

PLAN OF WORK
Annual Report

SOUTH DAKOTA STATE UNIVERSITY
Federal Fiscal Year 2002
October 1, 2001 - September 30, 2002

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.

In addition to applied 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 help interpret AES applied research, and help 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 2002, 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 2002 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: 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. For example, during this reporting period, South Dakota experienced one of the worst droughts in recorded history, surpassing that of the 1930s. It has already cost more than \$1.4 billion in South Dakota. Efforts to assist farmers and ranchers deal with the drought are described in greater detail as a Key Theme.

Outcome: The Cooperative Extension Service, working closely with the scientists of the Agricultural Experiment Station, re-evaluated all crop and livestock management practices for times of drought. These revised management practices were publicized and distributed to all producers using media, meetings, and individual contacts. In each case, care was taken to subtly incorporate family issues and stress management in the ag production information.

Impact: South Dakota is still dealing with the drought. While crop losses have topped \$461 million, and livestock losses are at \$281 million, farm and ranch families have been given information necessary to cope with the financial crisis. It will be many years before the economic impact can be measured. But today, communities and neighbors are more sensitive to the stresses endured by farm and ranch families.

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.

Outcome: The SDSU crop breeding program provides varieties adapted to South Dakota growing conditions. Additional performance testing documents which varieties will perform best in South Dakota’s climate.

Impact: Producers rely on SDSU performance testing to determine which varieties hold the greatest promise for yield. By using top varieties, hard red spring wheat producers can expect an additional profit of \$30.45 per acre.

Program: Livestock Systems

Output: SDSU programs literally extend from the farm gate to the consumer’s plate, ranging from programs that test for new diseases, to programs that help producers determine how their water quality impacts the profitability of their livestock operation, to new ways to earn more money in the dairy industry. One program studied the management traits of cow-calf producers in an effort to determine why some producers earn higher profits than others.

Outcome: The study found the biggest difference between high and low profit cow-calf producers was how they handle assets. The management recommendations which resulted from this study helps producers manage assets to create wealth.

Impact: Cattle producers average a two percent return on investment, compared to most businesses which average a ten percent return. This management program helps cow-calf producers manage assets, leading to improved family incomes for the thousands of cattle producing families in South Dakota.

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	1,801,725
State Match	1,801,725
FTE	170.41
Smith Lever	941,105
State Match	1,061,871
FTE	50.74

Key Themes for Goal One

Key Theme: Risk Management “Impact of Drought on Agriculture” (also relates to Goal 2, 3, 4, 5)

Brief description of the activity - South Dakota is experiencing one of the worst droughts in recorded history, surpassing that of the 1930s. It has already cost more than \$1.4 billion dollars in South Dakota. Crop losses now stand at \$461 million, and livestock losses are at \$281 million. The state’s cattle inventory is down by 250,000 head because of drought-forced sales. The drought of 2002 has created financial hardships for farmers and ranchers, leaving crop failures, forces sales of livestock, and emotional stresses in its wake. The Cooperative Extension Service has actively worked with individuals and communities to provide science-based information and options to problems.

In one county alone, the number of feed samples sent to the Extension Office for testing increased tenfold because of the drought. Of the 37,500 acres tested, 20,000 had safe nitrate levels, 10,000 acres had marginal nitrate levels and were safe to feed if mixed with other feeds. Approximately 7,500 acres were too high in nitrate levels to be feed. Assuming a cost of \$15/acre to hay, the cost saving of not harvesting this hay was \$112,500.

SDSU CES operates a web-based “Feed Finder” program, designed to bring feed buyers and sellers together. The Feed Finder program has averages 1,500 hits per day, with a single day high of 5,400 hits.

Just one South Dakota county hit hard by the drought estimates it would require 1,370 semi-trucks to move the feed needed to keep livestock until they could be moved to spring pastures. This convoy of truck would be 26 miles long, and would haul 45,028 bales of hay, 86,016 bushels of corn, 4,160 barrels of protein supplement, 642 tons of range cake, 6,375 bushels of oats, 800 bags of soybean meal, and 15 tons of straw.

Nearly every county and community has examples like this. But perhaps most frightening is another statistic from an Extension survey of needs within a county hit by the drought. Approximately 10 percent of the respondents indicated the need for food assistance for their families, help with medical insurance, medical bills, and/or prescription medications.

Short impact statement - Depression and stress have followed in the wake of the drought. “What SDSU Extension is doing that others are not is combining the ag and family issues. The surveys we have done following our regional drought meetings would indicate that the people issues are as big if not bigger than the cow and crop issues,” according to Extension Program Leader for Agriculture and Natural Resources Kim Cassel.

“We can’t make it rain, but we do try to help people as best as we can with the information they need to make informed decisions about how to cope with the drought,” said Extension Educator Maurice Lemke.

Source of Funding
Smith Lever
Hatch
State – State Funds

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

Key Theme: Risk Management “Multifunction Farm Programs” (also relates to Goal 2, 3, 4, 5)

Brief description of the activity – American farm policy may be edging closer to that of European nations. There is growing discussion among American policy-makers to pay farmers for producing goods other than food and fiber. The concept, known as “multifunctionality,” pays farmers for contributing to a range of other public goods, such as clean water, wildlife, carbon sequestration in soils, flood protection, and landscape quality. A South Dakota State University economist, studying as a Fulbright Scholar in the United Kingdom, compared new farm policy ideas of Europeans and Americans. The United Kingdom and France are both experimenting with “working lands” policies which promote conservation on existing farmland. As a result, society gets the benefits from sound agricultural production, but also gets biodiversity, water quality and other conservation benefits. In the United States, Secretary of Agriculture Ann Veneman speaks of “consumer-driven agriculture.” She says that U.S. consumers increasingly insist on defining what is produced, how food production takes place, and with what effects. Americans consider environmental quality as a kind of “non-market” good that is extremely important in consumer choices.

Short impact statement - As debate continues to evolve over the costs and benefits of American governmental farm policy, understanding trends that motivate discussion will help farmers prepare for shifts in public support. For example, based on the experiences of farmers in the United Kingdom and France, it is possible that the loss of production-related subsidies can be cushioned if the money isn’t taken away but is shifted to areas such as rural development and agri-environmental projects.

Source of Funding
Hatch
State – State Funds

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

Key Theme: Risk Management “Performance Testing Pays Big Dividends”

Brief description of the activity - Every year, South Dakota crop growers produce about 1.8 million acres of spring wheat. On average about 20 to 25 varieties are available for seeding every year. Of these varieties, about 8 to 10 are identified as top yielding varieties. South Dakota State University conducts variety tests to determine which varieties hold the greatest promise for yield. The average for the top yielding varieties is 7 bushels per acre higher than the yield average for all the 20 to 25 varieties tested every year.

Short impact statement - Hard red spring wheat prices are currently at \$4.35 per bushel. By simply using top yielding varieties, producers can expect an additional profit of \$30.45 per acre. This is a very efficient means of increasing crop profits without measurably increasing crop production input costs.

Source of Funding
Smith-Lever
State – State Funds

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

Key Theme: Animal Production Efficiency “Water Quality and Beef Production” (also relates to Goal 2,4,5)

Brief description of the activity – Water is a critical resource on semi-arid rangelands of western South Dakota. It is clear that very poor quality water can kill livestock. A number of producers have recently suffered livestock losses, including deaths, poor performance, health problems, that have been determined to be partly or wholly a result of poor water quality. Development of new, higher quality water supplies is costly. Livestock producers cannot economically justify developments to improve water quality without reliable information with which to evaluate the impacts of their current water supply on livestock production and health. Government officials are also unable to justify the expense of providing rural water systems without data showing the quality of existing water supplies and the losses to producers who have no access to good quality water. The effect of water quality was studied by AES scientists for two summers with yearling steers on rangeland and in confinement. Research results show quite dramatically that steers, both on rangeland and in confinement, drinking water with total dissolved solids (TDS) of 5000 mg/L or greater and sulfates of 3000 mg/L or greater gained markedly less weight than steers that had access to good quality water (1000 mg/L TDS and 400 mg/L sulfates). Steers accessing poor quality water in a confinement situation also developed polioencephalomalacia, a condition that has been associated with high sulfur levels in the diet.

Short impact statement – Using the new knowledge developed through AES research, hundreds of water samples from stock dams, wells, and dugouts have been tested in

County Extension Offices for electrical conductivity (EC, an indicator of TDS). Water samples with an EC greater than about 3000 were recommended for further analysis by a lab to determine TDS and sulfate concentrations. As a result, livestock producers were able to make informed decisions on the use of their water sources. Producers have consulted directly with county Extension Educators and state Extension Specialists regarding how to manage pastures with poor quality water. These producers have considered timing of pasture use to utilize water when it is least dangerous, development of alternate water sources, pipelines, water hauling, and breaching and cleaning of old dams. Producers are also much more aware of symptoms of cattle health problems associated with high TDS/sulfate water and their treatment.

Source of Funding

Hatch
Smith Lever
State Funds

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

(1) State Specific

Key Theme: Animal Profitability “Prospering in the Cow-Calf Business” (also relates to Goal 2,3, 4, 5)

Brief description of the activity – Most businesses in the United States average a 10 percent return on investment. Cattle producers average two percent. In the past 30 years, other parts of the economy prospered, while over half of the cow-calf producers in South Dakota and the Midwest went out of business. South Dakota State University studied high, medium and low profit producers and found an interesting trait shared by profitable producers: There is no advantage in being big. In fact, the biggest difference between high-profit and low-profit cow-calf producers is in how they handle assets. In other words, the investment it takes to generate pounds or yield. “It boiled down to people who were able to take the resources they had and manage them to create wealth,” said SDSU Extension Range Livestock Production Specialist Barry Dunn. The difference that separates profitable producers is that they were better shoppers and marketers. They bought inputs cheaper, they produced calves that weighted the same as those of other producers, but they sold their calves at a higher price. A series of recommendations were developed to help producers lower their investments, including: extending the grazing season and feeding less hay, cutting down on supplements by raising higher quality feed, renting rather than owning, changing the time of calving to a more favorable season, increasing the bull-to-cow ratio, and running bulls a year longer.

Short impact statement - Better management, not more investments in land, livestock, or equipment, is the key to improving the return to assets ratio of cow-calf producers. This ultimately will lead to improved family incomes for the thousands of cattle producing families in South Dakota and the Midwest.

Source of Funding
Smith Lever
State – State Funds

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

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

Key Theme: Animal Health “Porcine Reproductive and Respiratory Syndrome Test”

Brief description of the activity - Porcine reproductive and respiratory syndrome virus (PRRSV) causes late-term abortions and respiratory disease in swine. This virus has been the most significant economic and health problem in the swine industry since 1987 when the syndrome was first described. The virus can be transmitted through boar semen, but cannot be detected very well using culture methods. Worldwide, artificial insemination (AI) is becoming the predominant method of accelerating genetic improvement and performance through the use of superior boars. Veterinary scientists at South Dakota State University have developed a rapid, quantitative and automated polymerase chain reaction test, described as “real-time PCR,” to detect multiple strains of the virus including the European and European-like strains that are now found in the United States. This test can also be used to differentiate these wild-type viral strains from vaccine. Currently, the test is being compared to a well validated “nested PCR” assay that was developed by SDSU in 1995 and is considered the “gold standard”.

Short impact statement - The new Real-Time PCR test has the potential to be used “in-house” at boar stud facilities, in private companies and other veterinary diagnostic laboratories. This allows swine producers to rapidly test and move pigs and/or semen without the potential for PRRSV to be transmitted.

Source of Funds
Hatch Funds
State – State Funds

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

- (4) Integrated Research and Extension

Key Theme: Animal Health “Test for Johne’s Disease in Cattle and Bison” (also relates to Goal 3)

Brief description of the activity - Johne’s Disease is a chronic, wasting bacterial disease of cattle, bison, sheep and goats caused by *Mycobacterium avium* subsp. *paratuberculosis*. This disease has significant economic importance to the cattle industry due to losses from lowered milk production and shorter life expectancy, with estimated losses exceeding \$1.5 billion per year. It is also becoming a significant public health concern due to its possible association with Crohn’s Disease in people. Diagnosis of

Johne's Disease has been difficult since the organism may only be shed intermittently in cattle feces and may take up to 16 weeks to grow in culture. Also, tests using serum to identify *M. paratuberculosis* antibodies may detect less than half the infected animals, since antibodies develop very late after infection. Recently, voluntary Johne's Certification Programs have been established in several states, including South Dakota. Rapid and reliable tests that will detect the organism in cattle are needed. These tests would identify infected animals to prevent transmission of the bacteria and subsequent economic and health losses. Veterinary Scientists at South Dakota State University have developed a real-time polymerase chain reaction (PCR) test that will detect the *M. paratuberculosis* DNA in fecal and tissues samples from cattle and bison. This automated, quantitative test can be performed within a day, compared to several weeks needed for culturing of the organism.

Short impact statement - Diagnostic testing for *Mycobacterium paratuberculosis* has increased due to the voluntary Johne's testing programs in South Dakota and other states. The SDSU PCR test is now used commercially. Commercial companies that have a license to use the DNA sequence are also now evaluating the real-time PCR procedure. When adopted, it will allow for faster, more convenient, less labor intensive testing to identify the bacteria in infected animals.

Source of Funds

Hatch Funds

State – State Funds

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

(4) Integrated Research and Extension

Key Theme: Managing Change in Ag “New Opportunity in Dairy” (also relates to Goal 5)

Brief description of the activity - In 1988, South Dakota had 2,960 commercial dairy operations. Today, there are only 889 commercial dairies. While milk production per cow has increased considerably, production has been concentrated into fewer, larger farms. For dairy farmers going out of the milking business, the opportunity to move into raising dairy heifers is appealing, especially since South Dakota is ideally suited for this segment of dairy production. SDSU dairy scientists have found that raising dairy heifers allow a more flexible lifestyle, and is ideal for small producers. Freedom and flexibility are some of the greatest benefits from switching from regular dairy production to raising dairy heifers. It can cost as much as \$1,200 to raise a heifer, which currently sells for up to \$2,500. “It's a very profitable business,” confirmed SDSU Dairy Scientist David Schingoethe.

Short impact statement - The general trend in the dairy industry, as everywhere else in agriculture, is toward larger, specialized units, so the need for heifer operations will be growing in the future. Larger dairy farms will specialize in milk production and leave the

rearing of heifers to contractors. This makes contract dairy heifer production for in-state and out-of-state producers a flourishing business in South Dakota.

Source of Funds

Smith-Lever

State – State Funds

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

(1) State specific

(4) Integrated Research and Extension

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 – Biotechnology

Output: SDSU meat scientists have studied the impact of genetics on tenderness and flavor as it impacts consumer acceptance of beef.

Outcome: Research at SDSU has documented a genetic condition in cattle which reduces the physiological response to stress, ultimately causing meat to be more tender.

Impact: Findings from the SDSU study benefit both consumers and livestock producers through improved product acceptance and greater product marketability.

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 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	18,573
State Match	500
FTE	.90
Smith Lever	298,616
State Match	260,930
FTE	13.35

Key Themes for Goal Two

Key Theme: Food Safety - Biotechnology “Genetic and Environmental Factors Affecting Meat Quality” (also relates to Goal 1, 3)

Brief description of the activity – Consumers want meat that is tender and full of flavor. These factors are affected by a host of variables. But now, SDSU researchers believe genetics may hold the key to a good steak. Scientists at South Dakota State University suggest that a genetic condition exists in cattle that is characterized by a lessened physiological response to stress resulting in higher postmortem muscle glycogen content and faster pH decline, which leads to longer sarcomeres and enhanced proteolysis causing meat to be more tender. These results could lead to genetic selection of beef animals for improved tenderness.

Short impact statement - Improving meat quality would benefit both consumers and livestock producers. Because leaner animals produce meat which is more viable in quality, improvements in meat quality will enable consumers to enjoy tenderness and flavor along with enhanced nutrition and health. Livestock producers will benefit because improvements in meat quality will increase the demand for meat products.

Source of Funding

Hatch Act

State – State Funds

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

(4) Integrated Research and Extension

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: Human Health and Diet

Output: South Dakota State University has made substantial contributions to the area of human diet and health through activities as varied as studying the traditional diets of Native American populations in South Dakota in an effort to learn how to overcome current challenges of diabetes and obesity; to developing a new use for corn starch which revolutionizes the delivery of oral health care products.

Outcome: Tribal members have learned how to incorporate native plants and prepare a more traditional diet. And, thanks to research at SDSU, a new corn-starch based product is available nationally.

Impact: Information from SDSU holds the promise of helping to reduce high rates of diabetes and obesity on Native American Indian Reservations. A new delivery method is available for oral health care products and other medicines.

Program: Food Quality

Output: SDSU scientists have tested ozone as a new way to control food contamination.

Outcome: A new technique based on ozone has been tested to kill harmful microorganisms without affecting the texture, taste or nutritional value of meat.

Impact: SDSU hopes to increase the effectiveness of ozone control methods, allowing greater food safety without compromising food taste and consumer acceptance.

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	66,363
State Match	66,363
FTE	11.6
Smith Lever	233,493
State Match	262,499
FTE	12.56

Key Themes for Goal Three

Key Theme: Human Health and Diet “Listerine PocketPaks” (also relates to Goal 1)

Brief description of the activity – In 1999, scientists at Warner-Lambert Laboratories were working on a new concept for the delivery of oral care products. It was a pullulan-based gum that would dissolve when wet. In theory, an oral care product would be applied to a small strip. The consumer would place this strip in their mouth, where it would dissolve, releasing the product. But the company encountered several problems with the pullulan base. It dissolved too slowly when placed in the mouth, and was grainy. Consumers did not care for either texture. Scientists at South Dakota State University had been working to develop new uses for corn, and in 1989 initiated research on pullulan. The study of this corn syrup-based gum quickly became an area of international expertise for SDSU scientists. The only other pullulan research was at the USDA’s laboratory in Peoria, Illinois; and, at laboratories in Europe. Warner-Lambert Laboratories approached SDSU scientists with a request to help resolve the problems with the pullulan product carrier.

Short impact statement - SDSU scientists evaluated the Warner-Lambert Laboratories pullulan product, and were able to modify the texture and dissolution speed. With this problem resolved, Pfizer brought the product to market under the name “Listerine Cool Mint PocketPaks.”™ Listerine Pocket Paks™ have quickly caught on with consumers and today is one of the fastest growing new oral health care products on the market.

Source of Funds

Hatch Act

Special Research Grants – USDA Competitive Grant – Non-Food Product

Characterization

Commodity - South Dakota Corn Utilization Council

State Funds

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

(1) State Specific

Key Theme: Human Health & Diet “Community Health and Nutrition” (also relates to Goal 2 & 5)

Brief description of the activity – The diet of Native Americans has changed during the past 100 years. This change was brought about by several factors, including the forced re-settlement on Reservations; and, education of Indian children at boarding schools, which interrupted the opportunity for the older generation to pass on acquired knowledge about traditional nutrition to younger generations. As a result, diet is implicated in a number of health problems among Native Americans, including diabetes and obesity. A partnership between South Dakota State University and Sisseton Wahpeton Community College (SWCC) is paving the way for a healthier diet for the Sisseton-Wahpeton Dakota people. A 2-year project, funded in part by a USDA grant, is working to: 1) document the diet of the residents of the Lake Traverse Reservation; 2) conduct laboratory analysis of these foods at South Dakota State University to determine nutritional values; and, 3) provide information through an educational partnership that allows the people of the Lake Traverse Reservation to improve community health through better nutrition education and informed eating choices. SDSU is offering a class at SWCC about the uses of native plants, and Extension staff are working with young tribal members to help them understand the need for their community to study food science and nutrition.

Short impact statement – This survey has documented that traditional foods still eaten today are not prepared in the traditional methods. For example, today’s pemmican is sweeter than it was 100 years ago, reflecting current Native American preferences. The survey also documented that traditional food preparation techniques have been lost in many tribal families. As a result of this partnership, the tribal community will gain a better understanding of nutrition, and will be able to incorporate traditional foods in their diets. Student at SWCC will gain research experience in laboratory techniques, and SDSU students will gain a better understanding of the Native American culture, traditions and values.

Source of Funds
Hatch
Smith Lever
State Funds

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

Key Theme: Food Quality “Ozone to Prevent Food Contamination” (also relates to Goal 2)

Brief description of the activity - Food-borne illnesses affect 76 million people each year in the United States. While most victims experience only minor symptoms such as nausea and diarrhea, an estimated 5,000 people die from eating food contaminated with harmful organisms. Scientists at South Dakota State University are testing a new technique to make food safe by using ozone, in combination with irradiation and bacteriological methods. The objective is to find the best combination of methods that

kill harmful microorganisms without affecting the texture, taste or nutritional value of meat. The Food and Drug Administration has recently approved the use of ozone for food sanitation. However, the research is still in early stages. SDSU's efforts are to assure that ozone is effective in killing as many microorganisms as possible. Scientists hope to soon develop a method that will allow ozone to disinfect both the exterior and the interior of meat, and will control both E. Coli and Listeria. Ozone has several advantages over irradiation and bacteriological control methods. Consumers are concerned about the carryover effects of radiation, and do not want additional chemicals applied to their food to kill bacteria. Ozone is a gas, which breaks down in to oxygen and water in less than one day. There are no residual effects of ozone, and consumer acceptance of this method is likely to be high.

Short impact statement - Currently, thermal procedures like cooking are used to control E. Coli and Listeria. The thermal processing methods will kill 99.9999 percent of the microorganisms, meaning that one in 1 million products could be contaminated. Ozone is a non-thermal control method, and does not affect the nutritional and sensory qualities of the food product. However, it kills only 99.9 percent of the microorganisms, meaning that one in 1,000 meat products could be contaminated. SDSU hopes to increase the effectiveness of ozone control methods, allowing greater food safety without compromise food taste and consumer acceptance.

Source of Funds

Hatch Funds

State Funds

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

(2) Multistate Research

(4) Integrated Research and Extension

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: West Nile Virus has swept across the nation, generally spread by wild birds. SDSU, working with other state agencies, has implemented a plan to monitor for the presence of the virus through sampling of infected birds and animals. This sampling has detected a number of animals carrying the virus.

Outcome: SDSU identified two squirrels and one Reindeer in the state that were infected with West Nile Virus, in addition to several of horses.

Impact: West Nile surveillance information obtained was reported to federal agencies in support of epidemiology studies regarding the movement of the virus and viral vectors (mosquitoes).

Program: Ag Input Management and Precision Farming

Output: SDSU has studied ways to reduce odor and phosphorus associated with livestock confinement facilities.

Outcome: The outcomes have been dramatic: studies indicate a new low-phytate corn decreases excreted phosphorus from hogs by 40 percent, and an inexpensive biofilter that reduces odor by as much as 97 percent.

Impact: These efforts will help pork producers co-exist not only with their environment, but also with their neighbors.

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	198,108
State Match	207,108
FTE	36.6
Smith Lever	222,865
State Match	303,935
FTE	13.92

Key Themes for Goal Four

Key Theme: Wildlife Management “West Nile Virus” (also relates to Goal 1,3)

Brief description of the activity – Since 1999, cases of West Nile Virus have been identified in horses before cases we found in humans. South Dakota State University devised a plan to monitor for the presence of West Nile Virus infected animals as an indicator of sites within the state of South Dakota that are potential sources of infection for humans. During 2002, the SDSU Cooperative Extension Service cooperated with the South Dakota Department of Health to monitor for the disease. During this reporting period, birds were collected in all but one South Dakota counties which tested positive for the West Nile Virus. In addition, the SDSU Animal Disease Research and Diagnostic Laboratory, in conjunction with the South Dakota Department of Public Health and the National Veterinary Services Laboratory tested 896 horses in South Dakota. Six hundred and sixteen of the South Dakota horses tested were found to be infected with West Nile Virus. Tests were also conducted on a number of horses in other states—267 horses in Minnesota, 216 horses in Iowa, 47 horses in Nebraska, 25 horses in Montana, 14 horses in Wisconsin, 7 horses in Illinois, 3 horses in North Dakota, and 1 horse each in Virginia, Wyoming, Missouri, and Arizona.

Short impact statement - In addition to the many South Dakota horses infected with West Nile Virus; SDSU also identified two squirrels and one reindeer in the state that were infected with West Nile Virus. Other animals, including exotic birds and reptiles at zoos and domestic livestock, are rarely infected but isolated cases have been detected in some areas of the U.S. Scientists suspect additional animals have been infected in South Dakota and testing of farm poultry, wild and tame deer and elk, wild foxes, and various zoo species are currently underway. To date, West Nile cases have not identified in these species in South Dakota.

The surveillance information obtained is being reported to the Centers for Disease Control and Prevention (CDC), the U.S. Geological Survey, and the U.S. Department of Agriculture Animal and Plant Health Inspection Service (APHIS) so that national maps tracking the presence of West Nile Virus in birds, horses, and humans can be created and maintained on the world-wide web. This information will be critical to future epidemiology studies concerning the movement of the virus and viral vectors (mosquitoes). Tracking the presence of West Nile Virus may also allow us to identify possible reservoir animals—exotic or domestic birds, reptiles and/or non-human mammals—information that will be critical to establishing effective methods of vector control and disease prevention for both humans and non-human animals.

Summary of Funding

Smith Lever
Hatch Act
State

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

(4) Integrated Research and Extension

Key Theme: Ag Input Management & Precision Farming “New Corn May Reduce Phosphorus from Feedlots” (also relates to Goal 1, 2, 3, 5)

Brief description of the activity – Each year, hogs and poultry in the United States excrete about 30 million tons of manure containing 460,000 tons of phosphorus. South Dakota and many other states have written manure management regulations based on nitrogen, not phosphorus. A farmer who applies manure to his or her fields based on what the nitrogen standard allows can easily apply two to five times as much phosphorus as the crops will remove. Excess phosphorus in runoff can wash into waterways where it can spur abnormally high growth of algae and other aquatic plants. Decaying algae and plants, in turn, can deplete the dissolved oxygen in water to that fish and other organisms die. Therefore, controlling phosphorus runoff is important to maintaining a healthy aquatic environment. In the next two to three years, a new low-phytate corn will become available to farmers, theoretically allowing non-ruminant animals such as swine to absorb more of the phosphorus from the feed. South Dakota State University research has concentrated on managing phosphorus in manure. One way is to improve the digestibility of corn so that there is less phosphorus in hog manure. Low-phytate corn decreases excreted phosphorus by approximately 40 percent.

Short impact statement - Hogs typically can use only 15 to 20 percent of the phosphorus in ordinary corn, but they can absorb 65 to 75 percent of the phosphorus in low-phytate corn, allowing producers to decrease the supplemental phosphorus added to feed. Less phosphorus in the swine ration, combined with greater absorption in the animal, means less phosphorus runoff in the environment.

Bob Larson, a rural Sioux Falls, South Dakota hog producer who raises 18,000 slaughter pigs each year, says SDSU’s research into low-phytate corn carries tremendous implications for pork producers. “As an industry, we’re very interested. We have a phosphorus problem with manure, and this could help us tremendously.”

Source of Funding

Hatch Act

Smith-Lever 3(b) & (c)

Special Research Grants

Institution Challenge Grants

Renewable Resources Extension Act

Commodity

State – State Funds

Local

Other

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

(4) Integrated Research and Extension

Key Theme: Ag Input Management and Precision Farming “Biofilters Reduce Livestock Confinement Odor” (also relates to Goal 1, 2, 3, 5)

Brief description of the activity – As livestock confinement facilities grow in size and number, community concerns about odor management increase. Research at South Dakota State University is addressing that problem through the development of biofilters. A biofilter is simply a hood that covers the exhaust fans, channeling the exhaust through a layer of wooden pallets about four feet by four feet in size. The wooden pallets extend out about 20 feet from the building. On top of the pallets are a plastic netting covered with a 16-inch mixture of wood chips and compost. Construction of a biofilter for an average size swine confinement facility is somewhat labor intensive, but can cost as little as \$1,500 in materials. The projected life of a biofilter is four years, or until the wooden pallets start to collapse, compromising the airspace and reducing the systems ability to filter air. When that happens, the biofilter can be rebuilt and will continue to function.

Short impact statement - University tests indicate that the biofilter will reduce odor from a swine confinement facility by as much as 97 percent. The biofilter can be added to an existing closed facility with a ventilation system.

Source of Funding

Hatch Act

Smith-Lever 3(b) & (c)

State

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

(4) Integrated Research and Extension

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: Quality of Life

Output: SDSU horticulturalists have evaluated several types of turf grass to determine which will do best in home lawns as well as in commercial applications in South Dakota.

Outcome: Buffalograss, a plant native to the Plains, was identified as an excellent option for South Dakota lawns. It is energy efficient, tolerates great temperature swings, and is drought tolerant.

Impact: Buffalograss saves time, labor and money; and reduces the need for pesticides and fertilizers.

Program: Economic Development - Information

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: SDSU, working with several other land grant partners in the Midwest produces a commercial television program called *Today's Ag*. The program airs on commercial television stations, and on RFD-TV. The program has proven itself as an effective tool to communicate science-based information from land grant universities to agricultural and rural audiences.

Impact: Because of national satellite syndication, the program is available every week to 30 million subscribers of the DISH Network and DIRECTV.

Program: Economic Development - Agriculture

Output: SDSU Economists studied the off-farm employment patterns of South Dakota farm and ranch families and discovered a number of factors leading to off-farm employment.

Outcome: A clearer picture now exists regarding how farming and off-farm employment together help support the modern agricultural family. Researchers confirmed that the need for additional income and health insurance were prime motivators to seeking off-farm employment.

Impact: The off-farm employment trend is likely to continue and increase. While it helps reduce the risk of a bad crop year, it also may mean that farms need to be smaller so family members can work the farm and in town.

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 continues to be 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	263,041
State Match	272,114
FTE	18.8
Smith Lever	1,245,075
State Match	1,051,919
FTE	54.34

Key Themes for Goal Five

Key Theme: Economic Development - Agriculture “Off-Farm Employment Becomes Part of Modern Agriculture” (also relates to Goal 1,2, 3, 4)

Brief description of the activity - Since 1964, most net income earned by farm families in the United States has come from non-farm sources. In South Dakota, the number of farm operators working off the farm has increased nearly 10 percent in the past 20 years. Off-farm employment has become established as a part of modern farm life. South Dakota State University Economists studied off-farm employment rates since 1989. They found that 64 percent of South Dakota farms with married couples had some off-farm employment. Both the operator and spouse worked off the farm, either part-time or full-time, in 33 percent of the households. Only 36 percent of the farm households in the state had no off-farm employment by the operator or spouse. Economists found a number of factors leading to increased off-farm employment, including: families needing additional income, families needing health insurance coverage, and spouses who want to have careers away from the farm. Farmers aged 55 or older were less likely to work off the farm. What is new about this trend is not that farmers are working off the farm. Rather, it’s that they are working more days at non-farm jobs. In addition to the pay, these off farm jobs bring another valuable commodity to the rural family: benefits. In many cases, the most valuable part of the job may be the health insurance coverage for the rural family. Self-employed ranchers or farmers often pay hundreds, sometimes thousands of dollars to provide health insurance coverage to their families. By working off the farm, they are able to access health insurance at substantially lower costs.

Short impact statement - Partly due to off-farm jobs, farm operator household incomes were actually about 15 percent higher than the average for all U.S. households in 1998 - \$59,700 compared to \$51,900. The trend of additional off-farm employment will likely continue. It reduces risk, allowing farmers to ride out bad years. One drawback is that farm families may have to run a smaller, more specialized operation, choosing not to move into new enterprises that could make the farm more profitable.

Source of Funding

Hatch Act

Smith-Lever 3(b) & (c)

State – State Funds

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

(1) State Specific

Key Theme: Economic Development - Information “Impact of the Drought on People and Communities” (also relates to Goal 1,2,3,4)

Brief description of the activity – The drought in South Dakota has cost an estimated \$1.4 billion so far, and the impact continues to grow. The effect of the drought on local consumers, businesses and agribusinesses now tops \$757 million. To put this in perspective, the drought has cost the South Dakota economy about six percent of its total gross state product for the year 2000. While it’s possible to count the livestock that have been sold, crops that withered and were not harvested, and drop in economic activity, the real measure of the drought is its lasting impact on people. Communities that rely on agriculture have felt the crushing economic effects of the drought. “People are afraid to communicate with their bankers, and even with their own families,” according to Ziebach County Extension Educator Maurice Lemke. In Perkins County, ten percent of the people responding to an Extension survey indicated they needed food assistance for their families, help with medical insurance, medical bills and/or prescription medications. South Dakota State University has focused its resources on helping farmers and ranchers, families, businesses and communities to survive the drought. The Cooperative Extension Service has responded creating a drought task force, comprised of staff in every South Dakota Field Education Unit and subject matter specialty. The Agricultural Experiment Station continues its biostress research to identify crops and management systems that will cope with the dry conditions of the Northern Plains, and assist in an effective recovery when the rains return. Academic Programs is working with students to help them deal with the financial and emotional stresses of the drought.

Short impact statement - The drought task force works face-to-face with farmers and ranchers, families and in some cases, with communities to deliver science-based information to address the specific needs and issues arising from the drought. Issues addressed include:

- The tax implications of the drought – SDSU CES worked with the IRS to assure that tax answers were available as harvest and livestock decisions were being made.

- Family issues including stress, depression, children’s fears and family communications.
- Training and counseling for CES staff, targeted at supporting the people working in communities experiencing high levels of stress.

Source of Funding

Hatch Act

Smith-Lever 3(b) & (c)

State

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

(1) State Specific

Key Theme: Economic Development - Information “Today’s Ag – A National Television Program for Land Grant Universities” (also relates to Goal 1,2,3,4)

Brief description of the activity – Today’s Ag is a weekly half-hour news show about agriculture and rural life. It is the only television show in the nation that is endorsed by land grant universities, and is produced by South Dakota State University in cooperation with Iowa State University, the University of Nebraska-Lincoln, and North Dakota State University. Land Grant Universities, working with Today’s Ag, now have on-going access to a national audience, thanks to a partnership with RFD-TV. The partnership gives land grant universities access to more than 11 million viewers in all 50 states. In addition, Today’s Ag is also broadcast on commercial television stations across the Midwest. Existing and planned affiliate stations cover the television markets of: Sioux Falls, SD; Rapid City, SD; Omaha, NE; Lincoln, NE; Hastings/Grand Island, NE; Sioux City, IA; Waterloo, IA; Des Moines, IA; Cedar Rapids, IA; Ottumwa/Kirkville, MO; Fargo, ND; Bismarck, ND; and Rochester, MN. This network of stations gives Today’s Ag coverage of nearly all the TV Households in the states of the existing university partner group.

Short impact statement - Commercial television station broadcasts of *Today’s Ag* assures that the program reaches 300,000 farms in the Midwest with 196 million acres of farmland, nearly 15% of the total farmland in the United States. Additional satellite broadcasts on RFD-TV deliver another 21 million viewers. Audience surveys indicate that 44 percent of RFD-TV viewers are directly involved in agriculture. *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 Act

Smith-Lever 3(b) & (c)

State

Other – program sponsors

Scope of impact, identifying which of the following apply to the activities conducted
(5) Multistate Integrated Research and Extension (SD, IA, NE, ND)

Key Theme: Quality of Life “Buffalo Grass for Turf” (also relates to Goal 4)

Brief description of the activity – Turfgrass has a hard time thriving in South Dakota’s severe climate. Cool-season grasses such as Kentucky bluegrass are traditionally used in lawns. However, these non-native plants are labor intensive in the heat and drought of a South Dakota summer. To maintain their healthy green appearance, cool-season grasses require frequent mowing, fertilization, and during a drought, can require substantial watering. South Dakota State University horticulturists have evaluated native grasses to determine which types will do well in South Dakota lawns. Buffalograss may be the answer. Buffalograss is a hardy warm-season grass species native to Plains states from North Dakota to Texas. Historically, buffalo grazed it, and it is one of the most energy efficient turfgrasses in South Dakota. It tolerates cold weather, and doesn’t need water except in the harshest of drought periods. And then, it needs water only about once a month. Buffalograss plots at South Dakota State University have not been watered in three years. Buffalograss needs only about half the amount of nitrogen fertilizer of Kentucky bluegrass. It is competitive against weeds, and has no serious insect or disease pests. And perhaps best of all, it only gets between 5 and 7 inches tall, so it doesn’t need to be mowed more than just a few times each year.

Short impact statement - Compared to traditional cool-season lawn grasses, buffalograss saves landscapers time, labor and money; and reduces the need for pesticides and fertilizers. SDSU has started to recommend this native species for turf areas in South Dakota, including lawns, rural areas, acreages, commercial and industrial sites, and golf courses. Steve Harrar, golf course superintendent at the Minnehaha Country Club in Sioux Falls, S.D. has used buffalograss and likes it. “We have about two acres of buffalograss. It’s on a steep hill, which is tough to mow. I’m very pleased with it. It’s unique and very easy to take care of. I mow it only about once a month, and we’ve never had to irrigate it except when it was first planted.”

Source of Funding

Hatch

Smith-Lever 3(b) & (c)

State

Other – National Turfgrass Evaluation Program, South Dakota Turf Foundation

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

(2) Multistate Research

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

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

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

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

The State Extension Advisory Board provides guidance and direction to the Cooperative Extension Service, and informally to the Agricultural Experiment Station. Members of

this board are elected from each County Extension Advisory Board, and the 1994 land grant institutions.

On-going Stakeholder Input is often sought during special planning meetings. For example, the Sun Grant Initiative planning meeting in August 2002 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 – 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 other 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 2002</u>
Goal 1	87,684
Goal 2	30,405
Goal 3	24,432
Goal 4	31,219
Goal 5	97,729

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)

<u>Title of Planned Program/Activity</u>	<u>Actual Expenditures for FY 2002</u>
Goal 1	476,488
Goal 2	15,672
Goal 3	20,367
Goal 4	41,967
Goal 5	32,459

Integrated Activities (Smith Lever Act Funds)

<u>Title of Planned Program/Activity</u>	<u>Actual Expenditures for FY 2002</u>
Goal 1	237,499
Goal 2	82,352
Goal 3	66,176
Goal 4	84,558
Goal 5	264,704

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 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 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 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.