PLAN OF WORK

Annual Report

SOUTH DAKOTA STATE UNIVERSITY
Federal Fiscal Year 2000
October 1, 1999 - September 30, 2000

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 $16.3 billion in 1999. 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 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 2000, 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 work jointly 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, germ plasm and inbred lines developed and released for soybean, spring wheat, winter wheat, flax, and white corn. A landmark accomplishment, described in detail as a Key Theme, was SDSU's release of the first public soybean cultivar with a private transgenic trait (Roundup Ready). Commenting on this accomplishment, U.S. Senate Minority Leader Tom Daschle (D-S.D.) said the partnership between SDSU and Monsanto should be a model for future collaborative efforts between public institutions and private industry.
Outcome: The SDSU crop breeding program provides varieties adapted to South Dakota growing conditions. In the case of soybeans, SDSU has combined adapted varieties with transgenic traits that growers want. This is the only source of soybeans with this transgenic trait developed specifically for South Dakota.
Impact: Certified seed growers produced 50,000 units (50 lbs. Per unit) of 1091RR and will be available for producers during the 2001 season.

Program: Livestock Systems
Output: Livestock management efforts focus on Standardized Performance Analysis (SPA) of cow-calf producers, and calving to slaughter projects called the Calf Value Discovery Program. The calf value discovery project identified the influences of management, genetics, veterinary care, and feeding on final carcass quality.
Outcome: The SPA project documented that reasonable family incomes can be generated from as few as 200 cows as long as expenses and death losses were consistently minimized. The calf value discovery project is an integrated CES/AES program, representing a systems approach to understanding cattle management.
Impact: Both integrated programs add profitability to cattle production in South Dakota.

Program: Management Systems

Output: The program "Matching Cattle to Markets" demonstrated to cattlemen the effect of their marketing choices, measured in dollars and cents. The goal of the program was to improve producers ability to evaluate live animals and improve their marketing skills.
Outcome: This is a multi-state effort between South Dakota and Minnesota. Since the completion of the program, producers have used the grid system of marketing, sorting livestock for cutability and quality.
Impact: Producers report earning more money from their cattle when using the system. One producer reported increased profits of an average of $1.05 per pound, or $718 for the animal. Another producer reported $705 in premiums and $512 in discounts. Overall, 39 percent of the producers changed their cattle marketing program.

Assessment:
The programs of the Cooperative Extension Service and Agricultural Experiment Station have enhanced agricultural production systems, and helped individual producers increase the profit potential of their enterprises. New partnerships, such as the one with Monsanto, have brought valuable transgenic traits to South Dakota soybeans producers. This new soybean variety was designed specifically for South Dakota. 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	$1,695,404	
State Match	$1,707,984	($12,580 higher to offset Goal 2)
Smith Lever	$979,975	
State Match	$979,975	

Key Themes for Goal One

Key Theme: Biotechnology "Landmark Agreement Makes Roundup Ready Genes Available in South Dakota Public Soybean Varieties" (also relates to Goals 2,3,4,5)

Brief description of the activity - South Dakota soybean acres have nearly doubled since 1995, and now exceed corn as the state's largest crop. During 2000, 68% of the South Dakota soybean acreage was planted with Roundup Ready soybean varieties. None of these varieties were developed by public institutions, and were developed for use in other states and growing conditions. South Dakota State University and Monsanto entered into a landmark agreement to jointly develop and market public soybean cultivars that contain Monsanto's Roundup Ready technology. The public Roundup Ready varieties will be marketed by the South Dakota Crop Improvement Association under the new

brand name SoDak Genetics. All future transgenic varieties from the South Dakota Agricultural Experiment Station will be marketed under this brand name.

Short impact statement - The agreement between SDSU and Monsanto is the first of its kind. Previously, private industry has not entrusted its technology to a public institution. SDSU and Monsanto are working together to incorporate Roundup Ready technology in other crops, such as spring wheat. This program is in initial stages and varieties will not be available for several years.

Since 1996, South Dakota soybean producers have increasingly used Roundup Ready varieties. Use of this technology has been so important to producers that they have been willing to use varieties that are not specifically developed for South Dakota's growing conditions. As a result of this agreement, SDSU will develop Roundup Ready soybean varieties specifically for South Dakota and the northern Great Plains.

Hatch Act
Commodity – SD Soybean Research and Promotion Council, SD Crop Improvement Association
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: Agricultural Profitability "Standardized Performance Analysis" (also relates to Goal 5)

Brief description of the activity – Beef producers are always looking for efficient and effective ways to manage the financial side of their production operation. But they want to improve the business side of ranching without adding to their daily workload.

SDSU is putting the Standardized Performance Analysis (SPA) to work for cow-calf operators in South Dakota. SPA is a record keeping and analysis of the beef production enterprise. The goal of SPA is for ranchers to better endure the down side of the price cycle and better profit from the up side.

On the performance side, SPA-P analyzes the biological part of the enterprise, which in a cow-calf operation would include weaning weights, pregnancy rates, length of the calving period, death loss, and other measurements of actual production. The financial side, SPA-F is an enterprise financial analysis program which is based on the SPA-P numbers as a denominator.

Short impact statement - As a result of the SPA program, producers have access to management information in dollars per head or dollars per pound.

"It's a full analysis in which you've calculated in a standard way a break-even cost on a per-cow and per-calf basis," said SDSU Extension Beef Associate Barry Dunn. "The resulting break-even value allows a rancher to take two really big steps. The first is to control the cost of production, because you really break down feed per cow and fixed costs per cow to make management decisions. The second part allows you to do a good job marketing, since it is hard to forward contract or really market if you don't know hat your break-even value is."

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: Animal Health "Nitrate Testing Saves Cattle" (also relates to Goals 2, 4, 5)
Brief description of the activity – During a drought, nitrates become concentrated in forages. Highly toxic nitrate levels during periods of drought can cause the death of cattle.

The SDSU Cooperative Extension Service offered educational programs on the risks of nitrate poisoning. As a result, livestock producers in six counties submitted 60 forage samples to be tested for toxic nitrate levels. Eight samples showed very toxic nitrate levels, and 17 samples were potentially toxic. The remaining 35 forage samples were safe for consumption.

Short impact statement - Livestock producers protected nearly a million dollars worth of cattle from nitrate poisoning with just $800 in nitrate forage testing.

Smith-Lever 3 (b) & (c)
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: Risk Management "Managing Dairy Price Risk" (also relates to Goal 5)
Brief description of the activity – Dairy producers face substantial financial risk. One way to control this risk and plan for profit is to use milk futures and options to lock in prices.

The U.S. Department of Agriculture authorized dairy producers in two South Dakota counties to participate in the Dairy Options Pilot Program (DOPP). The SDSU Cooperative Extension Service taught the owners of 20 dairy operations how to use milk futures and options in marketing milk. As a result of the training program, these dairy operators became eligible to participate in DOPP, where the USDA picks up 80% of the premium costs and $30 of the transaction costs of buying put options on a limited volume of milk.

Short impact statement - All 20 dairy producers who participated in the Extension education program went on to sign up for the government DOPP program. These producers are using their knowledge of dairy put options to better manage the price risk of milk production. These producers are also better able to evaluate the fairness of cash forward contracts offered by cheese producers and cooperatives. One of the producers locked in a $14.00/cwt contract for 2000, while the market price fell to $10.50.

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: New Uses for Ag Products "New Corn Gum Product Helps Prevent Erosion" (also relates to Goal 5)

Brief description of the activity – Ethanol production is becoming a major industry in South Dakota. Like all other industries, ethanol plants create by-products. These plants use an abundance of energy to remove water from the condensed corn solubles, but they get little return for their product. South Dakota State University scientists have discovered a means to transform these by-products into a product that is profitable and environmentally friendly.

Using the by-products of ethanol production, SDSU researchers have created a corn-based gum product that can be used in different types of applications, replacing other synthetic gums that are imported into the United States.

The new gum product is blended with grass fibers or waste paper pulp and mixed with grass seed, creating a biodegradable grass seed/mulch product. This grass seed & mulch is spread on bare roadsides or torn up construction sites. As the grass begins to grow, the corn-gum mulch decomposes, protecting the soil from erosion without leaving an environmentally hazardous residue.

Short impact statement - The new corn-based gum may replace similar imported gums, which are more expensive. The product has an added benefit in that it is completely biodegradable. "This home-grown product wouldn't cost as much and would add value to South Dakota ethanol. The focus is to try to improve the economics on these corn

ethanol plants, primarily the dry mill plants we have in South Dakota," said Dr. Bill Gibbons of South Dakota State University.

Hatch Act
Special Research Grants
Commodity – SD Corn Utilization Council Grant
State – State Funds

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

Key Theme: New Uses for Ag Products "Wheat and Soybeans Replace Wood Fiberboard" (also relates to Goals 2 & 5)

Brief description of the activity – Toxic emissions from adhesives used in wood fiberboard panels can be a major health concern. Wood demand is projected to increase by 50% at a time when the world is already approaching maximum natural wood supply. Faced with an increasing worldwide wood fiber shortage, the construction industry is interested in the production of panel products from renewable agricultural residues. Wheat straw and soybean straw appear to make excellent fiber for those panel products, but have been limited by the available adhesives.

Scientists at South Dakota State University and Iowa State University have developed a soy protein-based adhesive capable of bonding agrifiber without compromising water resistance characteristics. Soybean straw and wheat straw, when bonded with the soy-based adhesive, have mechanical and water resistance properties comparable to wood fiber based panel boards.

Short impact statement - The new soy protein-based adhesive provides another panel fiber source to help satisfy increased consumer demand, without creating an additional strain on limited natural wood resources. The new product also creates a new market for soy protein as an adhesive.

Hatch Act
State – State Funds

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

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 work jointly to develop and support competitive and profitable agricultural production systems. This is accomplished by: 1) helping citizens adopt safe food selection, preparation, service and storage practices; 2) fostering rural-urban co-existence and use of natural resources by refining practices for the safe handling, storage and disposal of pesticides, livestock waste and other possible environmental contaminates; 3) studying the impact of present and future regulations on farms, producers, families and communities; and, 4) identifying and evaluating new marketing systems for agricultural products. 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 - Training
Output: A food safety curriculum titled the "Applied Food Safety Educational Program" has been developed for use in South Dakota.
Outcome: The project is based on input from stakeholders who identified appropriate tools and techniques for teaching food safety to young people. This year, the program has been piloted in 12 school districts and 13 CES Field Education Units.
Impact: school district administrators, as well as students enthusiastically received the pilot program. The program has fostered a new, collaborative relationship between SDSU CES and the 12 pilot school districts. The program also enables CES to address food safety issues ranging from food irradiation, food temperature and safety, and food preservation.

Program: Food Safety - Preservation
Output: A multidisciplinary team of scientists involving meats, nutrition, and agronomy has evaluated corn with elevated oil concentrations. Results indicated no consistent improvement in animal performance or feeding efficiency; however, the meat had elevated levels of vitamin E. The increased levels of this antioxidant adds greater shelf life to the final product, and helps maintain a natural color in the meat which consumers have come to recognize as an indicator of freshness and quality.
Outcome: Color is an important criteria to consumers when purchasing fresh meat. Enhanced use of high oil corn in the livestock ration may result in greater consumer acceptance of high quality fresh beef, due to more favorable natural coloring.
Impact: This research identifies opportunities for beef producers to feed livestock in a manner that has a visible impact on the quality of the final product. Beef that naturally maintains its fresh appearance extends shelf life in the story, and further enhances the consumer acceptance of the product. This research holds promise for cattle producers in all states.

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 discovered how varying the beef ration will have a positive impact on consumer acceptance of the product. 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 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	$15,237
State Match	$ 2,657
Smith Lever	$331,876
State Match	$331,876

Key Themes for Goal Two

Key Theme: Food Borne Pathogen Protection "Ozone Treatment Creates Safer Meat Products" (also relates to Goal 3)

Brief description of the activity – Rapidly increasing population density throughout the world has been accompanied by the evolution of new microbiological strains – such as *Listeria monocytogenes*, virulent strains of *Escharachi coli*, and assorted viruses. These microbes are playing a greater role in human illnesses. The world is also becoming more aware of the accumulation of toxic chemicals in our environment. These two independent developments have increased the national focus on finding safer sanitizing agents for food. Ozone is one such agent.

Ozone has been used safely and effectively in water treatment for nine decades. It is approved and recognized as safe for the treatment of bottled water. Scientists have investigated the use of ozone dissolved in water for sanitizing the surface of fruits and vegetables. South Dakota State University scientists are investigating the effectiveness of various ozone application techniques for the control of *Listeria monocytogenes* and *Escharachi coli* 0175:H7 in meat products.

Short impact statement - If studies currently underway are successful, ozone could replace chlorine as the food sanitizer of choice. This would reduce the use of chlorine, and provide a safer consumer meat product.

Hatch Act
State – State Funds

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

Goal 3: A healthy, well-nourished population.

1862 Research - X
1862 Extension - X

Program Description: A healthy, well-nourished population.

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

Program: Health and Nutrition - EFNEP
Output: The EFNEP program gives South Dakotans the nutrition information necessary to make healthy food choices. Psychological and socioeconomic factors present in South Dakota may influence food intake and nutritional status, and ultimately the health of the citizen. A disproportionate burden of diet-related disease is born by minority, low-income, and educationally disadvantaged persons. CES has focused nutritional education on these groups.
Outcome: During this reporting period, 444 adults and 1905 youth between the ages of 6 and 18 participated in the EFNEP program. This program empowered participants to improve their diet and nutrition.
Impact: Of the 444 adults participating in the program, 33% reported improved food safety practices, while 40% improved their food selection and food preparation practices. Of the 1905 youth participants, 76% improved food safety and food preparation practices while 63% increased their knowledge of nutrition essentials.

Program: Human Health
Output: SDSU Scientists have developed a very sensitive assay to determine sperm viability; the Sperm Chromatin Structure Assay.
Outcome: This assay detect sperm abnormalities prior to any detected by light microscopy and with much greater repeatability. Significant benefits have resulted for human fertility professionals and for the artificial livestock breeding industry.
Impact: This assay helps better define appropriate options to assist human reproduction and treat infertility. The assay also can be used to detect exposure to minute levels of environmental toxins.

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 farm youth, empowered farmers with disabilities to continue farming through training and equipment modifications, and developed a fertility evaluation which is used world-wide. 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	$66,784
State Match	$66,784
Smith Lever	$275,520
State Match	$275,520

Key Themes for Goal Three

Key Theme: Human Health "New Sperm Test Revolutionizes Human Infertility Treatment" (also relates to Goal 5)

Brief description of the activity – The sperm cell was the first cell ever observed under the light microscope by van Leeuwenhoek 330 years ago. For the past 50 years, scientists have focused on improving livestock genetics and helping infertile human couples. But they have been limited by technology. The microscope has been the basic tool of sperm research, limiting the scientists to sperm counts, motility and appearance; all assessments that are somewhat subjective.

South Dakota State University scientists have developed the Sperm Chromatin Structure Assay (SCSA). It is the first computerized, instrumentation-based test able to measure the genetic integrity of thousands of sperm cells in a sample in just seconds. The test also allows for faster detection of environmental heat stress and loss of sperm quality.

Short impact statement - The Sperm Chromatin Structure Assay (SCSA) is the only test in the world that is able to rapidly measure abnormalities that relate to defects in the paternal genes.

The test is included in the United Nations World Health Organization Manual, describing criteria for normal human fertility and techniques to assess fertility. The test has been established in laboratories around the world, including: Australia, New Zealand, Norway, Israel, Denmark, the Netherlands, and the Czech Republic.

"On the human side, a couple's experience with infertility is a major emotional and psychological problem. Our best contribution is to analyze the husband's sperm, and if it has defects that we can measure, we can likely spare the couple the expense of thousands of dollars on each attempt and the emotional expense of not achieving fertility," said Dr. Don Evenson, a Distinguished Professor of Chemistry and Biochemistry at SDSU.

In addition, a study in the Czech Republic has documented that environmental air pollution has a negative effect on sperm. This study used the SCSA test to detect changes in the sperm chromatin structure in relation to the presence of high pollution levels.

Hatch Funds – USDA
EPA
National Institutes of Health
March of Dimes
State Funds

Scope of impact, identifying which of the following apply to the activities conducted
(1) State Specific
(3) Multi-State 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 wildlife and agricultural production can productively 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: Chemical/Fertilizer Management
Output: For nearly a decade, the principles of broad crop rotation have been investigated throughout the state. The objectives of these projects are to diversify crop production in South Dakota, enhance the economic viability of agriculture, and minimize the use of pesticides and synthetic fertilizers. Crop rotations and tillage operations have been studied in southeastern South Dakota. Crop rotations in no-till systems have been studied in central South Dakota. Crop rotations emphasizing efficient use of water have been studied in the western part of the state.
Outcome: This substantial body of research has given clear guidance to producers throughout the state and region regarding the principles of successful crop rotations. The successful application of crop rotation was demonstrated in 2000, a year of one of the most severe droughts on record. The central part of the state received only 9 inches of precipitation, yet no-till producers had successful harvests, due in a large part to SDSU research and Extension programs.
Impact: Each year, crop production in the Northern Great Plains is impacted by numerous forms of environmental and biological stress. Crop rotation research is helping producers to develop cropping systems that can endure water, heat, disease, and other types of stress and yet maintain profitable production levels. The added diversity is environmentally sound and helps to minimize the need for synthetic inputs, such as pesticides and fertilizers. Research has documented that no-till systems help protect soils resources.

Program: Agricultural Input Management & Precision Farming
Output: Satellite and computer technology are being used to precisely manage agricultural systems. A multidisciplinary, multi-institutional team has been formed to help producers implement these new tools.

Outcome: Numerous conferences and publications have been developed on the principles and uses of precision agricultural technology. The research team has been emphasizing on-farm research and often takes a modern case-study approach to their systems research. The research has given guidance to producers for more judicious use of inputs such as seeds, pesticides, and synthetic fertilizers.
Impact: Numerous producers are now implementing precision agriculture tools in their operations. Producers indicate that these systems have lowered total use of pesticides and fertilizers and yields have been maintained.

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 strengthening the potential for agricultural profitability in South Dakota. Livestock waste management programs of the Cooperative Extension Service, in concert with the South Dakota Department of Environment and Natural Resources, have helped producers understand the various permits required for livestock production, as well as how facility design and location, combined with proper feeding can help minimize the impacts of livestock concentrations on the environment. Large producers are required to participate in the training in order to qualify for their permits. Agricultural Experiment Stations 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 regarding the contributions

GOAL FOUR FUND SUMMARY

Total Expenditures by Source of Funds

Hatch	$385,811
State Match	$385,811
Smith Lever	$291,175
State Match	$291,175

Key Themes for Goal Four

Key Theme: Biological Control "Multi-State/Multi-Disciplinary TEAM Spurge Controls Noxious Weed" (also relates to Goal 1)

Brief description of the activity – Leafy spurge is one of the harshest rangeland weeds in the nation. In the four-state area of South Dakota, North Dakota, Montana and Wyoming an overwhelming $144 million a year is lost due to this noxious weed. Leafy spurge displaces native vegetation, reduces livestock grazing, degrades wildlife habitats,

decreases rangeland plant diversity, and is nearly impossible to eradicate by any one method once it fires up.

A four-state collaborative TEAM (The Ecological Area-wide Management) has been assembled to combat the devastating effects of leafy spurge. It is the first large-scale, systematic demonstration of integrated control for leafy spurge. The team consists of representatives from the Cooperative Extension Service, Agricultural Experiment Station, and the USDA Agricultural Research Service.

The SDSU scientists are testing multiple control methods, including grazing sheep on the infested areas, herbicides and flea beetles. To help landowners wage war against leafy spurge, TEAM Spurge distributed more than 20 million flea beetles to 206 ranchers and land managers in 50 counties across 7 states in the last year.

Short impact statement - TEAM Spurge tests combining grazing and herbicides demonstrated 20% better control than herbicides alone. Biocontrol using Flea Beetles also shows promise. After the insects lay eggs on the ground, their larvae move into the soil and attack the leafy spurge plant, destroying the root from the inside out.
TEAM Spurge tests also indicate that goats seem to prefer leafy spurge to grass. Sheep eat the weed and grass about equally, and cattle seldom eat Leafy Spurge a second time after their first grazing. Rambouillet, Suffolk, Columbia and Polypay sheep grazing together removed about 55% of the leafy spurge and 50% of the grass.

Hatch Act
Smith-Lever 3(b) & (c)
State Funds
Other – National Fish and Wildlife Foundation

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

Key Theme: Natural Resource Management "Noxious Weed Control" (also relates to Goals 1 & 2)

Brief description of the activity – Noxious weed infestations currently represent a $180 million loss across South Dakota. Current county reports show only 60% of the acres receive effective weed control.

The SDSU Cooperative Extension Service provides education programs to producers, County Weed and Pest Boards, the South Dakota Department of Agriculture, the Bureau of Land Management, the Office of School and Public Lands, the Forest Service, and other agency land managers, and urban clientele. Extension is currently partnering with other agencies to expand effective control efforts and address expanding weed problems, including thistle and leafy spurge.

Short impact statement - Early survey results show that in 2000, educational programs resulted in a 10% increase in weed control efforts. Statewide, this additional weed control equates to a $15 million dollar benefit in crop production.

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: Water Quality "Agricultural Water Management Information System" (also relates to Goal 1 & 5)

Brief description of the activity – Controversy exists in South Dakota over the use of subsurface drainage on agricultural lands. On one side, the farmers and landowners need to obtain the highest economic return to remain viable in their operations. Meanwhile, many people in the general public are concerned that subsurface drainage may have detrimental effects on the environment. It is evident that many policy decisions are being made with little or no information. Consequently, the issue has remained polarized.

A cooperative effort is in progress to develop an information base on water management issues centered around drainage and wetlands. Cooperators include the Agricultural and Biosystems Engineering Department at SDSU, Farm Bureau, SD Soybean Research Council, and the SD Corn Growers.

A literature and information search is underway to find both current and historical information on the topic. Over 500 entries are in the database. The database will be made available to the public via several methods. Printed copies will be available together with a searchable CDROM version. Additionally, a dynamic, searchable database will be maintained on the Internet so that everyone has access to the information. A general information publication will also be produced as a summary of the project.

Short impact statement - The information database will allow farmers, decision-makers and the general public to have access to unbiased information that can be used when creating policy. The information will be available in a variety of forms to allow use by a broad range of stakeholders. Ultimately, having the information should result in the best possible chance of formulating equitable policy.

Smith-Lever 3(b) & (c)
Commodity – Cooperators include: SD Farm Bureau, SD Soybean Research Council, and the SD Corn Growers.
State – State Funds

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

Key Theme: Biodiversity "Mortensen Ranch Featured in Smithsonian Exhibit

Brief description of the activity – When Clarence Mortensen took over the family ranch west of Pierre, S.D. in the late 1940s, the area along a creek that ran through the 18,000-acre cattle ranch was treeless and scoured by gullies and ravines. Years of erosion and neglect had left the land scarred, reducing its agricultural production capacity.

Clarence Mortensen began a decades-long project to improve the ranch environment, both by better management of grazing and by building dams and planting trees to slow the flow of water from storms and melting snow. Over the years, Clarence has consulted with SDSU scientists, Extension staff and teachers to help focus the most current understanding of natural resource management on the revitalization of his ranch. The results have been impressive, both ecologically and economically. Restoring native grasses, trees and other plants has brought back native insects and wildlife, and managing cattle grazing in intentional patterns to mimic native bison has helped nearly eliminate erosion, multiply forage production eight-fold and cause the underground water level on their ranch to rise by four feet. These improvements have increased the livestock carrying capacity of the range, demonstrating that both agriculture and natural resources can benefit from good stewardship practices.

Today, the Mortensen ranch is a living laboratory for visitors, including SDSU scientists and students. The Mortensen's have turned back time nearly 200 years, restoring the land to the condition it was likely in before Europeans settled the North American continent. Their effort demonstrates how conservation practices will not only enhance natural resources, but also can be a profitable part of agricultural production.

Short impact statement – The Mortensen Ranch is featured in a new Smithsonian Museum exhibition about the North American prairie – from its unique mix of flora and fauna to its huge agricultural output. "Listening to the Prairie: Farming in Nature's Image" describes the evolution of the vast grasslands region as well as the progressive prairie farmers and ranchers who have found innovative new ways to farm the land and protect the environment.

The exhibit at the National Museum of Natural History runs from November 2000 to March 2001, and will then travel to 20 libraries across the country. The Mortensens, as well as other farmers and ranchers featured in the exhibition, have diversified their crops and livestock to minimize crop pests and withstand market fluctuations, reduced reliance on chemical pesticides and begun to sell directly to consumers for premium prices that reflect their hard work.

Other – the Smithsonian Institution, including grants from: W.K. Kellogg Foundation, US Department of Agriculture - SARE

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

1862 Research - X
1862 Extension - X

Program Description: Economic Opportunity and Quality of Life

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

Program: Family & Life – Youth Development
Output: In the year 2000, the Cooperative Extension Service piloted a program entitled "Putting Youth Back Into Sports." Pilot educational "face to face sessions" reached 125 people while written material was distributed to more than 10,000 families and interested parties across the State of South Dakota. Currently, a curriculum is being written that will address the developmental concerns of young athletes.
Outcome: SDSU has entered into a multi-state effort with Penn State University with the intent of developing the youth athletic curriculum and broadening it for national use.
Impact: One school district administrator has reported that use of the written educational materials has resulted in a decreased number of inappropriate behaviors at high school athletic events. In another school district, the school counselor uses the written educational material during counseling sessions with students.

Program: Economic Development – New Generation Cooperatives
Output: Ongoing research includes documenting social and economic conditions for the successful establishment and impacts of new generation cooperatives. One component of the research involved conducting a survey among residents in east-central South Dakota to assess residents perceptions of the social and economic impact of local cooperatives and value added agricultural industries.
Outcome: Survey respondents indicated that the economic as well as the social effects of a local cooperative have been positive. Other factors, such as air quality, were viewed as having been negatively affected by the cooperative. Residents expressed particular dissatisfaction with the completeness and accuracy of information provided by state and local officials, and by the cooperative itself.

Impact: Recognizing that value-added agriculture operations not only serve to benefit agricultural producer-members, but also aid rural development efforts, the results suggest that communication between leaders of the value-added agricultural operations and local residents is important for a mutually beneficial relationship. Further, the research shows that there is a great demand among rural citizens and their leaders for objective information concerning the potential social and economic impacts of such operations.

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 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	$190,735
State Match	$190,735
Smith Lever	$252,364
State Match	$252,364

Key Themes for Goal Five

Key Theme: Farm Safety "Raptor – The Utility Vehicle for People with Disabilities"

Brief description of the activity – Farm accidents or serious illnesses can cause life-changing disabilities. The physical limitations of such an accident or illness often prevents a farmer from being actively involved in agriculture.

Senior Agriculture Engineering students at South Dakota State University are developing hand and foot controls that can be installed on all-terrain or utility vehicles. For people with lower mobility impairments, students are designing a personal lift to be attached to the vehicle. And, the students are designing a modification to pick up wheel chairs and place it in the back of the vehicle. SDSU students are working with Koyker Manufacturing, the makers of a four-wheel utility vehicle called the "Raptor."

Short impact statement - The "Raptor" modifications will create to a utility vehicle for people with disabilities. It will be designed specifically for use in agriculture or other outdoor endeavors that require outdoor mobility. When completed, the equipment information will be shared through the National AgrAbility Project network, consisting of Land Grant Universities and the Cooperative Extension System.

Smith-Lever 3(b) & (c)
State – State Funds
Local – Student tuition
Other: Engineering and marketing assistance from Koyker Manufacturing of Lennox, SD.

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

Key Theme: Character/Ethics Education "Responsible Choices for Life"

Brief description of the activity – More money is spent each year for treatment and correction of delinquency in youth, than in prevention. If money and programs were targeted at prevention, the cycle of delinquency could be interrupted before expensive treatment is required. In Lincoln County, South Dakota, 30% of the population, or 6,191 people, are under the age of 20. This county spends $75,000 each year on corrections and/or treatment for delinquency related problems.

The Lincoln County Commission asked the South Dakota State University Cooperative Extension Service to implement a youth program that focuses on the prevention of delinquency. The program was titled "Youth Conference 2000: Responsible Choices for Life," and attracted 114 youth and 60 parents.

Short impact statement - Follow-up evaluations of youth indicates participants are focusing on behaviors that include honesty, proper lifestyle choices, and positive money management. Parents are focusing on role modeling and empowerment.

Smith-Lever 3 (b) & (c)
State – State Funds
Local – County Funds

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

Key Theme: Conflict Management "Putting Youth in Sports"

Brief description of the activity – The sportsmanship that kids are expected to exhibit on the field is often not matched by the sportsmanship in the stands. News reports from all parts of the country document the growing lack of courtesy and civility at student athletic events. In many cases, the worst offenders aren't the student athletes, but rather, the parents and adults. Parents attack coaches. Coaches choke umpires. Parents fight each other. The result is that young people say sports "aren't fun anymore," and drop out. Adults are largely the reason.

The South Dakota Cooperative Extension Service has piloted a program called "Putting Youth in Sports." Honesty, fairness, following the rules of the game, respectfulness, and courtesy are encouraged. The program fosters physical activity and sportsmanship, and provides a positive environment for the acceptance of personal and social responsibilities by youth, and to have fun. Winning is still part of the game, but not at all costs.
The first students of the program are coaches, parents and school/sports officials. The goal is to "transform youth sports so that sports can transform youth."

Short impact statement - Parents, coaches, sports administrators and others in the field of youth sports report that the program is having a positive impact. Nearly 100 people at three South Dakota communities completed the program. These people took the message to nearly 10,000 parents, coaches, and young athletes. The program has created an awareness of acceptable behavior, and everyone know that there is a higher standard. Perhaps most important, it set the stage for adults to be role models for good sportsmanship.

The pilot project was so successful that SDSU was invited to bring the program to Penn State. Stanford University has also joined preparing a series of workshops for parents, coaches, and other community leaders. These workshops will be piloted across the country and eventually integrated into the national Cooperative Extension System.

Smith-Lever 3(b) & (c)
State – State Funds
Local – County Funds

Scope of impact, identifying which of the following apply to the activities conducted
(2) Multistate Extension (PA, CA)

Stakeholder Input Process

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

The College of Agriculture and Biological Sciences solicited formal stakeholder input in many forms, from many sources, and at many locations. Methods of inviting stakeholder input included meetings or other communication with: Agricultural Experiment Station Research Farm Advisory Boards; Research Review Meetings with agricultural check-off groups including the South Dakota Soybean Research and Promotion Council, South Dakota Corn Utilization Council, South Dakota Beef Industry Council, South Dakota Oilseeds Council, South Dakota Pork Producers Council, South Dakota Wheat Commission, and others.

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

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

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, 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 was the establishment of 13 Field Education Units representing all parts of South Dakota. Each unit is comprised of 1 to 9 counties. A fourteenth 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 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

Title of Planned Program/Activity	Actual Expenditures for FY 2000
Goal 1	97,997
Goal 2	33,187
Goal 3	27,552
Goal 4	29,117
Goal 5	125,236

Summary of Multi-State 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, and the National Agrability Project.

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

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

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

Integrated Research and Extension Activities

Integrated Activities (Hatch Act Funds)

Title of Planned Program/Activity	Actual Expenditures for FY 2000
Goal 1	340,605
Goal 2	33,044
Goal 3	44,946
Goal 4	49,859
Goal 5	56,408

Integrated Activities (Smith Lever Act Funds)

Title of Planned Program/Activity	Actual Expenditures for FY 2000
Goal 1	195,994
Goal 2	66,375
Goal 3	55,104
Goal 4	58,234
Goal 5	250,472

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, Food Quality and Ag Product Marketing Systems provide information and research linkages to CES programs in Food Safety, Preservation and Training; Food Safety, and Pesticide and Livestock Waste Management.

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

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

In Goal Five, AES programs in 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; and, Strengthening Family Relationship and Roles.

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.