fabricate the product. One program, the Beef Quality Assurance/Critical Management Plan, helps individual cattle producers develop an integrated program to ensure that livestock are raised in a manner that minimizes known defects and food safety hazards.

Outcome: More than 3000 producers have participated in educational programs about chemical residue avoidance, common physical hazards and defects, prevention of transmissible diseases, and other important issues in cattle production. Site specific

quality assurance plans are maintained by producers completing this program. The plans focus on employee training, record keeping, cattle identification, and site specific methods to reduce chemical and microbiological hazards in beef.

Impact: In six years, top sirloin injection site lesions have decreased from 11.4 percent to 2.06 percent, thanks to beef quality education programs. This translates to an industry-wide recovery of \$76 million in 2002.

Program: Management Systems

Output: Livestock management systems are continually evaluated to determine greater efficiency leading to increased productivity and/or profit. One program, Standardized Performance Analysis (SPA) documented the profitability for the cow-calf producer during the decade of the nineties, demonstrating the relationships between production, investment, cost control, and markets. This program is described in greater detail as a Key Theme.

Outcome: Using the SPA database, producers have a tool to understand and better manage the factors affecting profit in the cow calf enterprise.

Impact: The average return on assets for producers is 2.9 percent. However, the SPA program has helped producers capture an 18 percent return on assets.

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	1,835,325
State Match	1,835,325
FTE	241.2
Smith Lever	927,306
State Match	927,306
FTE	56.18

Key Themes for Goal One

Key Theme: Plant Health “Scab-Tolerant Spring Wheat Varieties” (also relates to Goals 2,3,4)

Brief description of the activity - Fusarium head blight (i.e. scab) is a serious disease of wheat. It poses a threat to wheat production in South Dakota as well as in the North Central region of USA. Scab epidemics on spring wheat in 1993 caused losses approximately \$80 million to South Dakota producers. Continued losses in a lesser degree have been experienced in some areas. To reduce the scab threat in wheat production, developing scab resistant varieties became a top priority in the spring wheat breeding and pathology programs at South Dakota State University. An aggressive scab research program was initiated at SDSU to accelerate the development of spring wheat varieties that have improved scab resistance. To complement the breeding efforts, intensive research was conducted to develop screening techniques, identify/utilize new sources of resistance, and to study genetics. Large screening nurseries in combination with winter nurseries are used to select and advance breeding materials. Our overall approach has been to simultaneously select for scab resistance and desirable agronomic characteristics. Since 1995, seven new spring wheat varieties have been developed and released by the SD Agricultural Experiment Station.

Short impact statement - These newly released varieties in general have improved scab tolerance and yield 2 to 3 bu/acre higher. They are being widely grown in South Dakota. In recent years, producers have experienced little losses to scab, largely due to the replacement of older, susceptible varieties by these new varieties. In 2001, South Dakota harvested 1.65 million acres of spring wheat. By growing these new varieties, net profit to growers exceeded \$10 million. Many producers in at-risk areas of North Dakota and Minnesota have also adopted these varieties. More importantly, scab resistance levels in the current breeding germplasm has been improved steadily. This ensures the future development and releases of high yielding scab resistant varieties.

Source of Funding

Hatch Act

USDA-ARS National Wheat & Barley Scab Initiative

State – State Funds

Other – SD Wheat Commission, Minnesota Wheat & Barley Research & Promotion Council, SD Crop Improvement Association, Foundation Seed Stock

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

- (1) State specific
- (3) Multistate Research
- (4) Integrated Research and Extension

Key Theme: Adding Value to Animal Products “New Fabrication Techniques Add Value to Beef Carcass” (also relates to Goal 1,2)

Brief description of the activity – While overall consumer demand for beef has remained fairly constant over the past ten years, the demand for certain cuts has changed significantly. Demand for high-dollar tender steak cuts from the beef rib and loin has been increasing while demand for cuts from the beef round and chuck has been decreasing. These shifts in demand are a result of increasing consumer desire for steaks due to increasing popularity of backyard grilling and record growth of the mid- and upper-scale steak house segments of the restaurant industry. Meanwhile, consumers have lessened their desire for roasts due to decreased cooking knowledge and reduced meal preparation times. South Dakota State University researchers have developed new carcass fabrication techniques which could increase the value of beef carcasses. Specifically, a study was conducted to map the three-dimensional intramuscular tenderness variation in the four large beef round muscles. This study identified some exceptionally tender portions of these round muscles which could be utilized as high quality steaks. A second study was conducted to evaluate the point of separation between the beef wholesale chuck and the beef wholesale rib, traditionally between the 5th and 6th rib bones. SDSU researchers measured tenderness and consumer-purchase-preference differences among steaks from the 2nd to 12th rib bone locations. Consumer purchase preference was determined by placing steaks in a Sioux Falls retail food store and monitoring consumer steak purchases. It was discovered the chuck/rib separation point could be moved forward to a point between the 4th and 5th rib bones without compromising tenderness or consumer acceptability and thereby add four more rib eye steaks to every beef carcass.

Short impact statement - The round is the leanest of all beef wholesale cuts making it appealing nutritionally to consumers, but it is one of the least tender wholesale cuts. If tender portions of the beef wholesale round could be marketed as high quality steaks, the value of the beef round would certainly increase. The round makes up 22% of a beef carcass by weight, meaning that each \$0.01 per lb. increase in the cutout price of wholesale rounds would result in \$1.65 more value per beef carcass or \$46 million more value to the U.S. beef industry per year. Moving the rib/chuck point of separation one rib anterior would allow the industry to sell four more 1-inch rib eye steaks per carcass. These steaks have an average weight of 0.60 lbs which when multiplied by 4 steaks per carcass would yield 2.40 additional lbs of rib eye steaks per carcass. Assuming the retail price difference between rib eye steaks and chuck eye steaks is \$3.15/lb, this would result in a potential total of \$7.56 per carcass in added value at the retail level. According to AMI (1999), 47% of the average beef retail price is the equivalent farm value; therefore, \$7.57 additional retail value should translate into \$3.55/head added value for the beef producer.

Source of Funding

Hatch

Smith-Lever

State – State Funds

Other – SD Beef Industry Council

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

(1) State Specific

Key Theme: Animal Health “Beef Quality Assurance/Critical Management Plan” (also relates to Goals 2, 3, 5)

Brief description of the activity – Concerns about food safety and quality may lead some consumers to eat less beef. Since beef production comprises a major element of South Dakota’s agricultural income, an integrated program was implemented to ensure that cattle born or fed in South Dakota are raised in a manner that minimizes known defects and food safety hazards. While beef quality assurance education campaigns are commonly undertaken, a HAACP-like system is needed that provides continuous monitoring, documentation, and improvement. The South Dakota Beef Quality Assurance/Critical Management Points program contains a beef quality assurance educational component and an option for completion of a site specific quality assurance plan. This plan focuses on known critical management points to reduce chemical residues, physical defects, and microbiological hazards. In addition, it documents management activities to enable verification of these activities. Through the activities of County Livestock Extension Educators and State Extension Specialists, along with beef industry and private company support, more than 3000 producers have learned about chemical residue avoidance, common physical hazards and defects of beef, prevention of transmission of BSE (Mad Cow Disease) and other important diseases in cattle. More than 300 producers have written site specific quality assurance plans, focused on employee training, record keeping, cattle identification, and site specific methods to reduce chemical and microbiological hazards in beef.

Short impact statement - In six years, top sirloin injection site lesions have decreased from 11.4% to 2.06%, thanks to beef quality educational activities. This translates to an industry-wide savings of 76 million dollars in 2002. Producers with written site plans from the South Dakota BQA/CMP program will continue to reduce, and possibly eliminate these lesions in the future. This program has provided tools to develop effective antibiotic use plans that minimize chemical residues and antibiotic resistance.

Source of Funding

Smith-Lever

State – State Funds

Other - SD Veterinary Medical Association

SD Livestock Marketing Association

SD Cattlemen’s Assoc

SD Stockgrowers’ Assoc

SD Animal Industry Board

SD Beef Industry Council

SD Dept of Agriculture

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

(1) State specific

Key Theme: Animal Production Efficiency “Preventing Ketosis Extends the Productive Life of Dairy Cows” (also relates to Goal 2,3,5)

Brief description of the activity – Lactation ketosis affects as many as 30% of all dairy cows around the time of calving. The cause of ketosis is a carbohydrate imbalance (low blood glucose) during periods of high-energy demand for the dairy cow. This negative energy balance in combination with low blood glucose leads to accumulation of fat in the liver. Because of the resultant fatty liver, the dairy cow is susceptible to a host of metabolic and infectious disorders, which shortens productive life of the animal. South Dakota State University’s Dairy Science Department has discovered a specific combination of dietary supplements that stop the conditions that cause development of fatty liver, and subsequently prevented lactation ketosis in dairy cows. Research is on going for determination of other dietary agents that will strengthen these effects or give similar responses. Of particular interest are products that are produced by agriculture in South Dakota.

Short impact statement - There are nearly 100,000 dairy cows in South Dakota, and lactation ketosis affects approximately 30% of them. Treatment costs nearly \$140 per animal, or \$4.2 million per year, not including the cost of lost milk production, treatment of associated disorders, and the decreased herd life. Forty-percent of the dairy cows in South Dakota are currently being removed from the herd in South Dakota each year due to this disorder. SDSU’s breakthrough means that South Dakota dairy producers now have a way to reduce ketosis in their herds. This will extend the productive life of dairy cows, and decrease the cost of milk production.

Source of Funding

Hatch

Other - Grants from: Pestell, Inc. of New Hamburg, Ontario Canada; and Balchem Corporation, Slate Hill, New York

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

(1) State Specific

Key Theme: Animal Production Efficiency “New Management Practices Improve Beef Marbling” (also relates to Goal 2,3)

Brief description of the activity – The Beef Consumer Satisfaction Report reported, not surprisingly, that consumers prefer juicy steaks. It is known that higher marbling levels tend to help reduce negative effects of cooking at higher degrees of doneness. Because of the positive impact that marbling makes on customer satisfaction, the beef industry has become highly focused on improving marbling. It has long been thought that marbling is a late developing tissue and that growth implants administered late in the feeding phase may impede the development of marbling. However previous research at SDSU indicated that marbling development theories might have been wrong. Administration of implants early in the finishing phase may have a negative impact on subsequent development of marbling. South Dakota State University scientists have been focusing

on the use of growth implants to enhance production variables and their subsequent effect on carcass quality for many years. Because there is disparity between experimental outcomes among researchers as to the effect of implants on the development of marbling, SDSU conducted a two year study to quantify the rate and extent of which marbling develops in non-implanted steers of known genetic background and age. The researchers concluded that marbling is an intrinsic component of growth, meaning that marbling develops at a continual and steady pace throughout the growing and finishing phase during normal growth. Management factors imposed early in the finishing phase may impede the early marbling development. A study was conducted where a high potency implant was administered either early or late in the finishing phase. The administration of the implant early in the finishing phase reduced marbling scores whereas the delayed implant treatment had no affect on the subsequent development of marbling when compared to controls.

Short impact statement - Producers now have a scientific foundation upon which to base an implant strategy or management practice, one that will not affect the quality of the beef they produce. Producers who are striving to produce a beef carcass that will achieve high degrees of marbling for increased premiums now can make better management decisions. Likewise these findings have not only shown to improve the degree of marbling in carcasses but have shown to have no adverse affects on performance. These findings are the first of its kind. Because the development of marbling has now been redefined, the earlier theory of how growth implants effect the development of marbling has also been changed.

Source of Funding

Hatch Act

State – State Funds

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

(1) State specific

(3) Multistate Research

Key Theme: Risk Management “Standardized Performance Analysis Database” (also relates to Goals 4,5)

Brief description of the activity - The beef industry is a major segment of the South Dakota economy. A low return to production agriculture has been viewed as a major cause in the decline of economic vitality in rural America. Maintaining agricultural profitability is the only way to maintain a healthy and viable production system. This in turn has a major impact on the health of rural South Dakota. It is important to understand the drivers of profitability. For the past decade, South Dakota State University has collected individual cow calf production and financial data, resulting in a database containing information not previously available to producers, lenders, policy makers, or university educators. The Standardized Performance Analysis (SPA) Database documents profitability for the cow calf producer during the decade of the nineties. The database also demonstrates the importance of the relationships between production,

investment, cost control, and markets. This database is also being used by Extension Educators for producers, as well as by faculty for undergraduate and graduate student education. The only way to have a financially healthy beef industry is to understand and apply these relationships to decision making, in the context of a systems model, rather than using a linear process.

Short impact statement - Using the SPA database, Extension Educators have helped producers understand and better manage the factors affecting profit in the cow calf enterprise. Better management means that producers can earn a living and pay off debt on one-third the number of cows.

Source of Funds

Smith-Lever

State – State Funds

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

(1) State specific

Goal 2: A safe and secure food and fiber system.

1862 Research - X

1862 Extension - X

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

Overview:

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

Program: Food Safety – Genetically Modified Organisms (GMO's)

Output: At the request of the 2000 South Dakota State Legislature, South Dakota State University conducted a study to determine the safety of genetically modified food.

Outcome: This study found that mice fed genetically modified corn and soybeans had normal pregnancies, normal birth weights, and normal reproductive organs. Several generations of mice were tested to assure that future health problems were not associated with genetically modified food.

Impact: The SDSU study adds to the growing body of evidence documenting the safety of genetically modified foods.

Program: Food Security – The Genetics of Food

Output: The South Dakota State University Cooperative Extension Service created an educational program called “Genes by Design,” which introduces high school students to food biotechnology. The curriculum sums up on one, three-ring binder the full range of issues associated with food biotechnology. Activities in the program help students learn about the properties of DNA, which they extract from fruit.

Outcome: “Genes by Design” presents unbiased, science-based information about biotechnology, without attempting to influence attitudes. Some students think biotechnology is great, others have concerns, but all learn more about a new science that will have a growing impact on their lives.

Impact: “Genes by Design” is widely available and used in South Dakota high schools, and has recently been made available to schools in Iowa, Nebraska and Colorado. Through the program, students learn the agricultural and pharmaceutical benefits of biotechnology, gain an understanding of the ethical questions about genetically modifying crops, learn about concerns over the potential for unintended harm to other organisms, and gain a greater appreciation for issues including: international trade restrictions on biotech crops, as well as consumer demand that foods containing biotech crops be labeled.

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 the safety of transgenic crops and GMO-based foods. Analytical Services offered by SDSU provide scientific testing of dairy products, processed food, and evaluate various foods for overall safety, including the presence of E. coli 157.H7. The 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 TWO FUND SUMMARY

Total Expenditures by Source of Funds

Hatch	12,572
State Match	12,572
FTE	0
Smith Lever	235,080
State Match	235,080
FTE	13.92

Key Themes for Goal Two

Key Theme: Food Safety “Safety of Genetically Modified Foods” (also relates to Goal 1,3,4,5)

Brief description of the activity – South Dakota leads the nation for the percent of transgenic crops, sometimes known as Genetically Modified Organisms (GMO’s). The more common crops include Bt corn and Roundup Ready soybeans. These crops offer the promise of producing food with reduced chemical herbicides or insecticides. In theory, this would reduce the amount of chemical in the environment, as well as the potential of chemical residue on plants that may enter the food chain. Despite the promise of lower chemical use, there have been lingering concerns about the safety of consuming food with transgenic ingredients. The validation of the safety of GMO use in livestock and human foods, both short and long term, is critically needed now to address public concerns. South Dakota State University has conducted in-depth research to determine the safety of genetically modified food. The study involved feeding Roundup Ready soybeans and Bt corn to pregnant laboratory mice.

Short impact statement - The SDSU study adds to the growing body of evidence documenting the safety of genetically modified foods. The SDSU study found that mice fed genetically modified corn and soybeans had normal pregnancies, normal birth weights, and normal reproductive organs. Several generations of mice were tested to assure that future health problems were not associated with genetically modified food.

Source of Funding

Hatch Act

State – State Funds

Other - HIEHS

National Institutes of Health

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

(1) State Specific

Key Theme: Food Security “Genes by Design” (also relates to Goal 1,3,4,5)

Brief description of the activity – South Dakota leads the nation in the use of biotech corn and soybeans that have been genetically modified to show traits such as resistance to insects or tolerance to herbicides. But the closest most South Dakota high school students ever came to DNA was in a diagram in a science textbook. The South Dakota State University Cooperative Extension Service created an educational program called “Genes by Design,” which introduces high school students to food biotechnology. The curriculum sums up on one, three-ring binder the full range of issues associated with food biotechnology. Activities in the program help students learn about the properties of DNA, which they extract from fruit. “Genes by Design” presents unbiased, science-based information about biotechnology, without attempting to influence attitudes. Some students think biotechnology is great, others have concerns, but all learn more about a new science that will have a growing impact on their lives.

Short impact statement - “Genes by Design” is widely available used in South Dakota high schools, and has recently been made available to schools in Iowa, Nebraska and Colorado. Through the program, students learn the agricultural and pharmaceutical benefits of biotechnology, gain an understanding of the ethical questions about genetically modifying crops, learn about concerns over the potential for unintended harm to other organisms, and gain a greater appreciation for issues including: international trade restrictions on biotech crops, as well as consumer demand that foods containing biotech crops be labeled.

Source of Funding

Smith-Lever

State – State Funds

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

(1) State Specific

(3) Multistate Extension (IA, NE, CO)

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: Skin Cancer Detection

Output: The Cooperative Extension Service offers a variety of programs to assist clients is recognizing a potential threat, and staying safe. From food safety to farm safety, Extension staff have helped save countless lives simply by helping clients proactively evaluate their lifestyle and take appropriate safety steps. But what about previous exposure to risks which today may prove to be a threat? Using a DermaScan machine, the SDSU Cooperative Extension Service offered free skin cancer screening to farm families.

Outcome: The Extension Sun Safety Program has become an “early warning system for skin cancer.

Impact: Farmers, by nature of their occupation, are exposed to excessive amounts of sun, and are at high risk of developing skin cancer. The SDSU Extension Sun Safety Program has allowed farm families to quickly check whether they have possible skin cancer spots. Many participants have identified potential cancer spots early, leading to advanced medical examination and successful treatment.

Program: Better Milk Means Less Cancer

Output: Eating healthy food according to the USDA’s food pyramid is the first step is weight control and a healthy lifestyle. SDSU is working to enhance the healthful properties of food, without using questionable growth stimulants or chemicals. SDSU scientists have successfully increased the levels of conjugated linoleic acid (CLA) in cow’s milk, which is one of the major sources of the fatty acid.

Outcome: Butter made from CLA-enhanced milk was fed to laboratory rats, which enjoyed a 50% reduction in the incidence of cancer.

Impact: By raising CLA-levels as much as five times the normal amount in milk, SDSU scientists have found a way to naturally create a dairy food that offers the promise of controlling cancer.

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 THREE FUND SUMMARY

Total Expenditures by Source of Funds

Hatch	56,198
State Match	56,198
FTE	11.6
Smith Lever	593,519
State Match	593,519
FTE	12.55

Key Themes for Goal Three

Key Theme: Human Nutrition “A Healthy You” (also relates to Goal 2)

Brief description of the activity – Obesity has become one of the greatest threats to health in America. Wellness programs seem to be everywhere, but few people stay with these programs long enough to achieve their goals. SDSU Extension Educators in Moody and Hamlin County in South Dakota created a monthly program based on a newsletter titled *Healthy You 2000*. The newsletter, combined with e-mails, newspaper columns, and websites, gives users easy to understand wellness information. Healthy You 2000 is also a regular resource for Extension’s Expanded Food and Nutrition Education Program (EFNEP). Starting in 2001, Minnesota Extension Educators joined South Dakota in submitting articles and distributing the wellness information.

Short impact statement - The results speak well of the program. Of the more than 500 people receive the newsletter.

- 42% reduced salt consumption
- 47% reduced sugar consumption
- 74% reduced fat consumption
- 47% began or increased their exercise program
- 74% now consume more fruits and vegetables
- 39% lost weight
- 16% lowered their blood pressure and cholesterol

Source of Funds
Smith-Lever Funds
State Funds

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

Key Theme: Human Health “Sun Safety Program Helps Prevent Skin Cancer” (also relates to Goal 5)

Brief description of the activity – Skin cancer is the most common form of cancer in the United States, accounting for more than one million new cases each year. A principal cause is excessive and long-term exposure to the sun. Farmers, by nature of their occupation, are exposed to excessive amounts of sun and are at a high risk of developing skin cancer. The majority of skin cancers occur on areas of the body chronically exposed to sunlight, namely the face and neck. The South Dakota State University Cooperative Extension Service, working jointly with the South Dakota Soybean Research and Promotion Council, initiated a multi-pronged approach to show farmers the potential danger of excessive exposure to the sun, and help reduce exposure.

Using a Dermascan machine, Extension educators offered free skin cancer screening to farm families. The special lights in the machine can show potential trouble spots on the face and neck. Roberts County Extension Educator Jan Olson said, “The light shows the damage that has been done. We look underneath the eyes to see if the aging process is accelerated, and also if we can see little freckles that appear in clumps. That’s an indication that the skin has been damaged from too much sun exposure.”

Following the Dermascan examination, people are given free samples of *Soy Smooth*, a soybean-based sunscreen with an SPF of 15. Working with the National Farm Medicine Center in Marshfield, Wisconsin, Extension also implemented *Operation Hat Check*. The program invites people to exchange the baseball cap most producers wear for a wide-brim “booney” hat designed to shade the face, ears and neck.

Short impact statement - The Extension Sun Safety Program has become an “early warning system” for skin cancer. More than 24,000 bottles of *Soy Smooth* sunscreen has been distributed following a Dermascan examination of rural families. Stories from skin cancer survivors attest to the success of the program.

Jim Arthur, a farmer from Clark, South Dakota, discovered he had suspicious looking spots during a Dermascan screening. Jim visited a dermatologist and had to have several cancerous spots removed. “The experience made me a lot more careful about using sunscreen,” he said.

Shirley Skoglund, 61, of Lake Norden, South Dakota was part of a women’s group that invited their Extension Educator to discuss skin cancer. During a Dermascan screening, Shirley said she “was horrified to see it looked like a continual freckle all around my face.”

She scheduled an appointment with a dermatologist, who told her the spots were pre-cancerous and immediately began treatment. “I am extremely grateful that the SDSU Extension Service brought to Dermascan machine to my community,” Shirley said. “I had read about the need to be cautious, but never took it to heart. Now, I use sunscreen and some type of a cap. I also encourage other people to take advantage of Extension’s Dermascan screening.”

Source of Funds

Hatch Funds

State Funds

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

(1) State Specific

Key Theme: Nutricueticals “Making Milk More Healthful ” (also relates to Goal 1,2)

Brief description of the activity – Consuming conjugated linoleic acid (CLA) and other related products can decrease the incidence of cancer, and possibly of heart disease in humans. Cow’s milk is our main source of dietary CLA, but we need to consume more than the amounts usually present in milk to have significant disease protection. A number of dietary formulations for cows were evaluated to find the optimal combination of ingredients that will cause maximum concentrations of CLA in cow’s milk. Diets that contain some fish oil with fat sources that contain large amounts of linoleic acid such as soybeans or sunflower seeds are the most effective in increasing milk CLA. This increase in CLA content is substantially more than when feeding the oilseeds without the fish oil.

Short impact statement - Treatments of cow’s diets that were used caused a 3 to 5 fold increase in CLA concentrations in milk fat. When butter made from these milks was fed to laboratory rats challenged with cancer-causing agents, there was a 50% decrease in the incidence of cancer. Milk, butter, and cheese high in CLA tasted the same to humans as regular dairy products.

Source of Funds

Hatch Funds

State Funds

Commodity

SD Soybean Research & Promotion Council

MN/SD Dairy Foods Research Center

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

(1) State Specific

(3) Multistate Research

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: Agricultural Input Management & Precision Farming

Output: Precision farming has come a long way from the days of a jury-rigged desktop computer and fertilizer applicator, to the GPS-based measuring systems available as standard equipment on farm machinery today. With the advances in technology comes the need for educational opportunities for producers, consultants, and students. The new technology can simply be an unnecessary expense, unless it is accompanied with management skills necessary to analyze information and determine appropriate steps that not only save money, but also reduce chemical inputs that may impact the environment. A nine-state precision farming consortium has been formed to develop curricula for Kindergarten through university classes and Extension seminars. The consortium is also working to develop a web-based soil and crop model that can be used to test the impact of different climatic and management scenarios on productivity and water quality.

Outcome: Week-long Geographic Information Systems/remote sensing workshops have been held for teachers, producers, Extension educators, and crop consultants. The training sessions cover topics including: how to conduct a profitability analysis; using GIS to improve management; development of management zones; and, collecting and using spatial information for management uses.

Impact: This effort has both short term and long term impacts. In the short term, producers have modified their agrochemical application strategies. For example, in 2000, a collaborating producer analyzed weed maps and decided not to apply herbicides to two quarter sections. Long term, there is a large potential to reduce agricultural inputs by changing broadcast application practices to site-specific application in the Great Plains. For example, in South Dakota during 2000, it is estimated that there are 10,000 small and medium sized farms with 97% applying herbicides in a broadcast manner. If just ten percent of the growers change to site-specific application and reduce the number of acres where herbicides are applied, it is estimated that the eastern South Dakota would reduce herbicide application by 272,000 kg without impacting the quality of crops grown.

Program: Wildlife Management

Output: One of the most enjoyable parts of living in South Dakota is watching the wildlife. Natural resources are a valuable part of the state, and a growing component of our economy. South Dakota State University has undertaken a number of research projects with the goal of assuring that wildlife can co-exist and thrive in a state known for agriculture. For example, the giant Canada goose is a species native to the prairies of South Dakota, but in the 1940s, it was thought the Canada goose was extinct. A few remaining geese were found in a tame flock in Minnesota. From this remnant population, biologists were able to establish a small breeding flock. The effort was so successful that they can be hunted once again without fear of harming the population. Other species of birds that have been absent from the prairie for decades have also been introduced.

Outcome: Research is providing science-based information that will help manage the population and habitat of wildlife, while also providing farming landowners with options to protect their crops and support wild game.

Impact: Crop depredation from wildlife is being reduced, representing a win-win for conservationists and farmers. Populations previously thought to be extinct will realize the greatest benefit.

Assessment:

The programs of the Cooperative Extension Service and Agricultural Experiment Station have helped 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 concentrations 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 FOUR FUND SUMMARY

Total Expenditures by Source of Funds

Hatch	215,775
State Match	215,775
FTE	49.6
Smith Lever	203,583
State Match	203,583
FTE	15.33

Key Themes for Goal Four

Key Theme: Pesticide Application “South Dakota Precision Farming Consortium: Improving Profitability and Reducing the Impact of Agriculture on the Environment” (also relates to Goal 1,2,3,5)

Brief description of the activity – One of the first application of site-specific management involved rigging a computer to a fertilizer applicator for precise fertilizer applications. Today the emphasis has shifted from equipment design to conducting system-level experiments designed to develop a conceptual understanding of complex interactions among soils, topography, water, crops, genetics, weeds, insects, diseases, and nutrients in watersheds. To accomplish this task, system-level mechanistic research designed to define the causes of yield variability is needed. This research can lead to the development of a Web-based system that producers can use to test the impact of different management scenarios on productivity as well as environmental quality. Such a system could be used to:

- Reduce the economic risk associated with defining management zones;
- Improve in-season management recommendations;
- Simplify the procedure for converting information into decisions;
- Reduce the amount of misapplied agrochemicals, thereby reducing agricultural impacts on the environment.

The South Dakota Precision Farming Consortium is involved in Kindergarten through University teaching, research, and outreach activities. Research is being conducted in producers fields that are scattered across the state. Findings from South Dakota are combined with results from collaborators located in Minnesota, Iowa, Missouri, Wisconsin, Michigan, North Dakota, Georgia, and Montana. One of the goals of the research is to develop a Web-based soil and crop model that can be used to test the impact of different climatic and management scenarios on productivity and water quality.

In Kindergarten through University teaching, data sets from research activities are being used to develop grade appropriate curricula. To facilitate the development of curricula, members of the consortium have held week long Geographic Information Systems/remote sensing workshops for teachers. One goal of the workshops were to develop curricula that teachers will use in their classes. Similar workshops also have been held for producer collaborators, county agents, and crop consultants.

The consortium sponsors a number of outreach activities. Activities range from bi-annual symposium workshops to daylong training sessions. Training sessions have been held on the following topics:

- How to conduct profitability analysis;
- How GIS can be used to improve management;
- How to develop management zones; and
- How to collect and use spatial information for improving management.

Short impact statement - This project has both short and long term impacts in South Dakota. Short term impacts include:

- Over 50 K-12 teachers have been trained in remote sensing and GIS;
- Over 200 producer and consultants have attended training sessions. Many of these agricultural professionals have incorporated knowledge developed by the consortium into their agricultural management practices and recommendations;
- Remote sensing was shared with 5 producers in South Dakota in 2001. These producers worked with consortium members to test the ability of remote sensing to improve management.
- Producers have modified their agrochemical application strategies. For example, in 2000, based on weed maps, a collaborating producer decided to not apply herbicides to two quarter sections.

Long term impacts may be related to improved water quality and profitability, For example, there is a large potential for reducing agricultural inputs when broadcast strategies are changed to site-specific management in the Great Plains. South Dakota Ag Statistics Service (2000) estimated that there are about 10,000 small and medium sized farms in eastern South Dakota that grow about 3.4 million ha of row crops. Approximately 97% of these producers use herbicides at a rate of 3.1 kg/ha, almost all apply in a broadcast manner. If 10% of the growers change to a site-specific management, and producers reduced the number of hectares where herbicides were applied by 25%, this would result in a reduction of 272,000 kg of herbicides applied in eastern South Dakota. Clearly this will have a positive effect on profitability, sustainability, and environmental quality.

Summary of Funding

Hatch Act

Smith-Lever

Commodity – North Central Soybean Board, United Soybean Board, SD Soybean Research and Promotion Council, SD Corn Utilization Council

State – State AES Funds, SD Department of Environment and Natural Resources

Other – NASA, U.S. Environmental Protection Agency

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

(5) Multistate Integrated Research and Extension (MN, IA, MO, WI, MI, ND, GA, MT)

Key Theme: Wildlife Science and Management “Better Management Guidelines for Panfish” (also relates to Goal 5)

Brief description of the activity – Panfish species such as black crappie, bluegill, and yellow perch provide important sport fisheries across North America, including much of what is considered “family” fishing opportunities. Limitations existed in the scientific understanding of panfish biology and management with respect to the influences of human harvest, habitat, and interactions among various fish species.

South Dakota State University has conducted substantial research in support of family-oriented fishing opportunities in the Northern Great Plains states of Minnesota, Nebraska and South Dakota.

The research concentrated on the influence of food supplies and harvest regulations on the biology and management of bluegill, yellow perch, and other panfish. Better understanding of biology and management will provide the foundation for improved angling opportunities for future generations.

Short impact statement - State conservation agencies now have science-based guidelines to use when applying length limits for the management of panfish. SDSU's research, based on fish body condition, indicates circumstances under which a minimum length limit is likely to slow fish growth. In addition, management strategies have been developed to improve the quality of black crappie populations in larger impoundments. Biologists managing warm water Midwestern lakes also have an improved understanding of the effect of northern pike on both predator and panfish populations.

Source of Funding

State Funds

Other Funds

Nebraska Game and Parks Commission

South Dakota Department of Game, Fish and Parks

Minnesota Department of Natural Resources

U.S. Fish and Wildlife Service – Division of Cooperative Research

U.S. Geological Survey

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

(3) Multistate research (NE, MN)

Key Theme: Wildlife Management “Giant Canada Geese Return from Near Extinction to Threaten Crops” (also relates to Goal 1 & 5)

Brief description of the activity – The giant Canada goose is a species native to the prairies of South Dakota. In the 1940s, it was thought that the giant Canada goose was extinct. However, a few were found in a flock of tame geese in rural Minnesota. From this remnant population, biologists with the South Dakota Department of Game, Fish and Parks established a small breeding population. In the 1970s, biologists from South Dakota started a program to reintroduce the giant Canada Geese to their original habitat in South Dakota. The introduction effort has been spectacularly successful. In fact, the population increase has been so great that in parts of South Dakota, Canada geese have been causing crop depredation. While hunters and wildlife watchers are excited about seeing all the Canada geese, some farmers are not happy that huge flocks are now destroying their fields. The SDSU Biology/Microbiology Department has fitted 100 adult female Canada geese with radio transmitters, and more than 2000 Canada geese have been fitted with leg bands. The geese are being monitored in an effort to understand the seasonal movements of the Canada goose population.

Short impact statement - Wildlife managers will use the results of this study to enhance the population of Canada geese, while at the same time reducing the amount of crop depredation. The result is a win-win for wildlife conservationists and farmers. But the Canada goose population, which will no longer be threatened with extinction due to inadequate management options, will realize the greatest benefit.

Source of Funding

State – State Funds
SD Game, Fish & Parks grant

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

(1) State specific

Key Theme: Wildlife Management “Introduction of Wild Turkeys in South Dakota”
(also relates to Goal 5)

Brief description of the activity – Establishment of eastern wild turkeys (*Meleagris gallopavo silvestris*) in northeastern South Dakota will provide more accessible turkey hunting for residents of eastern South Dakota and an additional subspecies for all state residents. Eastern wild turkeys are native to southeastern South Dakota and are wilder and less dependent on farmsteads than Rio Grande wild turkeys and game farm turkeys currently found in portions of northeastern South Dakota. We expect better landowner tolerance for the wilder, less farmstead dependent, eastern wild turkeys. A total of 74 eastern wild turkey females were trapped in Iowa and Kentucky, flown to South Dakota, and released in Grant County during the winters of 1999 and 2000. We placed small necklace type radio transmitters on each of these turkeys prior to release and then monitored their survival, reproduction, movements, and habitat use. Annual survival for hens averaged 67% in 1999 and 2000. Approximately 93% of the females attempted to nest and the nest success (percentage of clutches hatching) averaged 50% for years combined. Females with failed first nest attempts tended to reneest about 45% of the time. Overall, 72% of the brooding females successfully raised one or more poults to at least 4 weeks of age. Production was more than adequate to establish a successful eastern wild turkey population in Grant County. Home range size (area used in daily activities) and dispersal from wintering areas to nesting areas were much greater than observed in other studies; we suspect that the scattered nature of resources such as forest patches cause birds to move greater distances to find daily needs than in other areas of North America.

Short impact statement – Eastern wild turkeys are now living and reproducing in the natural woodlands associated with the edge of the Prairie Coteau in Grant County. South Dakota Department of Game, Fish and Parks is allowing limited hunting. The allowable annual harvest of spring gobblers will likely increase over the next several years.

The eastern wild turkeys are dependent on the natural forest habitats along the edge of the Prairie Coteau and will not likely spread out into portions of the county lacking natural woodlands. Thus far the eastern turkeys do not appear to be dependent on

farmsteads to the extent of game farm turkeys in that same area. The eastern turkeys clearly seem shy of human contact. The wild turkeys readily make use of wind swept crop fields to find waste grain. The greatest threat to the success of the eastern turkey introduction exists in possible interbreeding with the semi wild game farm turkeys existing on some farms and ranches. Interbreeding could destroy the wildness of the eastern wild turkeys and lower their chances for continued success.

Source of Funding

McIntire-Stennis Cooperative Forestry

Commodity – National & State Wild Turkey Federation

State Funds

Other – SD Department of Game, Fish & Parks; and, Federal Aide to Wildlife

Restoration Fund, distributed through the SD Department of Game, Fish & Parks

Key Theme: Biodiversity “The Natural History Collections and Biological Survey at South Dakota State University”

Brief description of the activity – South Dakota State University’s Natural History Collections and Biological Survey are a collection of plants, animals, and insects dating back to the 1890s. The collection documents the current and historic biodiversity of the Northern Great Plains Region, and provides a continuous record of biotic changes. The specimens are preserved and managed according to quality-standards for scientific research and documentation. Over the years, the collection has grown, and today is the basis for historic research and comparisons on native and exotic species. As the sole scientific collection of insects, plants and vertebrates in South Dakota, it is constantly used for research and teaching. The collection provides a baseline for studies including: ecological biocomplexity, species conservation, evaluation of native species as alternative crops, and evaluating the impact of invasive species.

Short impact statement – The collection has been a resource for undergraduate and graduate students, as well as K-12 classes. It has also played a central role in research projects, including: inventories of native and invasive species, analysis and restoration of disturbed ecosystems, conservation biology theory and application, impact of land use and regulatory actions on wildlife, and systematic relationships of organisms. The collection was also a resource for two books, including: *Grassland Plants of South Dakota and the Northern Great Plains*; and *Plants of the Black Hills and Bear Lodge Mountains*.

Source of Funding

Hatch

Other – Private Contributions

Goal 5: Enhanced economic opportunity and quality of life for Americans.

1862 Research - X

1862 Extension - X

Program Description: Economic Opportunity and Quality of Life

Overview:

The SDSU Cooperative Extension Service and Agricultural Experiment Station work jointly to enhance economic opportunity and overall quality of life. This is accomplished by: 1) helping families learn how to cope with challenges and meet individual needs, allowing them to be more resilient to stress and crisis; 2) 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: Energy from Agriculture

Output: A concept, named the Sun Grant Initiative, has been developed to broaden the role of land grant universities to include a focus on renewable energy and biobased industries.

Outcome: Congress has authorized study in support of the development of Sun Grant Institutions within the land grant system. With leadership from USDA-CSREES, regional centers will emphasize integrated research, Extension and education programs on renewable energy and biobased industries for rural communities.

Impact: The long-term impact of the Sun Grant Initiative will be the enhancement of America's energy security. Just as the Land Grant concept revolutionized agriculture in the late 1800s and 1900s, the Sun Grant concept holds the promise of building a biobased economy in the new Millennium.

Program: Information is Economic Development

Output: Agriculture is the economic foundation of most Midwestern States. Yet, there are fewer and fewer media channels available to communicate science-based information from Land Grant Universities to citizen-clients.

Outcome: South Dakota State University has developed a commercial television program called *Today's Ag*. The program consistently among the 20 most-watched television programs in the market, and has proven itself as an effective tool to communicate science-based information from land grant universities to agricultural and rural audiences.

Impact: In a recent Nielsen ratings period, *Today's Ag* was the number ten most-watched program. The program recently started a planned expansion to include

commercial television stations in Iowa, Nebraska, North Dakota and parts of neighboring states. The regional program will reach 300,000 farms with 196 million acres of farmland, nearly 15% of the total farmland in the United States.

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 new generations of cooperatives and/or value added enterprises can thrive and support local communities, as well as individual agricultural producers. Value-added industries work to capture economic opportunities for agricultural producers and rural communities. SDSU has been a leader in the development of a nationwide model to study ag-based bio-energy opportunities, leading to the eventual charter 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 FIVE FUND SUMMARY

Total Expenditures by Source of Funds

Hatch	227,876
State Match	227,876
FTE	18.9
Smith Lever	924,427
State Match	924,427
FTE	61.36

Key Themes for Goal Five

Key Theme: Leadership, Economic & Energy Development “Sun Grant Concept Leads to New Energy Technologies and Biobased Products” (also relates to Goal 1,2,4)

Brief description of the activity - America is experiencing its second major energy crisis in 30 years. There have been shortages of electrical power. Retail prices of gasoline and natural gas have hit record high levels. Consumers and the entire economy have felt the pinch of high energy costs. The War on Terrorism makes America’s energy independence even more critical.

Agriculture can help reduce America's reliance on imported fossil fuels and petroleum-based products by producing biobased fuels, like ethanol and biodiesel, electrical power, lubricants, plastics, pharmaceuticals, cosmetics, and building materials. Research is needed to develop bioenergy uses for agricultural products.

A concept, named the Sun Grant Initiative, has been developed to broaden the role of land grant universities to include a focus on renewable energy and biobased industries. Congress has authorized a planning grant to study the development of the Sun Grant Initiative within the nation's land grant system. Sun Grant Centers are proposed for: South Dakota State University, Oregon State University, Oklahoma State University, the University of Tennessee-Knoxville, and Cornell University. With leadership from USDA-CSREES, these centers emphasize integrated research, Extension and educational programs on renewable energy and biobased industries for rural communities. The centers will serve as the primary land grant liaison with the U.S. Department of Energy's national bioenergy centers at Oak Ridge National Laboratory in Tennessee, and the National Renewable Energy Laboratory in Colorado.

Short impact statement - Just as the Land Grant Concept revolutionized agriculture in the late 1800s and 1900s, the Sun Grant concept holds the promise of building a biobased economy in the new Millennium. Sun Grant Institutions will help America achieve revolutionary advances in biobased industries for the benefit of America's independent farmers, rural communities, and the public at large.

The long-term impact of the Sun Grant Initiative will be the enhancement of America's energy security. Sun Grant Institutions will promote diversification and environmental sustainability of America's agriculture, and strive for enhanced opportunities for economic diversification in America's Rural Communities.

Source of Funding

Hatch (limited)

State (limited)

Other: Special Research Grants – Congressional Funding

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

(5) Multistate Integrated Research & Extension (OR, OK, TN, NY). Also includes: U.S. Department of Energy's national bioenergy centers at Oak Ridge National Laboratory in Tennessee, National Renewable Energy Center in Colorado.

Key Theme: Community Development “*Today's Ag – Commercial Television Program backed by Land Grant Universities*” (also relates to Goal 1,2,3,4)

Brief description of the activity – Agriculture is the economic foundation of most Midwestern States. Yet, there are fewer and fewer media channels available to communicate science-based information from Land Grant Universities to rural residents.

For ten years, South Dakota State University has produced *Today's Ag*, a 30-minute commercial television magazine program about agriculture and rural life. In January 2002, the *Today's Ag* program started a planned expansion into Iowa, Nebraska, North Dakota and Minnesota, supported by cooperative agreements with Iowa State University, the University of Nebraska, and North Dakota State University. *Today's Ag* is the only ag program on commercial television endorsed by and produced in cooperation with land grant universities. When the expansion of *Today's Ag* is complete, it will air in 10 television markets stretching from Kansas to Canada, and Wisconsin to Wyoming. The *Today's Ag* regional viewing area is one of the most highly concentrated agricultural areas in the United States, including: 39% of the corn, 37% of the soybeans, and 28% of the wheat. It also includes 40% of the hogs and pigs, 20% of the cattle, and 9% of the dairy cows.

Short impact statement - The regional *Today's Ag* television program will reach 300,000 farms with 196 million acres of farmland, nearly 15% of the total farmland in the United States. Currently, it is the most-watched ag program in South Dakota; and, Nielsen ratings indicate it is the 10th most watched program overall in the market. It regularly draws a larger audience than some of today's most popular shows, including: *West Wing*, *CSI*, *Friends*, and all newscasts on the local ABC, and NBC affiliates. *Today's Ag* has proven itself as an effective way to communicate science-based information from land grant universities to agricultural and rural audiences.

Source of Funding

Hatch

Smith-Lever

State – State Funds

Other – Commercial sponsorship

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

(2) Multistate Extension (SD, IA, NE, ND)

Key Theme: Information Technologies “Mobile Computer Lab” (also relates to Goal 1,2,3,4)

Brief description of the activity – It is important for those who live in rural areas to have access to higher education and continuing education courses that help them develop skills in information evaluation, critical thinking, and decision making. Students studying agriculture and natural resource subjects, such as Range Science, need to develop those same skills through hands-on real-life experiences with the resource. Efforts to address the educational needs of rural students and adult learners are hampered due to the lack of computer technology in many remote locations. Having up-to-date computer resources available to these individuals would greatly enhance their educational opportunities. The overall objective of this effort is to offer courses that teach skills in evaluation, critical thinking and decision-making in rural areas, both for rural adult learners and for undergraduate students who need exposure to real-world situations. A Higher Education grant was obtained for the purchase of notebook computers and peripheral equipment for

use in remote locations. With this grant, South Dakota State University West River Ag Center (WRAC) staff developed a mobile microcomputer laboratory. The micro-lab includes 20 notebook computers on a wireless network with associated printers, scanner, digital camera, video projector, etc. The notebook computers were purchased with basic word-processing, spreadsheet, and presentation software as well as specialty software to facilitate instruction of specialty topics in areas such as farm/ranch financial management, production records, herd management, marketing, and 4-H. The lab is stored in duffle bags and is available for use by University Teaching, Research, or Extension personnel on a check-out basis.

Short impact statement - Since the creation of the lab in December of 2001 (3 months), the microcomputer lab has been checked out 20 times for a total of 32 days by WRAC staff and other Extension Educators. The micro-lab has been set up in 20 locations (in two states) for use by over 400 individuals. The popularity of the micro-lab is demonstrated in that scheduling conflicts have occurred which resulted in the micro-lab being split and set up in locations over 300 miles apart in the same day. Other notebook computers have also been borrowed from WRAC staff to supplement the number of machines required in a given location. Training using the micro-lab has included instruction in farm and ranch management software such as Quicken, QuickBooks Pro, SPA 80, CowSense, and other specialized software. The micro-lab has also been used by 4-H staff to conduct volunteer leader training. This microcomputer lab has greatly enhanced the ability of University staff to provide higher quality educational programming to the rural citizens of South Dakota.

Source of Funding

Hatch Act

Smith-Lever

Other CSREES - Higher Education Grant

State – State AES & CES Funds

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

(1) State Specific

Stakeholder Input Process

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

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

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

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

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.

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, rather than 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 – this board solicits and coordinates 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.

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

Multi-State Extension Activities

<u>Title of Planned Program/Activity</u>	<u>Actual Expenditures for FY 2001</u>
Goal 1	78,430
Goal 2	19,441
Goal 3	17,528
Goal 4	21,398
Goal 5	85,636

Summary of Multi-State Extension Activities

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

<u>Title of Planned Program/Activity</u>	<u>Actual Expenditures for FY 2001</u>
Goal 1	563,840
Goal 2	12,572
Goal 3	19,242
Goal 4	44,128
Goal 5	96,253

Integrated Activities (Smith Lever Act Funds)

<u>Title of Planned Program/Activity</u>	<u>Actual Expenditures for FY 2001</u>
Goal 1	484,513
Goal 2	120,098
Goal 3	108,280
Goal 4	132,190
Goal 5	529,034

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 Genetics; 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 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 Three, 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 Four, 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 Goal Five, AES programs in Bio-Based 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 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.