ANNUAL REPORT OF ACCOMPLISHMENTS AND RESULTS

North Dakota State University

North Dakota State University Extension Service
North Dakota Agricultural Experiment Station

Federal Fiscal Year 2000
(October 1, 1999 - September 30, 2000)

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A. PLANNED PROGRAMS

Goal 1. An Agricultural System That Is Highly Competitive In the Global Economy

Program 1: Competitive and Profitable Crop Production

Overview *- Changing climate conditions, pests and prices make crop production a challenge. Through these challenges, NDSU specialists and researchers respond b helping the states producers find ways to improve the profitability and sustainability of crop production.*

North Dakota leads the nation in production of hard red spring wheat, durum wheat, sunflower, barley, all dry edible beans, pinto beans, canola and flaxseed. The state ranks second in production of all wheat, navy beans, oats and honey and third in sugar beets. Exports of North Dakota commodities and products are valued at $1.7 billion. Crop production is critically important to the economy of the Northern Great Plains. Cash receipts from crops provide more than $3 billion to the economic base of North Dakota. A short growing season and low rainfall limit diversification, yields and cropping potential. Still North Dakota is one of the most agriculturally diverse states in the nation with more than 40 different crops grown.

Similarly, livestock production is big business in North Dakota, accounting for $15.4 percent of the total agricultural cash receipts — $549 million — in 1998. And livestock production is the original value-added enterprise adding value to the state's abundant crop forage and rangeland resources. More than 44 percent of North Dakota's land use is associated with rangeland, pasture land and hayland. NDSU programs help producers cut costs, boost returns and fund new opportunities.

A key to the success of crop production in North Dakota is the continued genetic improvement of crops. In 2000, varieties released by NDSU had an annual economic impact based on increased yield alone of about $110 million annually. About 90 percent of that economic impact was from the spring wheat variety Alsen, the first hard red spring wheat variety which combines high quality and good agronomic characteristics with resistance to Fusarium Head Blight.

In addition to improvement in the state's major crops, scientists assess minor crop varieties and production practices. These minor crops give producers crop rotation flexibility for dealing with pest and disease problems in major crops. In North Dakota, lentil acreage has increased from about 2,500 acres in 1993 to more than 44,000 acres in 2000. Dry peas have increased from 2,000 acres to more than 67,000. Canola increased from 20,000 acres to 1.26 million.

The micro-rate system of herbicide application developed at NDSU has been widely accepted by sugar beet growers in North Dakota and Minnesota and shows potential for use in other

cropping systems.. Average savings per acre of micro-rate application in sugar beet was $20 with a total industry cost saving of $39 million. The micro-rate system in corn weed control is expected to reduce herbicide costs in North Dakota by $16/acre. Preliminary research in small grains, soybean, and drybean project cost reduction of $2 to $6/acre annually. This herbicide application method will increase both net economic income and reduce herbicide usage.

NDSU specialists are helping livestock producers hone their management skills too. The NDSU Extension Service helps dairy producers assemble diagnostic advisory teams of local experts to identify key areas for improvements. So far, 46 farms have adopted the concept. Some sample results: One farm increased cash flow $7,200 in the first month without any additional expenditures by applying new technology, while using existing farm resources. Balancing herd rations, feed bunk management, and monitoring production helped increase annual income over $86,000. Another farm boosted milk production by 7 pounds per cow per day adding $1,800 per month in income by making ration changes and implementing timely nutrition monitoring. Poor quality forages limited a third farm's income potential, so the team redesigned the farm's cropping system to improve milk production and efficiency of land and labor use.

Better management of rangeland resources if often a key to greater profitability for beef producers. Eighty-four ranchers participated in the 12-month rangeland planning workshop. Roughly 47 percent of the ranchers were beginners in developing new grazing strategies while the remaining individuals looking to further improve their current grazing and forage programs. These four workshops impacted almost 116,000 acres of native rangeland, pastureland, and hayland. Over 75 percent of the participants were planning to add new range improvement practices and over 90 percent planned to implement some of the training strategies learned in the workshops. Two employees of the US Forest Service and the Commissioner of the North Dakota Game and Fish Department participated in the program. These three individuals response to the workshop included trying to incorporate new strategies on a potential 1 to 2 million acres of public lands.

Leafy spurge is a weed that reduces the usefulness of millions of acres in North Dakota. Cattle won't eat the weed, but NDSU specialists found that sheep effectively controlled leafy spurge after one year using a single species grazing approach and after three years using a multi-species grazing approach. Leafy spurge stem densities were reduced by 94 percent and 82 percent on single-species and multi-species grazing treatments, respectively, after five years. Season long grazing using a multi-species approach provided a quicker, more efficient grazing of leafy spurge than rotational grazing; however, both reduced leafy spurge stem densities by 92 percent and 32 percent, respectively, after five years. The research provides new options for North Dakota livestock producers who want to control this invasive weed. Chemical control on large patches of the weed are seldom cost effective. The research shows that sheep can provide some financial return while providing control.

Most calves born in North Dakota are shipped to out-of-state feedlots for finishing, representing

an untapped potential to add value to them in the state by feeding them locally grown feed crops. The NDSU Extension Service showed that it cost up to 3 cents less per pound to finish cattle in North Dakota compared to an out-of-state feedlot. Extension information prompted a group of cattle producers to pool funds and custom feed more than 1,300 head in North Dakota feedlots. With help from Extension specialists and agents, they realized a return of more than 31 percent last year. Another group built a 7,000-head feedyard in Bowman County. Other producers will earn a premium of up to 3 cents per pound for cattle that meet processing specifications of a new local processing company. More than 130 producers attended Extension feedlot schools last year. One participant estimated that better health practices, bunk management and feeding practices cut his cost of gain by up to five cents per pound.

Key Theme – Plant Germplasm: Genetic Improvement of Major Crops.

The NDSU Agricultural Experiment Station has breeding and research programs in most of these crops with the goal of releasing new varieties. Germplasm from these research programs is shared with public and private breeders worldwide. In sunflower and sugar beet, which are also major crops, germplasm is released by the USDA for use by private and public breeding programs. USDA scientists provide basic genetic information and in some cases develop and provide germplasm to assist breeding programs. In some crops, USDA coordinates regional trials that allow the plant breeder to determine the adaptability of his genetic material across a wide range of environments outside North Dakota. The plant breeders, which are located in the Department of Plant Sciences, cooperate extensively with their counterparts in the Departments of Plant Pathology, Cereal Science and the research extension centers in varietal development and genetic research. Crosses made by the breeder are evaluated for agronomic characteristics by the breeder, quality characteristics by cereal scientists, and disease resistance by plant pathologists. Based on the information provided, the breeder then makes a decision on which material to discard and what it moves forward in the program. The extension service has a major role in educating the producers about new varieties.

Impact - Genetically improved varieties that possess improved agronomic performance and quality have a major impact on the state and region. Varieties that have increased yield and improved disease resistance and quality provides producers with the opportunity to increase their economic potential through wider accessability to markets and improved prices. The genetic improvement of major crops for successful crop production requires research effort by the scientist and subsequent dissemination of the knowledge and education to the producer, product purchaser, and the end use of the finished product by extension personnel. Extension efforts are directed at the state, county, national, and international levels.

Several new and improved crop varieties were developed and released using conventional methods of plant breeding. Some of these varieties have increased yield due to improved disease resistance, especially head, kernel, and leaf disease resistance while others that have been released have improved agronomic and quality factors (for example, greater test weight, kernel size, higher protein (wheat), improved milling extraction percentage, lower protein (barley for

malting purposes), increased fiber levels in oat for human consumption, specific oat varieties for race horses, hulless oats for improved livestock feeding efficiency, etc.

In 2000 varieties released by NDSU had an annual economic impact based on increased yield alone of about $110M annually. About 90 percent of the economic impact was from the spring wheat variety 'Alsen'. Alsen is the first HRSW variety which combines high quality and good agronomic characteristics with Type II resistance to Fusarium Head Blight (FHB). The variety will also have an impact in South Dakota, Minnesota, and to a lesser extent, Montana. Almost 40,000 bushels were increased and available to producers in North and South Dakota and Minnesota. If the variety is approved for production in Canada, where it is well adapted, it will also have a significant economic impact there.

Other varieties were released for use by oat, durum, dry edible bean, six-rowed barley, and soybean producers. The acceptance of the two-rowed barley 'Conlon' as a malting variety will have a major impact on barley production in central and western North Dakota. The benefits will also be felt in South Dakota to a lesser extent. The recent release of several high quality and high yielding durum varieties has had a major impact in northwestern North Dakota and northeastern Montana. The education of producers about the strengths and weaknesses of new varieties is a primary function of the extension service. A typical crop variety lasts 5-6 years, at which time it is probably replaced by another that possesses improved agronomic characteristics and yield. If the variety finds a niche area or market, it can last much longer. As a result, there is a continual need for programs to provide producers the option to select those varieties from public and private breeding programs that best fit their needs.

Source of federal funds: Smith-Lever and Hatch

Scope of impact: Multi-state Integrated Research and Extension: SD, MN, MT

Key Theme – Agricultural Profitability: Assessment of Minor Crops

Much of the agronomic assessment of minor crops is conducted at the NDSU Research Extension Centers located throughout the state and by one or two research projects located at the main station in Fargo. Efforts can be divided into minor crops, which involve both research and extension, and new crops, which typically involve research only, since crops in this area are not commercially grown. Research and subsequent extension training on minor crops are typically directed toward answering producers' problems. These include variety evaluation for agronomic performance and quality, disease and insect resistance, and information on agronomic practices including stand establishment, weed control harvesting procedures and storage. Agronomists, plant pathologists, and entomologists and extension personnel located at the REC and at the main station, and cereal scientists at the main station are heavily involved in all aspects of the work. One of the major factors that limits the production of new crops is nonadaptability of available varieties and the availability of a market.

Impact - Since 1993, disease problems in hard red spring wheat and durum wheat, and barley have

increased dramatically and reduced acreage, yield, and quality. As economic returns from the major crops were reduced, minor crops become increasingly important in North Dakota. Acreages of crops such as peas, canola, crambe, and lentils all of which were considered minor crops just 8-9 years ago, became major crops as producers sought increased economic gains or in an attempt to incorporate them into crop rotations in an effort to reduce insect and disease buildup that developed under the more monoculture system.

The scope of the impact in North Dakota and neighboring states is evident by the changes in acreage. In North Dakota, lentil acreage has increased from about 2,500 acres in 1993 to over 44,000 acres in 2000. Dry peas have increased from about 2,000 acres to more than 67,000 acres during the same period. Canola increased from 20,000 acres to 1.26 million acres. North Dakota, despite its northern climate, has 1.8 million acres of soybean which is greater than barley, an older traditional crop. Other minor less extensive crops in which research and extension efforts have focused inc lude carrots, onions, and borage.

Source of federal funds: Smith-Lever and Hatch

Scope of the impact: Multi-state Integrated Research and Extension: MN, MT

Key Theme – Plant Production Efficiency: Develop management strategies to sustain crop productivity

Research on methods of correcting iron deficiency chlorosis in soybean by the Soils Department indicated varietal selection was the most important method of control, followed by increased seeding rate. Seed treatments were found to be ineffective. In another area of research, significant efforts have been made to reduce the amount of herbicides that are applied for weed control. The technique is called micro-rate application and consists of using an adjuvant to increase the activity of the herbic ide along with a reduced herbicide rate, for example ⅛ the rate recommended by the chemical companies. Applications are made 2-3 times during the season. The end results are a reduction in herbicide costs to the producers and reduced amounts of total herbicide usage resulting in a more environmentally friendly agricultural production system.

Impact - Because varietal sensitivity is the most important factor influencing iron chlorosis in soybeans, pre-screening of experimental lines by soil scientists in cooperation with the breeder will eliminate sensitive material from being released for commercial products. Since the varieties developed are adapted to North Dakota and to a lesser extent to South Dakota and Minnesota, the research will have regional impact. The micro-rate system has been widely accepted by sugar beet growers in North Dakota and Minnesota and shows potential for use in other cropping systems. Average savings per acre of micro-rate application in sugar beet was $20 with a total industry cost saving of $39 million. The micro-rate system in corn weed control is expected to reduce herbicide costs in North Dakota by $16/acre. Preliminary research in small

grains, soybean, and drybean project cost reduction of $2 to $6/acre annually. This herbicide application method will increase both net economic income and reduce herbicide usage.

Source of federal funds: Smith-Lever and Hatch

Scope of the impact: Multi-state Integrated Research and Extension, MN.

Key Theme – Agricultural Competitiveness: Increase the agricultural producer, consumer, government and social sector awareness, understanding, and information regarding agricultural systems.

Extension specialists, with assistance from research scientists, have developed several programs to describe varieties, production practices, and products available. These programs are designed to address problems by the urban and rural client. Information on the global economy and the opportunities and pitfalls associated with it are being provide d. Information that involves case studies of real situations are being taught in classrooms. The objective is to stimulate both independent thinking and develop team work, as the problems require the interpretation of concepts from several disciplines.

Impact - Clients of the North Dakota State University Extension Service and Agricultural Experiment Station are well served by the faculty and staff of Plant Sciences, Soil Science, Cereal Science, Entomology, and Agricultural and Biosystems Engineering. All faculty, both research and extension, provide current and unbiased information to specific producers, commodity, or business groups upon request. In addition to information on general problems, practices and procedures are available to the general public for farm, rural, urban, commodity and private industry.

Today, food production is global in nature. For some producers, especially older ones, this can be a difficult concept to comprehend, and special efforts must be made to strengthen the concept that rainfall patterns in South America, drought in Australia, etc., have a major impact on them. Agriculture is a business, not a farm that supports a family. Updated information must continually be provided in order for the producer to make sound business decisions.

Several of our undergraduate classes include case studies where students who work in small teams are asked to solve or help provide information to solve problems. These problems are often quite complex and require a blending of several disciplines into the development of a final solution. Many of the case studies are taken from problems posed to our research and extension faculty, private industry, ag consultants, industry, commodity groups and research and extension centers. The scope of the impact is primarily on North Dakota, the surrounding states of Minnesota, South Dakota, and Montana, and the Canadian prairie provinces. Several methods of information dissemination used include radio, television, press, internet, and consumer service as well as printed matter. In addition, numerous phone calls are received by faculty and staff, who

are directly accessible. The nature of the case studies given to students is such that when their schooling is concluded they must be able to reason out and solve a diversity of problems.

Source of federal funds: Smith-Lever and Hatch

Scope of the impact: Multi-state Integrated Research and Extension, MN, MT and SD.

Key Theme - Agricultural Competitiveness: County Cropping Systems:

Extension staff developed a comprehensive program to provide LaMoure County producers up-to-date and local information on cropping systems while helping them make transitions from one crop to another with as little negative impact profitability as possible.

To help producers with up to date information on small grain and sunflower varieties, staff work with area groups and establish variety plots. Annual plot tours feature a review of varieties/hybrids and current topics of interest to producers, such as insect problems, crop rotations, production practices, markets, herbicide comparisons and plant population studies. After the plots are harvested, data is compiled, printed and disseminated to producers in LaMoure and neighboring counties. The results are also printed in the Annual Crop Production Guide and Variety Trial bulletins printed by the NDSU Extension Service.

Throughout the winter meeting season staff either hold or invite producers to other area production meetings to fine tune their production skills.

Cooperating Institutions/organizations: LaMoure County Extension Office, Edgeley Farmers Union Grain Elevator, Farmers Union Oil Company of Edgeley, National Sunflower Association, Sunflower Seed Companies, Dr. Mike McMullen, NDSU Oats Breeder; Tom Kiecker, Edgeley Producer; and the LaMoure County Ag Improvement Association.

Impact - Because of more favorable prices and problems with disease, many county farmers were looking to switch from HRSW to soybeans and corn production. Most had little or no experience growing these crops. Because of crop tours, workshops and seminars, most producers made the switch and successfully increased returns. In 1995 there only 7,454 acres planted into soybeans and 21,375 acres into corn. In 2000 this number increased to 101,903 acres into soybeans and corn increased to 52,365 acres. Most of these acres were taken from less profitable HRSW acres. Wheat acres in 1995 were 261,901; in 2000 wheat acres fell to 165,613. Economic impact of changing wheat acres to soybean and/or corn acres was approximately $10 million of additional gross revenue for LaMoure County producers

Source of federal funds: Smith-Lever

Scope of impact: State Specific

Key Theme – Plant Health: Diagnosis and Management of Root Disease in Western North Dakota

Area extension cropping systems specialist, state extension plant pathologist, and county agents in southwest North Dakota developed a demonstration using a soil fumigant to show producers yield and quality losses that can be expected in continuous wheat, wheat every other year, and when a least a two-year break occurs between wheat crops. Also, nitrate levels in the root zone were compared between fumigated and non-fumigated soils to illustrate the potential environmental impact that continuous wheat may have should nitrates be leached below the root zone. These demonstrations were observed and discussed with producers at field days and county agricultural improvement tours. Presentations were developed and given to producer groups and were included in the NDSU Extension Service CD which is distributed to county agents across the state.

Cooperating Institutions and Organizations: North Dakota State University Cooperative Extension Service, Dickinson Research Extension Center, Williston Research Extension Center, Hettinger Research Extension Center, County Extension Services and County Crop Improvement Associations in Adams, Golden Valley, Hettinger, Mercer, McLean, Morton, Oliver, and Sioux Counties, Sustainable Agriculture Mini-grant program administered by NDSU, Cooperative Extension Service.

Impact – From Oct. 1, 1999 to Sept. 30, 2000 more than 450 producers attended field days and county crop improvement tours to observe the plots. In addition to the demonstrations, presentations at the New Opportunities in Dryland Cropping Systems program in Billings, Montana (over 250 people), and county crop improvement winter meetings (372 producers) on root disease and rotation's role in controlling them was presented. Eighteen producers have indicated that they have changed their crop rotation as a result of seeing this demonstration. About 75 more producers are interested in changing from intensive continuous wheat rotations to less intensive wheat rotations. In 1996, 72 percent of the wheat that planted in southwest North Dakota was on wheat, barley, or durum stubble. In 2000 48 percent of the wheat grown in the southwest part of the state was grown on wheat, barley, or durum stubble. Some of this change may be attributed to this demonstration.

Source of federal funds: Smith-Lever

Scope of impact: Multi-state Extension, MT

Key Theme - Biotechnology – Biotech Crops

Area extension cropping systems specialist and the Stark County Extension agent developed a demonstration and display on biotech crops at the Dickinson Research Extension Center. BT sweet corn and BT potatoes were grown and compared to isolines of the same varieties that did not contain BT. European corn borer infestation levels were documented in sweet corn, and Colorado potato beetle infestation levels were compared between potato isolines. Yield of marketable sweet corn ears and pounds of potatoes were documented. The identity of the potatoes was preserved after harvest and

they were used in a display and demonstration at the West River Ag Expo in Dickinson. French fries were made using NuSun sunflower oil and show participants offered the chance to try to taste the difference between BT and non-BT
potatoes.

Cooperating Institutions/Organizations: North Dakota Cooperative Extension Service, Stark County Extension Service, Dickinson Chamber of Commerce and Agriculture, National Sunflower Association, Novartis Seed and Nature Mark

Impact - More than 700 people tried to taste the difference between french fries made from BT and non-BT potatoes. No one who tried the fries could tell the difference. Over 30 requests for additional information on biotech crops were received as a result of this demonstration and display.

Source of federal funds: Smith-Lever

Scope of impact: State specific

Key Theme - Plant Production Efficiency: Sunflower Date of Planting in Western North Dakota

Area extension cropping systems specialist and the Slope County Extension agent developed a demonstration/study to show producers the effect that moving the planting date from late to early has on yield and quality of sunflower oil produced. In the two years that this demonstration has been conducted, plant stand establishment on April and early May seeding da tes was difficult while planting dates later in May stand establishment was much easier. Yield, oil content, and oleic acid content were higher for sunflowers planted around May 23. Producer groups have toured the plots during county ag improvement tours. Cooperating Institutions/Organizations: North Dakota Cooperative Extension Service, Slope County Cooperative Extension Service, Slope County Crop and Livestock Improvement Association, National Sunflower Association, ND State Board of Agricultural Resea rch and Education, SDA Agricultural Research Service, Fargo, ND, Mycogen Seeds Inc.

Impact - More than 60 producers attended a field tour that looked at the sunflower date of planting plots near Bowman. Nine producers have requested the information generated from these plots. One producer has already indicated that he is moving his planting date to similar to what the data from this demonstration indicates. If producers move from a June 7 – 10 planting date to a May 23 planting date they will generate an additional $25 per acre income from increased yield and oil quality.

Source of federal funds: Smith-Lever
Scope of Impact - Integrated research and extension.

Allocated Resources
($ x $1,000) **FY00**

1862 Extension ($)	Smith-Lever	1770
	State	2480
	FTE	55
1862 Research ($)	Hatch	1206
	State	1961
	FTE	28

Program 2: Competitive and Profitable Animal Production

Key Theme - Agricultural Profitability: North Dakota Dairy Diagnostic Program

The extension dairy specialist in collaboration with the North Dakota Dairy Strategic Planning Task Force launched a state-wide effort after conducting a pilot project and securing grant funds to establish a network of diagnostic teams for dairy farm families. This t ask force serves in an advisory capacity to the program and is involved in efforts for future funding. The group consists of producers, industry leaders, agricultural financial advisors, government and regulatory personal, as well as the extension dairy specialist. A state-wide coordinator and two facilitators (all part-time) introduce, implement, and maintain 10 to 20 farm teams each. The dairy farm family's own personal advisory team consists of a unique combination of various service providers who hav e a vested interest in the success of the dairy farm business. All advisory teams are required to help the farm families prepare and record a set of attainable goals and design a mission statement at the onset of the program. They continue to provide support and guidance on business and production decisions on regularly scheduled basis.

The program's intent is to analyze dairy farm enterprise(s) through teamwork, and provide training on communication and facilitation skills for both the farm family and the supporting team members. Key outcomes taken from the evaluations provided by the program users include: the value of setting goals and monitoring progress, developing trust between the farm and their service providers, reducing professional barriers among advisors, learning to communicate more effectively, the value of hearing others acknowledge success, and synergism through team efforts. By the end of the program planning year, 46 farms have adapted the advisory team concept. Our current goal is to establish these teams on 10 percent of North Dakota dairy farms, to secure additional funding, and develop a plan to sustain growth and development.

Impact - Some of the success stories are summarized below.

● Farm A. Increased cash flow $7,200 in the first month without any additional expenditures by applying new technology, while using existing farm resources. Balancing herd rations, feed bunk management, and monitoring production helped increase annual income over $86,000.

● Farm B. Two months of ration changes and timely nutrition monitoring resulted in 7 pounds per cow per day of additional milk adding $1,800 per month income to this dairy herd.

● Farm C. Poor quality forages limited this farm's income potential, so the team redesigned the farm's cropping system to improve milk production and efficiency of land and labor use.

● Farm D. Adding a new partner to this operation decreased fixed costs for an under-utilized facility and helped a younger dairy person get his start in the industry. This change further enabled the owner to increase his herd size while improving his weekend lifestyle.

● Farm E. By analyzing and adjusting the milking herd ration this farm realized a $0.69 feed cost per cow per day savings, equivalent to $20,000 increase in annual dairy income.

● Farm F. Milk production increased 4 pounds per day per cow after implementing team advice, generating an increase of $14,000 in farm revenue.

● Farm G. Financial analysis of the total farming operation by the advisory team provided farm management with the knowledge to initiate business changes that justified additional financing to purchase 40 more cows. This farm expansion and adjustment in time management for the dairy herd increased production from 56 to 70 pounds per cow per day on a herd expanded to 200 cows.

● Farm H. The average daily milk production for this herd rose an additional 1,800 pounds in one year due to technology and management changes in cow nutrition, herd handling techniques, implementation of a herd health program, and improvements in the cow reproductive program.

● Farm I. Changing their feeding system to a total mixed ration, increased daily milk production 11 pounds per cow over a six-month period.

● Farm J. This dairy farm family's rolling herd average increased 5,000 pounds in one year. Improved production was attributed to adjustments made on many aspects of the total farm business, i.e., financing, herd nutrition/feed bunk management, cropping systems, labor and family time management, and calf raising options, to better utilize existing facilities to implement a dry cow program.

Source of federal funds: Smith-Lever

Scope of impact: State Specific

Key Theme - Animal Production Efficiency: Reproductive Management

Extension personnel developed programs on swine breeding targets to go along with swine production targets for producer groups across the state. The presentations drew on published information from the CD: Reproductive Management of Pigs. Researchers presented results and projected uses of information on assisted reproductive technology in ruminants. All programs were presented to promote producer awareness of the existing technology and how it might be integrated into their programs. Producer efficiency can be most easily improved by increasing the use of new technologies. Cooperating organizations include the North Dakota Pork Producers and the North Dakota Lamb & Wool Growers.

Impact - More than 50 swine producers attended repeated presentations of the breeding targets material. Sheep producers (75-100) also were in attendance to listen to new ideas for improving reproduction.

Source of federal funds: Smith- Lever

Scope of Impact: State specific

Key Theme - Animal Health: Volunteer Johne's Program for North Dakota

In conjunction with the Office of the State Veterinarian, we assessed and developed a voluntary Johne's control program for North Dakota dairy and beef producers to help control Mycobacterium avium paratuberculosis in cattle.

Impact: Through the combined efforts of the Office of the State Veterinarian and the North Dakota Extension Service, the confidentiality laws of North Dakota were changed in 1999 so that testing results for Johne's disease status were exempt from public disclosure. From 1984 to 1994, approximately 25 cases of Johne's disease were reported in cattle. In the year 2000, 370 herds were tested for Johne's and 210 were positive, indicating that more producers are willing to have their herds tested and control of the disease will be improved. The long range impact of this program will be national. Many states (e.g. Hawaii) have contacted North Dakota with the hopes of following North Dakota's lead in establishing a voluntary Johne's control program.

Source of federal funds: Smith-Lever

Scope of Impact: Multi-state research and extension.

Key Theme - Rangeland/Pasture Management: Renewable Resources

An integrated extension and research program was developed to improve rangeland management across the state. Key components of the effort included:

Extension–

***** 12-month grazing and forage planning workshop (2- and 3-day): Four intensive grazing and forage sessions were held in North Dakota for livestock producers. Ranchers learned to improve their rangeland management skills and develop year-long forage use strategies.

* Trace and macro mineral management workshops: Four workshops were conducted in western North Dakota for livestock producers. Ranchers learned mineral needs for livestock, mineral status on rangeland and pastureland, and balancing mineral needs to improve management skills of the grazing livestock animal and become pro-active in maintaining and understanding a well-balanced mineral program. These workshops were designed to teach livestock producers potential problems in mineral deficiencies and how to balance a supplement program to improve livestock health.

*Educating youth on the importance of the range resource: A 4-day range youth camp was conducted in western North Dakota for youth interested in the range resource and range judging. Youth learned the importance of range to livestock producers, the environment community, and wildlife enthusiasts. They learned basic fundamental range management practices and how to judge the resource for health and value for forage and wildlife habitat.

Impact - Eighty-four ranchers participated in the 12-month planning workshop. Roughly 47 percent of the ranchers were beginners in developing new grazing strategies while the remaining individuals were looking to further improve their current grazing and forage programs. These four workshops impacted almost 116,000 acres of native rangeland, pastureland, and hayland. Over 75 percent of the participants were planning to add new range improvement practices and over 90 percent planning to implement some of the training strategies learned in the workshops. Two employees of the US Forest Service and the Commissioner of the North Dakota Game and Fish Department participated in the program. These three individuals response to the workshop included trying to incorporate new strategies on a potential 1 to 2 million acres of public lands.

More than 150 ranchers participated in the mineral management workshops, having a direct impact on the health and production potential of an estimated 30,000 head of livestock.

More than 40 youth ages 13-18 participated in the 4-day range camp and more than 140 participated in the State Range Judging Contest. We believe any involvement of youth in the importance of the range resource and fundamental needs for managing these lands will create a more well-rounded adult.

Research -

NDSU Extension Service in cooperation with the Animal and Range Sciences Department and Hettinger Extension and Research Center have conducted three nutritional studies in western and south central North Dakota. This research has recognized nutritional composition and mineral status of 36 different grass varieties (20 cool-season and 16 warm-season grasses).

Impact - These results will allow forage growers, livestock producers, and wildlife managers to selected one or more grasses that fit their needs and goals that should provide a more economically efficient operation. They can select a grass that fits a specific program and problem area. Example: if livestock producers need to add spring and fall pastures and a summer haying field, they can select a grass that fits each specific need while providing nutrients and forage at optimal levels (meadow brome 'Regar' for spring, switchgrass 'Forestburg' for summer hay ground, Russian wildrye 'Mankota' for fall use while complementing the native pasture for summer grazing). Mineral status was also determined for native prairie with overwhelming results showing copper deficiencies during the entire growing season, zinc deficiencies in many years after mid July, phosphorus deficiencies by early July on all rangelands except lowlands associated with adjacent uplands, and potassium deficiencies after mid September. We also know calcium and iron are adequate during the entire growing season, and potassium high until mid September.

*Effects of sheep grazing using a multi-species and single-species grazing approach on leafy spurge infested rangeland: NDSU Extension Service, in cooperation with the Animal and Range Sciences Department and Hettinger Extension and Research Center have conducted grazing trials on leafy spurge infested rangeland throughout North Dakota.

Impact - Sheep effectively controlled leafy spurge after one year using a single species grazing approach and after three years using a multi-species grazing approach. Leafy spurge stem densities were reduced by 94 percent and 82 percent on single-species and multi-species grazing treatments, respectively, after five years. Season long grazing using a multi-species approach provided a quicker, more efficient grazing of leafy spurge than rotational grazing; however, both reduced leafy spurge stem densities by 92 percent and 32 percent, respectively, after five years. The research provides new options for North Dakota livestock producers who want to control this invasive weed. Chemical control on large patches of the weed are seldom cost effective. The research shows that sheep can provide some financial return while providing control.

Source of federal funds: Smith-Lever and Hatch

Scope of Impact: Multi-state Integrated Research and Extension, S.D. Mont. Wyo.

Key Theme - Animal Production Efficiency: Animal Genetics

Extension specialists have developed a two-part presentation on the genetic relationship to muscle quality. This program was designed to help producers better understand the merits of muscle quality and familiarize them with the genetic basis of breeding to achieve good muscle quality. Presentations were made at regional swine meetings, to suppliers of breeding stock, and to packing plant executives. The overall objective was to make more people in the pork chain aware of the importance of muscle quality.

Impact - About 90 people attended the producer meetings, over 20 attended the seed stock meeting, and over 15 were at the packing plant meeting. This impacted more than 20 percent of the commercial

hog producers and the sole packer of pork in the state. Since the meetings, several producers have become involved in assessing their herds to determine the status of the muscle quality of their animals. Upon completion of this phase, follow-up meetings will be held to discuss what can be done genetically to improve pork muscle quality. The North Dakota Pork Producers Council supported this program.

Source of federal funds: Smith-Lever

Scope of Impact: State Specific.

Key Theme: Agricultural Competitiveness - Animal Production Systems

Swine personnel at NDSU put together data for swine enterprise records, and a computer model was developed for utilizing production data from actual farms to give various expected return estimates. The estimates included return on investment, net profit per pig, and estimated feeder pig pricing based on an operation's grow/finish data. This model was taken to five producer meetings and the actual data was entered to obtain given unit results. These were compared to potential results estimated from the top 10 percent reports in the industry. The model was also utilized at three meetings of economic development groups to demonstrate the potential returns on investment made in the swine industry.

Impact - More than 80 producers were in attendance at the meetings or about 10 of the swine producers in the state. The meetings with people involved in economic development have resulted in two groups currently active in a swine project. Area specialists are using the model information in working with these two groups.

Source of federal funds: Smith-Lever

Scope of Impact: State specific.

Key Theme - Agricultural Competitiveness - Nutritional Management of Beef Cattle

Extension specialists, county extension staff, and research faculty developed a two day feedlot nutrition and management school designed to educate cattle feeders about ways to increase profitability and production efficiency when feeding cattle. It included sections on beef cattle nutrition, feed additives, implants, management, and other topics. Hands-on activities included bunk reading, feed mixing and delivery, and implanting. This program was presented at a research extension center and included a tour of a nearby commercial feedlot. Participants received a three ring binder of reference materials on topics such as nutrition, management, grain processing, and feed additives.

Impact - This feedlot school is limited to 25 participant per year to allow a high level of interaction between specialists and participants. Surveys conducted following the training indicated that participants had increased knowledge and awareness of nutrition and management of feedlot cattle and a desire for further training modules which could provide more in depth training programs on nutrition, marketing, and other topics.

Source of federal funds: Smith-Lever.

Scope of Impact - Multi-state extension. Participants were from MN., WI, ND, SD, and MT.

Key Theme - Adding Value to New and Old Agricultural Products: Lean Lamb

Extension specialists have helped the Dakota Lamb Growers Cooperative develop specifications for "Dakota Lean Lamb" and "Natural Lamb." Lambs are being sold over the Internet, lean lamb products are being developed and the cooperative is working on marketing contracts for premium markets. Assistance was provided in the facilitation of informational meetings for the cooperative, newsletter preparation and distribution, plus a sheep school on lamb grading and feeding.

Impact - This grassroots approach to marketing lamb to increase producer returns has yielded a membership of 102 members in the cooperative from North Dakota, South Dakota, Minnesota and Montana. The coop was successful in landing a $250,000 USDA marketing grant. The Dakota Lamb Growers Cooperative is probably one of the bright spots in the North Dakota sheep industry as a value added industry.

Source of federal funds: Smith-Lever

Scope of impact - SD, MN, MT

Key theme - Adding Value to New and Old Agricultural Products: Rural economic development through value-added livestock production.

Southwest Feeders is a multi-faceted project being developed to enhance value-added economic development in southwestern North Dakota. North Dakota State University will operate in a proactive manner, stimulating value-added agricultural activities through a coordinated education and research effort. This will differ from many current and traditional methodologies of supporting agriculture by focusing multiple disciplines on a single problem and using increased economic activity as a definable outcome. Enhanced economic activity in southwestern North Dakota will occur through the backgrounding of beef calves and finishing of lambs. These are viewed as viable mechanisms for converting existing agricultural resources (e.g. livestock, feed, facilities, and labor) into additional economic activity.

There is in excess of $20,000,000 in new and potential economic activity available to the agricultural community of southwestern North Dakota associated with beef backgrounding. Statewide the potential level of economic activity exceeds $55,000,000. Lamb finishing would increase the statewide level by $2,100,000. There is an urgent need for increased economic activity in southwestern North Dakota. The efficient utilization of locally available agricultural resources to add value to beef calves and lambs is a viable mechanism for addressing this need. The Southwest Feeders Project is designed to actively engage the agricultural community of southwestern North Dakota in value-added livestock production

through a coordinated and targeted program in calf backgrounding and lamb finis hing.

The North Dakota Barley Council and local banks and economic development organizations from southwestern North Dakota have pledged financial support for the initiation of this effort.
Impact - Southwest Feeders has met with various potential participants (from all aspects of agriculture and economic development) to assess support for this effort and has received considerable encouragement to aggressively pursue this project. The more increased awareness development of this project has generated has increased the number of producers considering value - added postweaning management options. This is strongly encouraging given the strength of current calf prices at weaning. The combination of resources available for value - added economic development from livestock is not restricted to this area of North Dakota. Northwestern South Dakota, southeastern Montana and northeastern Wyoming have similar characteristics and expansion of this project into this region would seem appropriate.

Source of federal funds: Smith-Lever

Scope of Impact: State Specific

Key Theme - Agricultural Profitability: Feedlot Development in North Dakota

A demonstration project was conducted to determine the value of feeding producer - owned cattle in North Dakota. With that information, cattle producers from across the state developed the North Dakota Statewide Cattle Feeders Consortium. That group conducted a feasibility study and developed business plans to build large cooperatively owned feedyards. The North Dakota State University Extension Service developed the North Dakota Feedlot School and Advanced Cattle

Feeding Workshops to enhance feedlot management skills and improve knowledge of feeding and marketing.

Impact - The NDSU Extension Service showed that it cost up to 3 cents less per pound to finish cattle in North Dakota compared to an out-of-state feedlot. Extension information prompted a group of cattle producers to pool funds and custom feed more than 1,300 head in North Dakota feedlots. With help from Extension specialists and agents, they realized a return of more than 31
percent last year. Another group built a 7,000-head feedyard in Bowman County. Other producers will earn a premium of up to 3 cents per pound for cattle that meet processing specifications of a new local processing company. More than 130 producers attended Extension feedlot schools last year. One participant estimated that better health practices, bunk management and feeding practices cut his cost of gain by up to five cents per pound.

Source of federal funds: Smith-Lever

Scope of Impact: Multi-state, integrated extension and research: KS, MT, SD, MN, WI. and WY.

Key Theme - Agricultural Competitiveness: Leadership and Economic Development

Through a series of hands-on leadership development classes, cattle producers developed business plans for economic development opportunities. Cattlemen then explored implementing the plans and assessed community and economic feasibility. Through continued extension facilitation, guid ance and informational assistance, business plans, financing packages, and equity drives were developed for cooperative cattle feedlots, a limited liability partnership that owns cattle for custom feeding, a cattle financing cooperative, a limited liabilit y company for owning delivery rights to a meat processing plant, and a meat slaughtering and marketing 'c' corporation. Producers involved in the program have emerged as directors and managers of the proposed plans.

Impact - Cattle producers in central North Dakota realized that working as a group would provide more economic development than could be accomplished individually. Through educational sessions and continued facilitation and instruction, producers were able to develop several new vertically integrated cattle business ventures. The cooperative cattle feedlot plan is completing construction of a 7000-head cattle feedlot located in a cow calf region where feed grains are traditionally low priced. The limited liability partnership that owns catt le for custom feeding has returned a 23.5 percent return on equity during a one-year period for 23 cattlemen involved.

A cattle financing cooperative was developed for local producers and now provides financing for 95 percent of the calf purchase price with low interest notes. The finance cooperative has grown 25 percent per year for cattle financed. Fifty-six cattle producers wanted to develop an outlet for supplying finished cattle at a 10 percent added value premium and then developed a limited liabil ity company as an investment vehicle for owning a majority of the processing company. These producers then recruited a partner under a corporation for construction of the harvesting and processing facility and development and marketing of a processed meat product line for a national ethnic market.

Source of federal funding - Smith-Lever

Scope of Impact: Multi-state extension. Cooperative feedlot owners are from ND, MT, SD and WY. Financed cattle are marketed to IA, SD, NE, and MN. Processed meat products have markets in CA, IL, NJ, NY, LA, CO, IA and internationally.

Key Theme – Adding Value to New and Old Agricultural Products: Dakota Heritage Beef

Two surveys and a focus group were conducted for Dakota Heritage Beef, a group of southwestern North Dakota and northwestern South Dakota ranchers. The purpose of the first survey was to determine consumer interest and potential for a test market in a branded beef product. The second survey was to gauge consumer satisfaction of their purchase. Important findings included: Survey 1, 1- Consumers indicated that they were interested in buying locally produced beef (64.3 percent would pay a premium), 2- Quality was more important than price as the determining factor in buying beef (85.8 percent). Survey 2, 1- 77.4 percent of the survey respondents found the product through in-store

promotions. 2- 91.1 percent were interested in future purchases.

Impact – Consumer willingness to pay for locally produced food products is an important element in determining the feasibility of value-added ventures. Impacts of the survey indicate

further analysis is warranted in determining the feasibility of facilities for producing branded beef product.

Source of federal funds: Hatch

Scope of Impact: State Specific

Allocated Resources
($ x $1,000)

			FY00
1862 Extension ($)	Smith-Lever		387
	State		543
		FTE	13
1862 Research ($)	Hatch		422
	State		688
		FTE	10

Goal 2: A Safe and Secure Food and Fiber System

Overview: *North Dakota and the United States have seen an increased awareness of food safety issues. Food prepared in institutional or restaurant settings has the potential for large-scale outbreaks of food borne illness.*

At the same time, North Dakota agricultural producers play a key role in supplying food for the nation and world. Efforts to safeguard that food supply by protecting crops is an important function of NDSU research and Extension. Pest management programs at NDSU have four thrusts: effective and efficient pesticide use, biological control, genetic resistance to pests, and preventative pest management. Taken together, these thrusts will result in pest management programs that are sustainable and have reduced inputs.

In the past five years, more than 1000 food service managers and employees from restaurants, nursing homes, hospitals, daycare centers and schools in 100 different North Dakota cities have attended NDSU Extension food safety workshops held through the state. The four to six-hour workshops focus on the Hazard Analysis and Critical Control Point (HACCP) approach to food safety that was developed by NASA to ensure safe food for its astronauts.

A series of eight food safety workshops targeting volunteer food handlers who prepare or serve food in senior citizen centers throughout North Dakota were held. Pre/post testing showed increased knowledge, and six-month follow-up surveys showed improved food handling techniques. Based on the results of this program, a train-the-trainer package, "Safe Food for All Ages" and several handouts were developed and distributed targeting volunteer food handlers for 2000-01.

Fusarium head blight epidemics rank among the worst ever recorded for any crop during this century, with losses at $2.6 million in this region. Extension specialists and experiment station researchers joined a multi-disciplinary 14 state team of scientists to evaluate fungicides and methods of Fusarium head blight (scab) control. Studies conducted at multiple sites and over years found certain systemic fungicides provided the greatest reduction in disease and increased yield and quality. Based on these studies, the EPA granted a section 18 emergency exemption for two fungicides. It was estimated that 800,000 acres of wheat were treated in ND and MN in 1998 to control scab with new spray techniques developed by our scientists.

As diseases, insects and weeds adapt to control methods, a significant focus of plant breeders is the development of crop varieties that are resistant to pests and diseases. A new wheat variety, Alsen, that is resistant to Fusarium head blight is expected to save producers millions in lost yield and fungicide applications while providing wheat that has good milling and baking characteristics.

A forecasting system (late blight hotline) has provided growers improved information for timing of sprays for potato late blight control. Heavy disease pressure in 2000 resulted in low losses for

growers using the late blight hotline compared to heavy losses in previous years. The total economic gain for 1998, due to new spray techniques and section 18's, on new fungicides was estimated at $19 million.

Key Theme - HAACP

Increases in daycare, hospital and nursing home populations as well as a growth in restaurant and deli businesses means a growing portion of the population is at risk from such outbreaks. In addition, quantity food preparation presents unique challenges for safe food handling and preparation. In this environment, government regulation is demanding more attention to the development of food safety practices. As a result there is high demand for training and educational materials in food safety. The National Restaurant Association estimates that a single outbreak of foodborne illness will cost a restaurant at least $75,000.

A novel train-the-trainer program in collaboration with extension and research faculty targeted beef cattle producers, veterinarians, slaughter plant personnel, meat market managers, health department inspectors, extension personnel and consumers. The topics focused on pre-harvest food safety, Hazard Analysis Critical Control Point for meat processors and food service workers, and consumer food safety. The training consisted of two full days of intense training, including field trips to a meat processing and fabrication plant and an injection site demonstration at a veterinary clinic.

Impact - In the past five years, more than 1000 food service managers and employees from restaurants, nursing homes, hospitals, daycare centers and schools in 100 different North Dakota cities have attended NDSU Extension food safety workshops held through the state. The four to six-hour workshops focus on the Hazard Analysis and Critical Control Point (HACCP) approach to food safety that was developed by NASA to ensure safe food for its astronauts.

A series of eight food safety workshops targeting volunteer food handlers who prepare or serve food in Senior Citizens Centers throughout North Dakota were held. Pre/post testing showed increased knowledge, and six-month follow-up surveys showed improved food handling techniques. Based on the results of this program, a train-the-trainer package, "Safe Food for All Ages" and several handouts were developed and distributed targeting volunteer food handlers for 2000-01.

A pilot project, with partial funding from the district office of the Food and Drug Administration, promoted the use of food thermometers and refrigerator thermometers in the home, based on the national "Thermy" campaign. The pilot group participants were Native Americans on the Fort Berthold Reservation in the northwest quadrant of North Dakota. Follow-up surveys have shown increased use of food thermometers and increased knowledge of food safety concepts. Other outputs of this program include new lesson plans, handouts, posters and evaluation tools.

Food entrepreneurs in North Dakota had an opportunity to attend two workshops. One workshop, presented by regional FDA staff, provided information on establishing a HACCP plan and setting up a sanitation programs in their workplace. The 17 attendees included regulators, food entrepreneurs and

those involved in food processing. A second workshop, presented by the Nebraska Food Entrepreneur Assistance program, provided background in food safety, marketing and business plan development for the 32 attendees, which included food entrepreneurs, extension agents, and regulators. In addition, a food testing service was established with grant funding, and at least 100 potential products to be marketed in North Dakota were tested for pH and water activity levels. A website and food entrepreneur binder are in progress for release in late 2000.

The Family Nutrition Program targets limited income audiences with food safety information as well as information on improving nutritional practices, food security and stretching the food dollar. Follow-up surveys for the classes, displays and other methods used by the Nutrition Education Assistants/ Agents have shown positive changes in food handling behavior.

Source of federal funds: Smith-Lever

Scope of Impact: Statewide Extension

Key Theme - Food Security: Pesticide Management

Pesticide management programs are directed at efficacious pesticide use practices based on efficient sampling and accurate risk assessment. This involves a thorough understanding of pest biology and interaction with the impacted crop system. It emphasizes the use of pesticides only when warranted by pest population size and economic impact. Fusarium head blight epidemics rank among the worst ever recorded for any crop during this century, with losses at $2.6 million in this region. Extension specialists and experiment station researchers joined a multi-disciplinary 14-state team of scientists to evaluate fungicides and methods of Fusarium head blight (scab) control. Studies conducted at multiple sites and over years found certain systemic fungicides provided the greatest reduction in disease and increased yield and quality. Based on these studies, the EPA granted a section 18 emergency exemption for two fungicides. It was estimated that 800,000 acres of wheat were treated in North Dakota and Minnesota in 1998 to control scab with new spray techniques developed by our scientists. Extension specialists developed a major educational program to explain the spray techniques. Research on wheat disease forecasting system provided advise leading to positive economic returns. Late blight of potato has been epidemic every year since 1992. Season-long control now involves 8-12 fungicide sprays, but growers have successfully reduced or delayed spray applications based on recommendations provided by NDSU's late blight hotline. On-farm practices, such as use of trap or cover crops, changes in planting dates, and the use of improved resistant/tolerant varieties are designed to prevent or limit pest populations from reaching economic size and reduce the need for pesticides.

Impact - Pesticide use based on an only-when-needed basis saves growers money, reduces environmental contamination, and justifies pesticide use to the public. Pesticide use based on an only-when-needed basis requires growers to be knowledgeable pest management decision makers and makes extension efforts in pest management more critical. A forecasting system (late blight hotline) has provided growers improved information for timing of sprays for potato late blight control. Heavy disease pressure in 2000 resulted in low losses for growers using the late blight hotline compared to heavy

losses in previous years. The total economic gain for 1998, due to new spray techniques and section 18's, on new fungicides was estimated at $19 million.

Source of federal funds: Smith-Lever and Hatch
Scope of Impact: Multi-state Integrated Research and Extension. Growers in ND and MN benefitted from the potato late blight hotline. Cereal growers in ND, MN and SD have benefitted from the new spray technology, new section 18 fungicides, and the wheat disease forecasting system.

Key Theme - Food Security: Biological Control

Natural enemies are an essential components of a sustainable farm ecosystems. A major research and extension effort involving the departments of Entomology, Plant Science, and Animal and Range Science is underway to manage leafy spurge, a key weed pest of rangelands, that causes losses valued at $23.2 million per year in North Dakota. Insect predators of spurge are being evaluated for impact, and adaptability to local environments, and are being redistributed to speed their establishment and effectiveness. Interaction of insect natural enemies of spurge with possible spurge biotypes are being studied. Grazing animals such as sheep and goats are being incorporated in a management program with insect natural enemies and limited pesticide use to sustain leafy spurge populations at sub-economic levels. Biocontrol programs using predators, parasites, and pathogens of insect pests such as banded sunflower moth, sunflower midge, sugar beet root maggot, and Colorado potato beetle are underway. *Sclerotinia*, a major limiting disease of most broad leaf crops in the area, is targeted for control by several parasitic fungi. Basic research on the biocontrol of soilborne diseases is being conducted to find new ways of combating serious root diseases of crops such as Binucleate Rhizotonia (BNR). Root diseases cause substantial losses and are difficult to control. Transformation with carboxin resistance was accomplished for BNR. Two of the transformants showed biocontrol activity.

Impact - Biological control of leafy spurge is expected to be valued at $58 million per year by 2025 by restoring thousands of acres of rangeland to productivity and by reduced herbicide costs. Once established, biological control of leafy spurge and other pests will provide self-sustaining control without further input cost to the grower.

Source of federal funds: Smith-Lever and Hatch

Scope of Impact: Multi-state Integrated Research and Extension. Growers in ND and the surrounding states benefit from the leafy spurge biological control program. Leafy spurge flea beetles are redistributed in ND, MN, WY, SD, NB and MT.

Key Theme - Food Security - Genetic Resistance to Pests

The identification of pest resistant genes, their characterization, and genetic nature are major goals for research programs of insect and disease pests of a number of crops. Sources of resistance to the

sunflower midge are being sought in existing sunflower germplasm and varieties . Improved methods to screen for resistance and to characterize the functional nature of sunflower midge resistance are being made. Fusarium head blight (FHB) caused disastrous losses in small grains in the Dakotas and Minnesota between 1993 and 2000. Plant pathologists and breeders developed testing programs for FHB and tested thousands of lines in the field and greenhouse programs. The NDSU released variety Alsen combines FBS resistance with other traits to reduce losses from the disease. This should significantly reduce losses due to FHB. The potato breeding program has a major objective of developing cultivars with late blight resistance. One objective of dry bean pathology is to identify new sources of resistance of rust and white mold for the bean breeding program and incorporate this resistance into new varieties. Incorporating disease resistance genes into soybean cultivars has major impact on improving soybean production and profitability for growers. Extensive research in this area is now producing soybean cultivars with disease resistance.

Impact - Genetic crop resistance to pests provides growers with a simple pest management tactic that works under conditions unfavorable to natural enemies and pesticides. Genetic crop resistance eliminates or reduces the need for other pest management inputs and reduces grower expense. Genetic crop resistance saves growers management time because of reduced need for monitoring of pest populations. The economic impact of the FHB resistant wheats should result in mi llions of dollars saved over growing FHB susceptible cultivars. This will also save huge amounts in reduced fungicide sprays. Late blight resistance in commercial potato production could save millions in reduced spray applications and improved yields. Resistance to rust and white mold in dry beans would be elimination of two of the major problems in the dry bean industry. Incorporating disease resistance in soybean cultivars has had a major impact on improving soybean production especially in the area of ro ot rot.

Source of federal funds: Smith-Lever and Hatch

Scope of Impact: Multi-state Integrated Research and Extension. Growers in the tri-state area of MN, ND, and SD and in Manitoba profit from resistance to pests in the major crops. Resistance to FHB alone is worth millions to cereal growers. In addition breeders and pathologists have added resistance to important pests in the major crops.

Key Theme - Food Security: Preventative Pest Management

Emerging pests can cause severe economic losses for growers if their potential impact is not anticipated and if controls are not available. New crop varieties, tillage and other farming methods, changing weather patterns, and federal programs influence pro duction practices. In turn, these changes affect the pest insect and pathogen populations that are part of our agricultural ecosystem and can result in emerging pest problems. Although *Lygus* bugs have always been part of our agricultural landscape, historically their populations have been low and it is only in the last two years that they have become economically important. Changes in cropping practices are thought to have made the environment more favorable for *Lygus* bug populations to increase to the point where they are impacting sugar beet and sunflower, and possibly canola. Studies are underway to understand *Lygus* population dynamics, its impact per insect, and determine if *Lygus* will be a long term problem. Over 700 wheat fields and 150

barley fields are surveyed for leaf and head diseases, and insect problems. Every county was surveyed. Survey reports were summarized and provided information for the Crop and Pest Reports, which are widely distributed and discussed at several meetings. A new race of leaf rust was identified on commonly grown spring wheat varieties in the mid 1990s. This race increased and caused severe losses during the late 1990s. Producers abandoned the most susceptible varieties. Unfortunately, the abandoned varieties had some of the best levels of FHB resistance. A new variety with FHB and leaf rust resistance was released in 2000. This was the last potato growing area where the form of late blight, A2, was not found, so an extensive field and storage survey was established. A new mating A2 was found in the disease storage survey. Late blight of potato has been epidemic in North Dakota every year since 1992, partly because of the appearance of the new A2 mating types (US 8), which are more aggressive and resistant to the fungicide metalaxyl that previously controlled the disease. Potential new or invasive pests species include the cabbage pod weevil, cereal leaf beetle, soybean aphid, star thistle, salt cedar, knapweed, toad flax, and purple loosestrife. These are being monitored for establishment and impact.

Impact - Unexpected pest problems arising from emerging or new pests can result in severe economic impact for growers. Preventative pest management assesses potential problems and devises pest management solutions before the pests become economically important. Pest alerts and management solutions are provided so that growers can make educated decisions regarding their options. The economic impact of wheat leaf rust on scab tolerant cultivars was estimated at over $20 million. The release of the new rust and FHB resistant cultivar should alleviate much of this loss. An annual survey reports new diseases or insects and the severity of these pests. This information is widely used for management and spray decisions. The economic impact of the new A2 mating type in late blight has been a complete change in management practices by the potato industry. NDSU has led the development of these new management practices.

Source of federal funds: Smith-Lever and Hatch

Scope of Impact - Multi-state Integrated Research and Extension. Growers in ND profit from the disease and insect survey and corresponding management recommendations. Information is also beneficial to areas surrounding ND i.e., Red River Valley. Growers especially in ND but also the tri-state region will benefit from the release of the new wheat leaf rust and FHB resistant wheats. Growers in the potato growing areas of the tri-state area profit from the development of the new management practices for the new A2 mating type in potato.

Key Theme - Food Security: Sclerotinia Disease Development in Sunflower

Sclerotinia is a major disease of broadleaf crops in northeastern North Dakota. Due to the increased plantings of susceptible broadleaf crops, this particular disease is becoming a greater problem over larger areas than in past years. In the fall of 1999, wet weather enabled sclerotinia head rot disease of sunflower to be a statewide problem with losses reaching 60 to 70 percent in some areas. Especially hard hit were confectionary sunflower producers who produce seeds for human consumption and bird feed. Sclerotinia tolerance levels are very low for confection seed producers and if sclerotia bodies or

damage to the seeds exceeds 3 percent the field is rejected for human consumption. Producers in 1999 and 2000 were faced with the problem of what to do with highly contaminated confection sunflower seeds. Extension specialists worked with a group of farmers in north central North Dakota to determine if significant reductions in sclerotia contact could be obtained through harvest machine adjustments or in cleaning of the grain sample after harvest. Field studies in the fall determined that some techniques might reduce harvested sclerotia body content, but a more thorough cleaning with specialized equipment would be necessary to reduce sclerotia content, and to some degree dark seed content, in confection seeds. Information gathered in the study was ultimately compiled into an extension publication that was widely used in the fall of 2000 as this problem reoccurred.

Impact - Producers in the north central region stored sunflower seed following best harvest practices were able to clean the seed and many producers were able to market clean loads that sold for contracted price of $0.13 versus $0.05 for bird seed or confection market.

Source of federal funds: Smith-Lever

Scope of Impact: Statewide Extension. Sunflower is the fifth-largest seeded crop in North Dakota and the value of its production is greater than $20 million. The impact of this project affected producers throughout the north and east central parts of North Dakota as that is where the bulk of the confection sunflower seed is raised.

Key Theme - Food Safety: Improved Food Safety Undergraduate Education

We have been pleased to partner with the USDA HEP to develop a unique educational experience for undergraduates. We have developed and received approval of four new courses in food safety and a minor program of study in food safety, which we believe is the first such minor in the country. Additionally, the Great Plains Institute of Food Safety (GPIFS) has been established. As proposed in the grant, the first offering of these courses and the minor occurred during the summer of 2000.

Impact - These courses were taken by 27 students. Most have gone on to receive a minor in food safety. Several of these students have graduated, and some have been offered jobs directly related to their backgrounds in food safety. Although evaluation of the courses and minor by the educational consultant is on-going, the students and faculty involved in the program felt that it was very successful.

In addition, we have offered our experiences to others as a model of an educational initiative designed to respond to our stakeholders' needs in minimal time. Further, our experiences demonstrate the incorporation of experiential learning into a multidisciplinary curriculum in order to develop the problem-solving abilities of our students. Finally, this program is being used to demonstrate the development and implementation of a complex, multidisciplinary curriculum by a team of 19 faculty from widely different backgrounds.

Source of federal funds: USDA Challenge Grant

Scope of Impact: Regional and national impact. Current distance educational efforts with South Dakota State University, Michigan State University, and JIFSAN (University of Maryland and the FDA) should greatly extend the reach of the program.

Key Theme - Food Safety: Academic Minor

A new interdepartmental minor in Food Safety was developed for initial offering beginning June 12, 2000 in the first Summer Institute in Food Safety. Nearly 50 NDSU students expressed interest in the minor, and 23 students enrolled in each of the four program courses. External companies and agencies have expressed substantial interest in direct participation, receipt through distance formats, or expansion into a full major.

Allocated Resources
($ x $1,000)

		FY00
1862 Extension ($)	Smith-Lever	426
	State	594
	FTE	18
1862 Research ($)	Hatch	293
	State	477
	FTE	7

Goal 3: A Healthy, Well-Nourished Population

***Overview**. The U.S. Surgeon General issued a report regarding the physical activity and health habits of citizens in the United Sates. During the past decade, the number of children in the United States who are overweight has more than doubled. It is now estimated that about 11 percent of American children are overweight and an additional 14 percent have a body mass index between the 85 and 95 percentiles, which put them at increased risk for becoming overweight.*

With regard to physical activity, nearly 50 percent of American youth are not vigorously active on a regular basis and one-fourth of American young people ages 12-21 report no vigorous physical activity. Participation in all types of physical activity declines as age and grade in school increases. In North Dakota, 89 percent of seventh graders, 59 percent of 10th graders and 27 percent of 12th graders attend physical education class at least once a week. That these patterns tract to adulthood is supported by the current estimate that about a fourth of the adult U.S. population fails to engage in physical activity during their leisure time while only 15 percent regularly engage in vigorous physical activity during leisure.

North Dakotans face all of these problems and has some unique health- and nutrition-related concerns including an increased risk of diabetes and heart disease.

NDSU has developed a range of programs that target the problems outlined above.

The NDSU Extension Service has helped form 5 Plus 5 coalitions across the state. These coalitions bring together local experts to work toward the goals of the 5 Plus 5 program. In 1999-2000, nine coalitions developed community-wide educational plans and were designated as "5 Plus 5 Communities." To achieve this recognition, they established a partnership including a 5 A Day nutritionist, physical activity expert, and influential leader. Other less formalized 5 Plus 5 programs have occurred throughout the state.

The in-school Kids Calcium project increased knowledge as measured by pre/post testing and a 50 percent increase in calcium intake during school hours. About 41 percent of the students surveyed indicated they drank more milk as a result of this intervention. About 83 percent noticed the cow faces/captions, 67 percent watched the weekly video on the school channel, 50 percent read the calcium facts in the speech bubbles.

Nutrition knowledge scores of the 185 second graders that participated in the Pyramid Players program increased significantly from pre to post-test. In one of the cities, follow-up testing showed that 95 percent of the children brought the educational newsletters from the lessons home; 86 percent of the children reported trying new foods, 48 percent reported being more physically active and 42 percent reported eating more fruits and vegetables as a result of the five-week program. In the second city, 36 percent reported being physically active more often, 32 percent reported eating more fruits and vegetables, 60 percent reported trying new foods and

39 percent reported their families had tried at least one of the healthy recipes at home.

An extensive survey of 323 Tribal College students was conducted and will be used to develop and implement diabetes education programs for Native Americans. Nearly 40 percent of those surveyed had an immediate family member with diabetes, and 85 percent reported an extended family member had been diagnosed with diabetes.

Key Theme - Human Health: The 5 Plus 5 Program

Cardiovascular disease is the leading cause of death in North Dakota. Nationally, 40 percent of the deaths in the U.S. are due to heart disease and stroke, with a national annual health care cost of $260 million. Proper nutrition and regular physical activity are two ways to reduce the risk of cardiovascular disease and other illnesses. A North Dakota Department of Health survey found that only 18 percent of North Dakota adults eat five servings of fruits and vegetables per day and 34 percent of North Dakotans are completely physically inactive outside of work.

The North Dakota 5 Plus 5 program is an educational campaign designed to encourage participants to eat at least five servings of fruits and vegetables per day and to engage in 30 minutes of moderate physical activity at least five days per week as recommended by health and nutrition experts. The program is led by the North Dakota State University Extension Service, the North Dakota Department of Health and the Healthy Heart Council which includes representatives from the American Heart Association, the Dairy Council of the Upper Midwest, the North Dakota Beef Commission and healthcare centers, parks and recreation departments, registered dietitians and other agencies across North Dakota.

As an example of local participation, Fort Berthold, a reservation site, hosted 40 people (83 percent Native American) who completed a 5 Plus 5 program with linkages to the commodity foods program. The program includes cooking classes, lectures, displays and individual instruction. Elsewhere, a community coalition in Emmons, Kidder, Logan and McIntosh counties had 65 participants. The intervention included classes, educational displays, and the participants kept track of their daily fruit/vegetable intake and physical activity.

Impact - Among the outputs of the program are a 5 Plus 5 manual for establishing local coalitions, two to three new lesson plans annually, handouts and media releases. Joint training was held with public health nutritionists and extension agents. The NDSU Extension Service has helped form 5 Plus 5 coalitions across the state. These coalitions bring together local experts to work toward the goals of the 5 Plus 5 program. In 1999-2000, nine coalitions developed community-wide educational plans and were designated as "5 Plus 5 Communities". To achieve this recognition, they established a partnership including a 5 A Day nutritionist, physical activity expert, and influential leader. Other less formalized 5 Plus 5 programs have occurred throughout the state.

Pre/post testing at Fort Berthold indicated an increase in knowledge. About 90 percent of participants changed their food choices to include more fruits and vegetables and 30 percent increased their physical level to be more consistent with the Surgeon General's recommendations.

The 65 participants in Emmons, Kidder, Logan and McIntosh increased their knowledge and changed their behavior according to pre/post testing. On the pre-test, about 32 percent reported consuming five or more servings of fruits and vegetables daily, while, on the post-test, about 57 percent reported eating five or more servings of fruits and vegetables daily. The average number of self-reported minutes of physical activity the participants engaged in increased to about 34 minutes daily.

Source of federal funds: Smith-Lever

Scope of Impact: State Specific

Key Theme - Human Nutrition: Pyramid Players

Research shows that few children meet current recommendations for nutrition and exercise, and obesity among children is becoming a topic of increasing concern. Unfortunately, diet and exercise patterns set early in life are among those most difficult to break. The result may be an increased risk of some diseases and other health problems such as diabetes, cancer and heart disease.

Second graders in two North Dakota cities received education in a pilot nutrition, food safety and physical educational program using a new set of five lessons developed by the NDSU Extension Service. Extension agents trained the teacher on the curriculum and the teachers used the materials in their classrooms.

Impact - Educational efforts targeting children in North Dakota led by the NDSU Extension Service have included the development of a curriculum for second graders, the "Pyramid Players," which includes five lessons based on the Food Guide Pyramid, food safety concepts and physical activity information and activities. These lessons were piloted in ten schools in two North Dakota cities before being released statewide in 1999. Other counties and schools have begun using the curriculum in classrooms and in after-school enrichment programs.

Nutrition knowledge scores of the 185 participants increased significantly from pre to post-test. In one of the cities, follow-up testing showed that 95 percent of the children brought the educational newsletters from the lessons home; 86 percent of the children reported trying new foods, 48 percent reported being more physically active and 42 percent reported eating more fruits and vegetables as a result of the five-week program. In the second city, 36 percent reported being physically active more often, 32 percent reported eating more fruits and vegetables, 60 percent reported trying new foods and 39 percent reported their families had tried at least one of the healthy recipes at home.

Source of federal funds: Smith-Lever

Scope of Impact: State Specific

Key Theme - Human Nutrition: Kids Calcium Project

Calcium has emerged as a "super nutrient" as research has shown its roles in reducing risk of osteoporosis, hypertension, stroke, kidney stones, colon cancer and breast cancer. Calcium is one of the nutrients most likely to be missing from the diets of Americans. Calcium is of critical concern in the diets of children because of its role in bone development and growth. Findings from national food intake surveys reveal that milk intake drops off rapidly during the teen years from ages 12-19. This low level of calcium intake constitutes a "calcium crisis" according to nutrition experts. By age 17, 90 percent of adult bone development has taken place. Calcium deficiency is creating a generation at risk of osteoporosis, a "pediatric condition with geriatric consequences."

Impact - This in-school educational intervention held during National Nutrition Month used promotion, education and environmental changes to increase calcium intake among 1200 teenagers at a junior high school. In conducting this intervention, Student Council representatives at the pilot school served as a focus group and provided input in establishing a realistic milk consumption goal, in developing key messages relevant to their peers in the campaign. Unlike many interventions, this project did not involve classroom instruction but consisted of key messages posted in the students' home room areas, videos, interactive library displays and environmental changes to promote milk consumption (milk breaks during school, larger containers/different flavors of milk available during school lunch).

Student outcomes included increased knowledge as measured by pre/post testing and a 50 percent increase in calcium intake during school hours. About 41 percent of the students surveyed indicated they drank more milk as a result of this intervention. About 83 percent noticed the cow faces/captions, 67 percent watched the weekly video on the school channel, 50 percent read the calcium facts in the speech bubbles.

The project was supported in part by a grant from the Midwest Dairy Council ($3000)

Source of federal funds: Smith-Lever

Scope of Impact: Statewide

Key Theme - Human Health: Diabetes

Diabetes is a serious and costly disease affecting Native Americans and is increasing at an alarming rate. A leading cause of death for many tribes in the northern plains, diabetes also is a major cause of amputations, kidney failure and blindness. The prevalence of diabetes among American Indians in the Aberdeen Indian Health Service Area, which includes North Dakota, ranks fourth among the 12 Indian Health Service units in the country.

Impact - A USDA-funded extensive survey of 323 Tribal College students was conducted and will be used to develop and implement diabetes education programs for Native Americans. Nearly 40 percent of those surveyed had an immediate family member with diabetes, and 85 percent reported an extended family member had been diagnosed with diabetes. About half of those surveyed reported eating 1 to 3

servings of fruit per week and 38 percent reported consuming 1 to 3 servings of vegetables per week. About one-third of the respondents reported eating fast food meals three or more times weekly, and 81 percent preferred "regular" soda pop over "diet." Only 18 percent have participated in classes on nutrition and health, but 62 percent indicated they would participate in nutrition -related education outside of school. An intervention and educational materials are in development.

Source of federal fund: Smith-Lever

Scope of Impact: Multi-state Extension will influence programs across the country.

Key Theme - Human Nutrition: Family Nutrition Program

Healthful nutritional choices, food security and stretching the food dollar remain foca l points of the programming in the Family Nutrition Program, which targets food stamp recipients.

Impact - Follow-up evaluation has shown that the participants have increased their knowledge and changed their behavior regarding food spending and food choi ces. Low income families are at particular risk for poor nutrition and malnutrition. They often lack the skills and education to plan nutritionally balanced meals, shop wisely, and prepare meals in a wholesome and safe manner.

Source of federal funds: Smith-Lever

Scope of Impact: Multi-state Extension. The FNP is a national program.

Key Theme - Human Nutrition: Food Resource Management

The overall goal of the food resource management program of the Family Nutrition Program is to help clients maximize the use of their limited food resources. Utilizing the food resource management components from the Building a Healthy Diet curriculum developed by Iowa State University, nutrition education assistants/agents for the Family Nutrition Program are delivering programs targeted for limited resource audiences across the state of North Dakota. Classes are often held at variety of cooperating agencies such as County Social Services, Tribal organizations, WIC or Head Start.

Impact - 1,328 North Dakota residents attended food resource management programming. Participants defined a variety of means to help them effectively manage their limited resources. Surveys show:

- 39 percent use a spending plan more often than before their participation in FNP.
- 49 percent use a menu planning process.
- 54 percent shop from a list more often since participating in FNP.
- 53 percent use comparison shopping techniques such as reading labels, unit pricing, and reading nutrition fact labels

Source of federal funds: USDA Food Stamp Nutrition Education.

Scope of impact: State Specific
Key Theme - Human Nutrition: Food Security

The goal of food security is to help food stamp recipients have an adequate supply of food throughout the month. Food security issues were incorporated into a variety of educational topics presented by Nutrition Education Agents/Assistants (NEAs) at their nutrition education classes. Emphasized themes included increasing knowledge and/or use of food assistance programs provided in their community. Classes were offered at a variety of locations including the tribal commodity warehouses, food pantries, Headstart, County Social Services, or transitional living facilities.

Impact - Upon completion of FNP programming, 85 percent of respondents indicated they had enough food to eat throughout the month. In addition, 59 percent decreased the frequency with which they used emergency food assistance and 11 percent increased their use of available non-emergency food assistance programs including WIC, food stamps, school breakfast, and school lunch.

Source of federal funds: USDA Food Stamp Nutrition Education.

Scope of Impact: State Specific

Key Theme - Human Nutrition – Children and Adults

Research has shown that children who help make food are more apt to try that food, and healthy habits learned young often extend into adulthood. A bread-making fair was conducted in Williams County for 10 to 11 year olds. The students participated in a class on the Food Guide Pyramid and made "bread in a bag."

Impact - Pre/post testing of the 238 participants (53 percent male) showed improved knowledge scores. The average pre-test score was 63 percent correct, and the average post-test score was 85 percent correct. About 88 percent planned to make bread again. About 77 percent of the children planned to share their bread with their families and 16 percent planned to share it with friends.

Source of federal funds: Smith-Lever

Scope of impact: State-specific

Allocated Resources
($ x $1,000)

		FY00
1862 Extension ($)	Smith-Lever & FNP funds	2165
	State	88
	FTE	51.7

1862 Research ($)	Hatch		0
	State		0
		FTE	0

Goal 4: Greater Harmony Between Agriculture and the Environment

Overview: *Agricultural pollution primarily from non-irrigated crop land, grazing land, and feedlots presents a significant threat to North Dakota's surface waters. About 60 percent of the state's total river and stream miles, and about 70 percent of the lakes and reservoirs are either threatened or impaired for designated uses. In both cases, the major pollutants are nutrients and sediments from agricultural nonpoint sources. Agriculture also threatens ground water. Over application of fertilizer can result in degradation of ground and surface water. Livestock waste has been identified as an increasing source of pollutants. The area occupied by feedlots and other concentrated production units is currently relatively small, however their proximity, relative location in regard to drainage ways, and the concentration of nutrients during snow melt or runoff events, make them a significant factor for pollution of surface and ground water.*

The irrigated area in North Dakota is increasing in response to the demand for dependable, high yielding, and high quality crops. The potential exists for 500,000 new acres of irrigated crops with sprinkler methods, yet the only high value crop now grown there with irrigation is sugar beets. High value crops, such as potatoes, high quality alfalfa, dry edible beans, carrots, onions, and cabbage, offer more potential return to producers and the increased income would be multiplied throughout the local communities. A key to success will be rotations and systems that are both profitable and environmentally friendly.

In studies using zone management of N in sugar beets, economic advantages when there is sufficient variability of N range from $10-100/acre. On wheat and sunflowers, net returns are in the range of $5-15/acre, which would roughly double profit margins in these crops. In addition, the use of some form of zone N sampling reduces the need for "insurance" rates of N, which are often 40-50 lb N/acre ($12-15/acre current price).

Researchers collected and analyzed manure samples to provide producers with a simple tool/method for determining manure nutrient values just before or at the time of land application. That tool would help producers use manure for it's plant nutrients while helping them avoid over application that could endanger water supplies. Seventy-six percent of the producers that participated in manure application planning workshops said that they were going to implement changes in their manure management practices. The most common intended changes were to test manure nutrient concentrations, to give credits for the manure nutrients applied, and to keep records.

Irrigation research at Carrington will provide production information for high-value crops that farmers can use to optimize their profitability. Research in western ND will provide a baseline of irrigation management information to support the expansion of irrigated potato acreage in the area. Ground water quality information will inform producers, agencies, and the public about the ground water quality impacts of irrigation. Software development will assist producers in

North Dakota and Minnesota to better manage irrigation scheduling.

Key Theme - Water Quality: Nutrient Management

Extension specialists and Experiment Station researchers developed approaches that make site-specific fertilization feasible for a variety of crops in different physiographic settings. These techniques reduce overapplication of nitrogen (N) where residual N is high at the end of the growing season and in areas where leaching potential is high. Sugar beet growers in the Red River Valley manage about 100,000 acres using satellite imagery and aerial photography to map areas of homogeneous N uptake within sugar beet fields and then give an N credit or adjustment for subsequent crops. Wheat and sunflower growers in central and western North Dakota are using topography, aerial imagery and electrical conductivity detectors to locate homogeneous zones within fields. These zonal boundaries are used as guides for soil sampling. The move to site-specific approaches is only about two years old west of the Red River Valley with about 15,000 acres involved.

Impact – In 2000, programs focusing on site-specific management totaled about 400 attendees at various presentations around North Dakota. In addition, site-specific soil testing has been woven into nearly all presentations given, amounting to about 2,000 other attendees. News releases on radio and in the press have been provided for people who do not attend meetings. Four circulars were printed in 1999 to provide general site-specific information regarding sampling, fertility, concepts and environmental benefits. These have been well received by growers and received a national award from the American Society of Agronomy in 2000. It is estimated that an additional 20,000 growers were contracted indirectly to some aspect of site-specific farming/N management in 2000. In studies using zone management of N in sugar beets, economic advantages when there is sufficient variability of N range from $10-100/acre. On wheat and sunflowers, net returns are in the range of $5-15/acre, which would roughly double profit margins in these crops. In addition, the use of some form of zone N sampling reduces the need for "insurance" rates of N, which are often 40-50 lb N/acre ($12-15/acre current price). There is the intangible benefit of reduction in nitrate leaching due to better N utilization by crops and reduction in over-fertilization of "leaky" areas of the field.

Source of federal funds: Smith-Lever and Hatch

Scope of Impact: North Dakota and also sugar beet growers in west-central MN.

Key Theme - Water Quality: Irrigation and Fertility Practices for Vegetable Crops

Carrington: The second year experiments were conducted under a two-tower center pivot irrigation system. Crops included potatoes, carrots, dry edible beans, and onions. Experimental treatments consisted of high, low, and non-irrigated water management regimes; variety comparisons; and fertility treatments. Fertility treatments consisted of various levels and/or schedules of nitrogen, phosphorus, and potassium. Irrigations were scheduled independently for each main plot or zone to provide statistical comparisons of irrigation

treatments. Soil moisture, rainfall, irrigation, and weather were monitored to develop crop water use estimates.

Williams County: Data collection continued for the third year under sprinkler-irrigated potatoes. Several measurement stations were established in quarter-section center pivot fields. At each station, thrice-weekly measurements were made of soil moisture, rain, and irrigation. The data sets will be used to estimate crop water use and evaluate irrigation scheduling algorithms developed for the more humid, eastern parts of North Dakota.

Central North Dakota: Site selection, characterization, and soil and water sampling was initiated during 2000 to determine the impacts of irrigated potato production on ground water quality.

Impact: Irrigation research at Carrington will provide production information for high-value crops that farmers can use to optimize their profitability. Research in western North Dakota will provide a baseline of irrigation management information to support the expansion of irrigated potato acreage in the area. Ground water quality information will inform producers, agencies, and the public about the ground water quality impacts of irrigation. Software development will assist producers in North Dakota and Minnesota to better manage irrigation scheduling.

Source of federal funds: Smith-Lever and Hatch

Scope of Impact: State Specific

Key Theme– Water Quality: New Cultivars of Dry Edible Beans for Irrigated Production Systems

Breeding programs for dark and light red kidney, pink, small red, black, cranberry, and great northern bean market classes have been initiated. Plant rows were evaluated in 2000 and preliminary yield trials of black beans, pink, and great northern were also grown. In 2000, there were 24 entries in the black prelim trial, 30 entries in the kidney trials, 14 entries in the cranberry trials, 22 entries in the great northern trials, in addition to the 48 entries in navies and 86 entries in pinto trials.

Impact: Goals are to diversify irrigated bean production in the Northern Plains into other market classes, thereby increasing the possibility of further exports.

Source of federal funds: Hatch

Scope of Impact: Region Specific

Key Theme– Water Quality: Irrigation Technical Information and Assistance

Three irrigation workshops conducted by extension specialists at Bismarck and Grand Forks, North Dakota, were focused on subject matter needs of beginning and experienced irrigation producers. Topics included agronomic, economic, irrigation equipment, water management, fertility management, and current research-based information. Thirty five farm visits were made to provide on-site technical assistance in addition to

many office inquiries. Irrigation pumping unit efficiency tests were conducted on several farms. This activity provides opportunity for evaluation of irrigation practices and for directed education of farmer-producers. Three tile drainage programs were presented. Two off-stream irrigation water storage pond programs were presented. A user manual was developed for an irrigation scheduling tool that is based on a spreadsheet Checkbook program.

Impact: More than 175 people attended the irrigation workshops. The drainage education programs were attended by 220 people. Pumping plant testing was completed on 27 farms.
Source of federal funds: Smith-Lever

Scope of Impact: State Specific

Key Theme– Water Quality: On Site Testing of Manure Characteristics

Manure samples were collected from livestock producers (89 samples) located in eastern North Dakota. These samples were analyzed using a commercially available nitrogen meter and compared to standard laboratory analysis. Regression-based relationships (meter vs. laboratory analysis) suggest only a marginal utility (i.e., producer use) of the meter. Better accuracy was obtained with solid-state surface conductivity (metal oxide) gas sensors. Regression relationships indicate R-squared of 0.99 for hydrogen of ammonia concentration, 0.97 for methane to ammonia, and 0.54 for methane to hydrogen sulfide. The gas concentrations were then compared to nutrient concentration from laboratory analyses. The following R-squared values were found: ammonia to nitrogen 0.79; ammonia to organic-N 0.73; ammonia to ammonium 0.86; ammonia to phosphorous 0.94; ammonia to potassium 0.68; hydrogen sulfide to nitrogen 0.80; hydrogen sulfide to organic-N 0.72; hydrogen sulfide to ammonium 0.92; hydrogen sulfide to phosphorous 0.78; hydrogen sulfide to potassium 0.72; methane to nitrogen 0.05; methane to organic-N 0.0006; methane to ammonium 0.73; methane to phosphorous 0.48; and methane to potassium 0.12.

Impact: The project objective is to provide producers with a simple tool/method for determining manure nutrient values just before or at the time of land application.

Source of federal funds: Smith-Lever and Hatch

Scope of Impact: State Specific

Key Theme– Water Quality: Design and Performance of Feedlot Systems

Initiated a research and demonstration project of "lignite ash for feedlot surfaces" to investigate the use of coal combustion byproducts (fly ash, bottom ash) in providing a more durable feedlot surface. Using a coal ash stabilized surface is expected to improve animal welfare and performance, as well as provide opportunities for reducing some of the environmental impacts of feeding areas. Year one activities,

including stabilization and placement of controlled low strength material for feedbunk aprons, have been completed.

Impact: Undetermined

Source of federal funds: Smith-Lever and Hatch

Scope of Impact: Region Specific

Key Theme– Water Quality: Livestock Waste Technical Information and Assistance

Environmental Assurance Program Workshops. Two EAP Workshops were held for pork producers dealing with regulations, odor control, nutrient management, community relations and composting.

On Farm Odor/Environmental Assurance Program. Extension specialist acted as coordinator for the OFO/EAP (a National Pork Producer's Council initiative) and recruited 22 assessors (Extension, NRCS and consultants) and organized their certification school. The program is designed to offer pork producers a free, confidential review of their operation's environmental strengths and weaknesses.

Livestock Waste Management and Utilization Workshop. An interagency workshop designed to provide technical and field staff with a basic grounding in the issues that comprise the Comprehensive Nutrient Management Plans proposed by EPA/USDA. The two day workshop was attended by 90 participants representing NRCS, SCD's, NDSU Extension Service, NDDH, Section 319 funded Water Quality Coordinators, producer group boards, ND Dept. of Agriculture, ND Water Commission, ND Game and Fish, and tribal agencies.

Manure Application Planning Workshops. A manure application planning workshop was held at 10 locations around the state. The objective of the workshop was to give producers the planning and record keeping skills necessary to make better use of their manure as well as meet NDDH requirements. More than 120 producers, along with 45 local extension and NRCS/SCD staff, attended the 4 hour workshops. Each participant received a binder containing all of the information required to prepare a manure application plan. In their evaluation questionnaires, 15 out of the 120 producers reported that they had used manure tests in the past. Thirty-nine producers had tested soil from fields receiving manure, 17 had used manure nutrient credits to reduce fertilizer purchases, 7 had kept written records of manure applications, and 10 had performed a calibration of the manure spreader.

Impact: EAP Workshops-- Of the 12 producers that completed an evaluation form, 11 were planning to make changes in the way they manage their manure.

OFO/EAP Program -- Eight assessments were completed as part of the training program. One producer has participated since the program began.

Livestock Waste Management and Utilization Work shop-- On a scale of 1 (not useful) to 5 (very useful), evaluations from the participants scored the workshop at 4.1. The most common suggestions for follow-up activities or topics included; a field day to view successful waste management systems, more information on regulations and permits, information on system costs and more information on manure utilization.

Manure Application Planning Workshops-- Seventy-six percent of the producers who participated said that they were going to implement changes in their manure management practices. The most common intended changes were to test manure nutrient concentrations, to give credits for the manure nutrients applied, and to keep records.

Source of federal funds: Smith-Lever and EPA

Scope of Impact: State Specific

Allocated Resources
($ x $1,000)

		FY00
1862 Extension ($)	Smith-Lever	163
	State	227
	FTE	5
1862 Research ($)	Hatch	104
	State	171
	FTE	3.5

Goal 5: Enhanced Economic Opportunity and Quality of Life for Americans

Overview. The Great Plains is a vulnerable region in the United States because of its historical dependence on agriculture and its relatively sparse population base. In the 21st century, shaping forces will include information technology, agricultural technology, changes in federal policies, and international trade policy. Major changes in the rural landscape are causing great stress as well as creating new opportunities. A growing body of research suggests that the major contributing factors to the continuing decline among rural counties is their inability to adapt to the changes taking place.

Economic development has been a concern for North Dakota policymakers since the economic downturn of the early 1980s. Retail sales, adjusted for inflation, fell almost 20 percent from 1980 to 1988 and still have not regained their 1980 level. From 1980 to1992, all but five North Dakota counties experienced decreases in employment. Local leaders also understand that they must adapt to the many changes taking place and involve citizens as equal partners in decision making and action. They must focus more effort on broadening the base of participation to reflect the cultural and ethnic diversity of their communities. They must embrace multi-jurisdictional, as well as public/private partnerships, to gain efficiencies of size. These leaders want and need technical assistance and training to strengthen their own skills and knowledge so they can be effective in this changing environment.

At the same time, the state's youth need opportunities to be meaningfully involved in family, school, and community in order to develop skills and confidence to become productive, caring adults who contribute positively to society. Experiential learning in areas relating to healthy lifestyles, preparing for careers, developing communication, social skills, leadership and community involvement can provide the education and development of these life skills.

An effort in western North Dakota is offering value added opportunities to producers in the region. First, Anheuser Busch has implemented a malting barley increase program. Acreage of selected varieties of malting barley under contract has gone from zero acres in 1998 to 5,000 acres in 1999 and 10,000 acres in 2000. Anheuser Busch would like to contract 50,000 to 100,000 acres of malting barley in the near future. Second, identity preserved wheat production for sale directly to end user markets began in 2000. Ten producers contracting 1,100 acres of identity preserved hard red spring wheat participated in a pilot program to develop this opportunity. Acreage for this project should increase substantially in following years. Third, contracted irrigated potato production went from zero acres in 1997 to 80 acres in 1998 up to 1,200 acres in 2000. During the summer of 2000, $2.6 million of potato storage facilities were built as local French fry processors have guaranteed five years of production contracts

Approximately 189 people participated in five agritainment workshops. Of those participating 121 completed the post-workshop evaluations. Results include: 99 percent gave the program an

overall rating of useful to very useful; 55 percent or 66 people indicated that the workshop did help them to make a decision as to whether or not they would pursue starting a recreation business, 33 or 27 percent were already in business; 43 percent or 52 participants plan to start a business; of those already established 12 percent indicated that they would make changes in their current operation due to what was learned.

A study on the socioeconomic impacts of value added agricultural processing companies supports activities by local and state economic development staff to encourage creation of value-added agricultural processing facilities in the state. The report suggests how communities can prepare for such ventures and what concerns may arise. Another study on the impacts of plant and mine closings suggests how communities can best cope with and recover from those losses, by identifying key elements to recovery and success.

Almost 500 adults in 12 counties were trained in CHARACTER COUNTS! in 99-00 with over 8,000 students learning about the six pillars of character. Six communities have begun community coalitions to reinforce the activities learned at home and in school. As a result, kindergarten students in Washburn decided that they would save the money they would spend on Christmas presents for each other and buy groceries for needy families in the area instead. Over $150 was raised by 23 students. Before school starts the Belcourt community asks for donations of clothing and school articles and then a large garage sale is held for the community. The Jamestown, North Dakota, Middle School raised money to buy blankets to send to Guatemala.

Key Theme - Community Development: Value Added Agriculture Education

This effort focuses on three phases of value added agriculture development. The first is to help producers, industry, etc., identify the strengths and opportunities in the region. The second is to educate clients on constraints and requirements to develop an identified value-added venture. The third is to serve as a resource for implementing identified value added agriculture opportunities.

Impact - Five events aimed at educating the public on the strengths and identified opportunities for the region were held during the year. Interest in value-added agriculture was high as over 100 participants attended each session. The outcome of this effort included identification of four areas that participants felt had the best opportunity for success. The first was potential for high value crop development with the vast irrigation resources in the region (potatoes, carrots and onions were singled out). The second was developing niche crops to be used in rotation with high value crops (malting barley and identity-preserved wheat were identified). The third was attracting food-processing firms for better markets (an effort is underway to attract a French fry plant to the region). The final area of identified opportunity was the development of higher value dry land crops (chickpeas and other legumes saw dramatic acreage increases in 2000).

Throughout the year producers and end users were brought together in an effort to form value added agriculture production and marketing alliances. Three outcomes from this effort are offering value added opportunities to producers in the region. First, Anheuser Busch has implemented a malting barley

increase program. Acreage of selected varieties of malting barley under contract has gone from zero acres in 1998 to 5,000 acres in 1999 and 10,000 acres in 2000. Anheuser Busch would like to contract 50,000 to 100,000 acres of malting barley in the near future. Second, identity-preserved wheat production for sale directly to end-user markets began in 2000. Ten producers contracting 1,100 acres of identity-preserved hard red spring wheat participated in a pilot program to develop this opportunity. Acreage for this project should increase substantially in following years. Third, contracted irrigated potato production went from zero acres in 1997 to 80 acres in 1998 up to 1,200 acres in 2000. During the summer of 2000, $2.6 million of potato storage facilities were built as local French fry processors have guaranteed five years of production contracts. Eventually, the region hopes to attract a French fry processing plant from this effort.

Source of federal funds: Smith-Lever

Scope of Impact: Multi-state Integrated Research and Extension in ND and MT.

Key Theme – Supplemental Income strategies – The Dakota Lamb Growers Cooperative

Agribusiness and Applied Economics faculty have been working with a group of lamb producers to add value to their lambs. Help was given to secure three grants, conduct a feasibility study, and analyze niche marketing opportunities for lamb products.

Impact - The producers recently formed the Dakota Lamb Growers Cooperative and completed a successful equity drive where 102 members committed 8000 lambs for processing and marketing natural and premium lamb products under the Dakota Lamb label. Faculty involvement has been instrumental in developing this new generation cooperative which will have a significant positive impact on the lamb industry in the region.

Source of federal funds: Hatch

Scope of Impact: State Specific

Key Theme - Community Development: Rural Economic Development

The Extension specialist co-developed a comprehensive Business Retention and Expansion visi tation program to help interested community leaders identify existing business issues and needs. Research specialists in the NDSU Department of Agribusiness and Applied Economics analyze and present the data to community leaders. The NDSU Institute for Business and Industry Development follows up with individual requests from manufacturers. Annual progress surveys are conducted. An additional county-based program began in July of 2000 and will conclude in 2001. Results for this program will be reported in 2001. The State Department of Economic Development and Finance funded the primary research portion of the project.

Partners: Local Economic Development and Chamber of Commerce Staff, State Department of

Economic Development and Finance, NDSU - IBID and local county or city economic development groups and chambers of commerce.

Impact - Thirteen county and city based programs have been conducted since 1995. Eleven of 13 program coordinators responded to a follow-up survey conducted in this program year. Results include: of the 176 projects planned, 43 percent or 75 projects were in progress, 23 percent or 41 projects had been completed, 11 percent or 20 projects were dropped, and 23 percent or 40 projects had no indication as to progress.
Source of federal funds: Smith-Lever

Scope of Impact: Integrated Research and Extension

Key Theme - Impact of Change on Rural Communities: **Business Retention and Expansion**

The Extension specialist chaired a committee consisting of multiple agencies and o rganizations to develop and deliver a statewide curriculum and program for community strategic planning. Extension specialists also provided facilitation training for staff from the following agencies and organizations: USDA Rural Development, USDA Rural Development Council, State Department of Economic Development and Finance, State Department of Community Services, Governor's Office Regional Planning Councils, North Dakota State Department of Health and local Economic Development Professionals.

Impact - Seventy-five facilitators for the strategic planning process were trained in a two day workshop. Seventy two of the facilitators attended another one-day session for pilot program updating and specific facilitator skills training. Thirty -six counties are currently in the process of conducting strategic planning programs with the assistance of the trained facilitators.

Source of federal funds: Smith-Lever

Scope of Impact: State Specific

Key Theme - Supplemental Income Strategies: **Rural Economic Development**

Extension specialists and county extension agents conducted educational Agritainment workshops in five areas of the state. The goal of the program was to provide information to help families decide if a recreation business was feasible for their individual location and operation. Additional workshops are planned for 2001. A follow-up interview survey of a sample of participants from each workshop will be conducted in 2001. Partners: Local economic development staff, Southwest Area REAP board, North Dakota Department of Tourism.

Impact - Approximately 189 people participated in five workshops. Of those participating, 121 completed the post-workshop evaluations. Results include: 99 percent gave the program an overall rating of useful to very useful; 55 percent or 66 people indicated that the workshop did help them to

make a decision as to whether or not they would pursue starting a recreation business; 33 or 27 percent were already in business; 43 percent or 52 participants plan to start a business; of those already established, 12 percent indicated that they would make changes in their current operation due to what was learned.

Source of federal funds: Smith-Lever

Scope of Impact: Multi-state Extension - ND and MT

Key Theme – Impact of Change on Rural Communities: The Socioeconomic Impacts of New Agricultural Processing Facilities

Expanded processing of agricultural products in rural areas has been widely pursued as a strategy for community economic development. Expansion of value-added agricultural processing in rural areas is generally seen as a positive development; however, this expansion has not been without its problems for some communities. The objective of this completed study was to gain a better understanding of the socioeconomic impact of new agricultural processing plants. The impacts of these plants on rural communities were evaluated through data collected from community leaders, company officials, and area residents in four North Dakota towns that are the sites of new agricultural processing facilities developed during the 1990s. Study results indicated that improved job opportunities and enhanced incomes were generally seen as major positive effects of each of the new processing plants. Residents' incomes were enhanced both by the plants' jobs and payroll (which often represented second incomes for area households) and by increased incomes for area farmers (either from dividends paid directly by the processing plants, or from higher prices for a crop already being produced, or by allowing producers to raise a commodity that previously had no viable market). Because most of the plant jobs were taken by persons already living in the area, the new plants did not lead to substantial immigration or major population growth in the host communities, but rather served to stabilize the local economy and population (or to slow the rate of decline). Of all the effects of the plants, only air quality and water quality were more often rated as negative than positive by local residents. However, interviews with community leaders indicated that even these effects did not constitute major problems or issues.

Impact – Study supports activities by local and state economic development staff to encourage creation of value-added agricultural processing facilities in the state.

Source of federal funds: Hatch

Scope of Impact: State Specific

Key Theme – Impact of Change on Rural Communities - The Socioeconomic Impacts of Plant and Mine Closures

Adjustments to downsizing or closure of a major community employer was analyzed by (1) describing the approaches employed by some midwestern communities to maintain or restore their economics vitality in the face of a major plant closing or downsizing, and (2) describing the economic , community,

and social organizational factors related to those community development efforts. The communities ranged in size from about 400 to 10,000 residents.

Impact – Design for lessening the impacts of plant closures should be based on findings of the report regarding effective policies employed in the study communities. Communities facing a closure/downsizing in this study tended to make a "better" adjustment when there was/were:

- An economic development organization (regional if not local) in place prior to the closure;
- Cohesion of community and agency leaders who were not concerned with "turf" issues;
- A focus on both assisting displaced workers and promoting economic development;
- Substantial lead time prior to closure/downsizing;
- An understanding that the adjustment period from downturn to upturn was not overnight, but might take months, or even years, but a "Can Do" attitude prevailed throughout;
- A closure/downsizing that was not the sole or dominant employer;
- Some displaced workers who were not local residents, but were commuters; and
- A range of alternative re-use options for the closed facility, rather than a single restrictive use -option.

Source of federal funds: Hatch

Scope of Impact: National

Key Theme - Agricultural Financial Management: Farm Alliances and Partnerships

Ownership costs of machinery and other farm assets have continued to rise in recent years while prices for grain and oilseed commodities have clearly not kept pace with production costs. Some farmers and ranchers have been exploring alternative types of ownership of farm assets as a method of reducing per unit costs of production. Producers requested that the NDSU Extension Service provide educational programs on Farm Alliances models that could help farmers improve their overall management and possibly increase their farm financial performance and efficiency of their farm assets. The Farm & Family Economics team members gave high priority to educational programs focusing on farm alliances and partnerships. This was a result of input coming from all over the state. The target audience was primarily farmers and ranchers with gross income of under $500,000 and agricultural lenders who serve these producers.

Impact - A formal evaluation of the participants has not yet taken place, as the delivery efforts are still in process. However, these efforts have resulted in an estimated 25-50 producers requesting additional information/assistance from lenders/agents/adult ed. instructors and professionals on this topic. This is based on recorded contacts as well as estimates for discussions between lenders and borrowers. It is estimated that at least 20 percent of the producers involved will begin the developmental stage of some type of alliance/partnership at the farm level within the next two years.

Source of federal fund: Smith-Lever

Scope of Impact: State Specific but can be used as a Regional or Multi-State Program.

Key Theme – Impact of Change on Rural Communities: The Economic Effects of Migration

This study describes basic socioeconomic characteristics of new residents to North Dakota, the factors motivating their move, and their satisfaction with the North Dakota communities where they live. New residents who responded to the survey were generally younger than the North Dakota population overall; about two-thirds were between 21 and 40 years old. The educational level of the migrants was also higher than that of the state's population overall; 47 percent of the new residents were college graduates and an additional 35 percent reported some college or post-secondary vocational/trade school attendance. About 48 percent of the new residents had previous ties to North Dakota.

The new residents most often mentioned the following reasons for moving to North Dakota: looking for a safer place to live (59.5 percent), closer to relatives (50 percent), quality of the natural environment (49.5 percent), lower cost of living (48 percent), outdoor recreational opportunities (38 percent), and quality of local grade/high schools (35 percent). New job opportunities or transfers were central to many new residents' decisions to relocate. About 65 percent of the new resident households indicated that a new job or business opportunity, a transfer by a current employer, or a military transfer had been a key factor influencing their decision to move. Following their move to North Dakota, about 67 percent of respondents and 69 percent of their spouses or partners were employed full-time, while 12 percent of respondents and 11 percent of spouses were employed part-time.

Impact – Understanding of factors underlying in-migration decisions will be useful to regional economic development staff in providing services and concentrating on factors favorable to increasing popula tion growth in areas of North Dakota experiencing growth.

Source of federal funds: Hatch

Scope of Impact: Multi-state research

Key Theme - Character/Ethics Education: Character Counts

Today's children have not always had the opportunities needed to make wise choices. 4-H Youth programs provide opportunities for youth to develop life skills in communication, working with others, and getting along with others. Ethics Education is an educational program that has been incorporated into programs within 4-H youth programming as well as in schools and communities throughout North Dakota. CHARACTER COUNTS! is an educational program developed by the Josephson Institute of Ethics and adopted by the NDSU Extension Service to teach six character traits. They are trustworthiness, respect, responsibility, caring, fairness and citizenship.

State, Federal, local and grant sources of funding have enabled North Dakota to offer CHARACTER COUNTS! in communities and in 4-H youth activities throughout the state. Volunteers, county extension staff, state and local, along with school administrators, teachers, and community members

have been part of the training and implementation of the program in local communities.

Leaders are trained in the curriculum and then are able to teach the curriculum and activities to others. It makes use of a traditional extension type of face-to-face training with leaders and then exponentially expands as each leader trains more people. Educational materials on character including extension publications and newsletters promote and explain character education. It has been incorporated into activities at county and state fairs as well. In addition television, radio, and newspapers have also picked up on the need to educate for character. Many schools have requested this character education program after going through school improvement processes and have come to the extension service for assistance in this area.

Impact - Almost 500 adults in 12 counties were trained in CHARACTER COUNTS! in 99-00 with over 8,000 students learning about the 6 pillars of character. In turn parents and other community members are also learning about pillars of character as they see their children through home activities and community activities related to character. In addition six communities have begun community coalitions to reinforce the activities learned at home and in school.

Although the formal evaluation will be done in program year 00 -01 there have been some behavioral success stories. Short term results have been documented in scrapbooks, projects, videos and reports based on what teachers and communities have seen and observed. Some examples shared have included awareness by the use and making of posters in the schools by students and teachers. Students are learning the terms and communities are also learning the process of change. Examples of some medium term results are illustrated by actions on the part of those learning about character.

- Kindergarten students in Washburn decided that they would save the money they would spend on Christmas presents for each other and buy groceries for needy families in the area instead. Over $150 was raised by 23 students. The McLean County Public Health Nurse, Sandra Birst, identified a family to receive the groceries. Committees were for med within the class to plan and carry out their project. Committees included decorating bags for delivery, making grocery lists and buying the groceries. The local newspaper also got involved by publicizing the event. The children showed responsibility by carrying out their given tasks, and they showed caring by thinking of someone else along with respect for others.
- Before school starts, the Belcourt community asks for donations of clothing and school articles and then a large garage sale is held for the community.
- The Jamestown, North Dakota, Middle School raised money to buy blankets to send to Guatemala.
- Students in two North Dakota communities have done surveys in their school to determine changes in character. The surveys showed that junior high school students return things they borrow most of the time and are unwilling to cheat or physically harm other students. The results showed that the junior high students surveyed see them selves as more caring and trustworthy, not as fair and responsible and need more work to be respectful of others and good citizens. The schools plan to survey the same students over time to see if the responses change as the students mature.

- The Rolette school system is seeing more orderly behavior in the hallways, in the lunch line and on the playground.

In communities where character education has had a longer tenure, teachers and administrators have noticed less fighting, less cheating, and better behavior at recess and athletic events. Formal evaluation process will begin in North Dakota in March 2001 to give us a better indicator of long term changes. A child who participated in character education summed up what character education is in North Dak ota: "Because what I learned made me change."
Source of federal funds: Smith-Lever

Scope of Impact: State specific within the National CHARACTER COUNTS! effort.

Key Theme: Child Care/Dependent Care: Together4Kids Program

The Together4Kids Program was initiated as a collaborative effort between Fargo Public Schools/Safe Community Committee, the Parent Resources Center/NDSU-Cass County Extension Service, Region V Children's Services Coordinating Committee and the Fargo City PTA. The 1999-2000 school year was the second year of the Together4Kids Program. During this school year, the parenting sessions offered to parents were targeted toward parents of students ages 6 to 17. A total of eight workshops were offered that included 18 different sessions. Off site child care and transportation were made available through the Parent Resources Center to those parents needing it in order to attend the Together4Kids Program.

Impact - Attendance at the sessions averaged about 40 parents with the largest audience over 110. In addition to advertising the Together4Kids Program using the normal avenues to promote the monthly programming (AdVentures for Kids - a monthly newsletter sent to all elementary families, posters, flyers, articles/flyers in school newsletters, PSA s, the Parent Resource Center newsletter), a monthly ad was purchased in the local newspaper. These ads included parenting tips about the monthly topic and promoted the program. The newspaper used serves a metropolitan area of over 120,000. The success of Together 4Kids has resulted in continuation of the program for the 2000-2001 school year.

Source of federal funds: Smith-Lever

Scope of Impact: State specific.

Allocated Resources
($ x $1,000)

		FY00
1862 Extension ($)	Smith-Lever	505
	State	710
	FTE	17.5

1862 Research ($)	Hatch		196
	State		321
		FTE	4.7

B. STAKEHOLDER INPUT PROCESS

Various processes for stakeholder input are utilized on an on-going basis. This input is used to shape our long range plan of work along with adjustments to our annual activities. These processes assure that high priority issues facing the people of North Dakota are addressed. Examples of stakeholder input processes undertaken are as follows:

State Board For Agricultural Research and Education (SBARE)

SBARE held monthly meetings during the fiscal year which were also attended by department chairs and Research Extension Center directors. The meetings focused on assessing current programs and identifying issues and needs for new programs. Individual citizens and commodity group representatives provided direct input. Three sub-committees, Crops, Livestock, and Other Programs, were organized as working groups for SBARE. These committees met several times with industry representatives to gathering additional input on issues and needs.

Multicounty Program Unit (MPU) Advisory Committees

Ten MPU Advisory Committees each met at least twice during the past fiscal year, once in the spring and again in the fall. The spring meetings dealt with issues and needs identification while the fall meetings were dedicated to program review. This input is utilized by extension agents to develop local programs and to set direction for the State Extension Plan of Work. Many MPU Advisory Committee members work directly with their local extension agent on program development. MPU Advisory Committee are nominated by their local county.

Research Extension Center Advisory Committees

The seven Research Extension Centers (RECs) held winter meetings with their citizens advisory boards that focused on issue identification for both research and extension programming. REC staff not only used this input to set program direction for the center but also conveyed it to main station researchers and to SBARE. Summer meetings and field tours were also held to review programs and observe the progress of research activities.

Irrigation Summit

An Irrigation Summit was held at NDSU during the fall of 2000. The purpose was to promote effective communication among irrigation interests in the state and NDSU, identify processes for maintaining strong communications and prioritize research needs. Research scientists presented a synopsis of their

current research for their research goals for the future. Industry representatives and producers identified additional research issues and needs. This information is used to guide irrigation research and extension program priorities.

Livestock Colloquium
Livestock constituents and interest groups were brought together to discuss current research and extension programs along with the identification of future issues and opportunities. This input has resulted in a reaffirmation of livestock program priorities along with the identification of several emerging issues.

North Dakota Nutrition Council

North Dakota Nutrition Council, established in 1980, has over 180 members that identify nutrition education needs for North Dakota. The council has representation from several agencies and organizations, each with a specific nutrition focus. North Dakota nutrition issues are identified by the membership and directed to the appropriate agency or organization for action. North Dakota State University Extension specialist and agents have taken the lead educational role in addressing several nutrition issues identified by the Council.

Family Life Education Committee

Department of Human Services and North Dakota State University Extension Family Life Education Committee was established in 1992 by the North Dakota legislature to educate and support individuals at all points within the family life cycle. The committee meets six times per year to identify issues, plan, and implement educational programs. The NDSU Extension Service is the primary source of the educational programs and outreach to the state.

C. PROGRAM REVIEW PROCESS

No significant change in program review processes since 5-year Plan of Work.

D. EVALUATION OF THE SUCCESS OF MULTI AND JOINT ACTIVITIES

The issues addressed in most "multi and joint" activities were identified by county and multicounty program unit advisory councils along with specific boards and groups like the Sugar Beet Research Education Board and SBARE. The targeted audiences for these programs were inclusive of all clientele with a vested interest in the issue. Many programs are on-going or multiple year in length; however, specific impacts were noted where applicable. Most of these activities resulted in time efficiencies for the extension educator, and they provided a complete educational experience for the end user. The

following is a partial listing of multi - state and multi - institution activities undertaken.

Great Plains States Staff Development Training

Extension program leaders from North Dakota, South Dakota, Nebraska and Kansas continually interact on programming and staff development issues that address needs in all four states. During May 2000, this group planned and delivered a three-day train-the trainer workshop on utilizing the "logic model" as a program improvement process for planning and delivering extension programs. Extension specialists from the University of Wisconsin facilitated the training for over 75 extension agents, specialists and administrators from all four states. The North Dakota team conducted a series of training programs on the "logic model" at district conferences during October 2000. This model is currently being utilized in the program planning and development process in North Dakota.

Tri-state Corn Symposium

North Dakota, Minnesota and South Dakota co-operated in planning and conducting a Tri - State Corn Symposium in January 2000. This symposium was attended by 180 corn producers from the three state area and emphasized management practices to assist them in producing a quality crop. Corn production continues to grow in the three states due to market opportunities, excellent yields for several years and adoption of agronomic practices that have made corn a competitive and viable crop in the three state area.

Alfalfa Management Workshop

Richland (North Dakota) and Wilkin (Minnesota) counties co-operated in planning and hosting an area alfalfa management workshop in January of 2000. Production of a quality product was the program theme and specialists in alfalfa production from both North Dakota and Minnesota were utilized in the event. Quality production is a concern as the local alfalfa market continues to grow with opportunities for markets both locally and in the midwest area. Producers indicated that producing a quality product was their major concern in order to capture premiums paid for quality.

Northern Plains Sustainable Agriculture Society and Organic Agriculture

The Northern Plains Sustainable Agriculture society (NPSAS) contains members from North Dakota, South Dakota, Montana, Nebraska, Minnesota and Canada. It is a group whose goal is to promote the use of sustainable food production systems in agriculture. While many of the members are organic producers, it welcomes all those interested in producing food sustainably. A North Dakota Extension agent has been the chair of this group for the past five years, with the majority of the members coming from North and South Dakota. The NDSU Extension Service staff have been active in developing educational programs for NPSAS. Over five years ago NDSU Extension was instrumental in developing the beginning organic farming program for NPSAS. It started out with 10 new producers and now annually draws a crowd of 60 producers from surrounding states. The NDSU Extension Service has also developed an organic crop budget and a bulletin on switching to organic production

that gets widely used in both North and South Dakota. New organic farmers have used the beginning organic farming tract and the bulletin on switching to organic production to help successful transition into organic production. Organic producers from North and South Dakota have used the crop budgets for financial planning and getting loans for their operation from lenders who are not familiar with organic farming. The North Dakota Extension agent who chairs this group continues to receive an increasing number of contacts from organic farmers, consumers, university personnel and federal agencies looking for advice on organic farming and the organic industry

EWEASK Regional Sheep CD ROM

EWEASK is a CD on basic sheep nutrition developed by the Northern Mountain Plains Regional Sheep Extension Service Consortium: Sheep Production in the Northern Plains (#93-ESPN-1-5197). The consortium includes sheep specialists from North Dakota, South Dakota, Montana, and Wyoming. The EWASK CDs have been distributed to county and area offices in all four states (~200 copies). The CD also contains sheep research reports from the four states.

Advanced Crop Advisers Workshop

This is an annual two-day event organized and conducted by the NDSU and Minnesota Extension Service. Participants include crop consultants, agronomists, extension agents, and agri-business representatives primarily from North Dakota and Minnesota, but also South Dakota, Montana, and Manitoba. Instructors include university and agri-business personnel. The objective of the event is to provide new and practical information for crop advisers to update and enhance recommendations provided to farmers. A typical agenda consists of five to six, two-hour concurrent sessions. About 130-150 people attend the workshop each year. Scope of impact is multi-state. Written evaluations from the 2000 workshop indicated favorable ratings: presentations = 3.2-4.5, content = 3.0-4.5, and value = 3.2-4.5 (scale: 1 = poor and 5=excellent).

Minnesota Fruit and Vegetable Growers Association

In 1998, vegetable growers and an extension specialist from North Dakota met with the Minnesota Fruit and Vegetable Growers Association board. The meeting focused on forming a two state organization for growers from both North Dakota and Minnesota. North Dakota growers needed a place to unify and learn from each other, and the Minnesota group needed more members to build their program. The MFVGA had just over 100 members, yet their annual educational meeting drew over three times that in attendance. Consequently, it was obvious that there was more interest. The MFVGA agreed that it could be synergistic to have the states join but asked that North Dakota provide members and program people to work with the association and the annual meeting. Since that time many North Dakota specialists and county Extension agents have been involved in the programming and membership. In 2001, the North Dakota membership has increased, and work toward a two state

organization continues.

Red River Valley Vegetable Task Force

The RRVV Task Force has been in place for several years to draw synergies from both North Dakota and Minnesota working through the Northern Great Plains Inc. Extension Service employees from both states are represented on the Task Force. The group continues to work with French companies that have advanced food processing capabilities. The advanced capabilities are not bei ng used in the United States, which represents an opportunity to do business with farmer-based cooperatives and joint venture with existing US companies. Contacts have been made and feasibility studies have been done to help implement the new process. A pre-processed vegetable project continues to show promise. This pre-processed system would use farmers and outsourcing companies to provide bacteria free farm inputs to the final food processor. This gives the processor the ability to market processed foods without preservatives and still maintain high quality and long shelf life. This is being made possible by having two states working together and sharing inputs for the analysis and launching of a new industry.

Multi State Onion Research Project

Minnesota, Montana and North Dakota Extension and Research people worked together in 2000 to extend the capacity for vegetable production and marketing in the region. A North Dakota specialist and a Minnesota Extension agent along with a researcher from Sidney, Montana, coordinated efforts with a seed company out of Idaho to look at onion varieties that will do well in the region. The company is interested in the region because vegetable production is being driven out of the existing production areas because of production cost, population expansion, and regulation. Test plots were initiated in 2000 at Sidney, Montana; Oakes, North Dakota; Carrington, North Dakota; and Staples, Minnesota. The test plot results were compiled and assembled for the seed company to further select varieties. The project has meant sharing of labor, talent and inf ormation to move toward a new production of a high-value crop to replace low valued commodities.

North Dakota/Montana County Program Collaboration

A small grain variety plot using seed from both Montana State and North Dakota State was planted, maintained and harvested as a cooperative venture. A joint small grains tour of this plot and other sites of current interest was planned and conducted. Educational speakers from both states, usually Extension specialists, were utilized. The Mo n-Dak Wool Pool, a joint 4-H camp, and educational programming in specialty areas are other collaborative efforts where extension agents from both states work together.

4-H Cooperative Curriculum System

A North Dakota 4-H curriculum Extension specialist chairs the staff development work team for this system. This involves two monthly phone calls, reviewing proposals and preparing materials which amounts to about 20 percent of this individuals's time. Several North Dakota extension agents are serving on curriculum design teams for leadership and geospatial literacy. Each design team includes members from at least six states. This work involves attending workshops on writing curriculum and leading efforts to write, revise, review, and pilot curriculum pi eces.

E. MULTISTATE EXTENSION ACTIVITIES

Value-Added Agriculture Education Program

Efforts to educate producers, industry, government, and financial clientele in both North Dakota and Montana are the focus of this value-added agriculture program. This effort focuses on three phases of value added agriculture development: (1) to assist producers, industry, etc. identify the strengths and opportunities in the region; (2) to educate clients on constraints and requirements to develop a value added ventures; and (3) to serve as a resource for implementing identified value added agriculture opportunities.

Five events aimed at educating the public on the strengths and identified opportunities for the region were held. Over 100 participants attended each session. The outcome of this effort included identification of four areas that participants felt had the best opportunity for success. The first was potential for high value crop development with the vast irrigation resources in the region (potatoes, carrots and onions were singled out). The second was developing niche crops to be used in rotation with high value crops (malting barley and identity preserved wheat were identified). The third was attracting food-processing firms for better markets (an effort is underway to attract a French fry plant to the region). The final area of identified opportunity was the development of higher value dry land crops (chickpeas and other legumes saw dramatic acreage increases in 2000).

Throughout the year producers and end users were brought together in an effort to form value added agriculture production and marketing alliances. Three outcomes from this effort are offering value added opportunities to producers in the region. First, Anheuser Busch has implemented a malting barley increase program. Acreage of selected varieties of malting barley under contract ha s gone from zero acres in 1998 to 5,000 acres in 1999 and 10,000 acres in 2000. Anheuser Busch would like to contract 50,000 to 100,000 acres of malting barley in the near future. Second, identity preserved wheat production for sale directly to end user markets began in 2000. Ten producers contracting 1,100 acres of identity preserved hard red spring wheat participated in a pilot program to develop this opportunity. Acreage for this project should increase substantially in following years. Third, contracted irrigated potato production went from zero acres in 1997 to 80 acres in 1998, up to 1,200 acres in 2000. During the summer of 2000, $2.6 million of potato storage facilities were built as local French fry processors have guaranteed five years of productio n contracts. Eventually, the region hopes to attract a French fry processing plant from this effort.

As value added efforts are implemented, such as the ventures described above, providing adequate resources and good information is critical to further developing these ventures. Detailed economic data on the forementioned projects were provided to producers interested in becoming involved with value-added agriculture. As a result, more producers are becoming involved, more acres of higher value crops are being produced, and producers are adding wealth to their bottom lines.

Agronomy Program

In 2000, a multi-state project was initiated between North Dakota State Extension Service, South Dakota State Extension Service and Ducks Unlimited. The project was to determine yield differences among soybeans grown on no-tilled land. The no-tilled land was divided into two treatments, soybeans onto wheat stubble and soybeans onto corn stubble. Within each treatment, multiple passes from several different planters were made. Roundup-Ready soybeans were seeded at different rates to compare stands and yields in the different stubble, with different planter units and at the seeding rate of 150,000, 180,000 and 210,000 plants per acre. Equipment dealers from Sargent, Marshall, Day and Ransom counties participated Two in-season meetings were arranged. Over 100 farmers participated in the first meeting, where specialists from both NDSU and SDSU gave presentations and led tours of the field demonstrations. A second in-season meeting reviewed the fields prior to harvest and involved about 65 farmers who observed the plots and stand results. A January meeting, held at two locations, involved a total of 35 farmers to review the yield and stand results. Cooperative work between Extension and Ducks Unlimited allowed an extensive trial program to be developed. It allowed succinct, current information to be disseminated on no-tillage and production practices. And, the program allowed farmers from both states to see the trials established, managed though the season and the final results. It also allowed the cooperative project to be produced through both universities and the non-profit organization of Ducks Unlimited.

Multi-state Crop Program and the Crops Teleconference for ND and MN

A cooperative project involving agronomy information sharing across the Red River Valley was begun in 1999 and continued through 2000 and into 2001. Cropping information on corn, soybeans and canola was shared across state lines in North Dakota, Minnesota and into South Dakota. Utilizing a specialist that worked cooperatively among the states allowed more information to be distributed across state lines. The specialist not only provided crop information for county extension programs but also cooperated in programs through other agencies such as Ducks Unlimited and seed companies. Both hard copy and electronic cropping information was provided in the form of bulletins, brochures, crop newsletters, posters, PowerPoint programs, DTN articles, news releases and through list serves such as AgDakota and Red River Valley. A Web site was also developed for county agents within the Red River Valley from both North Dakota and Minnesota and cropping concerns and information was disseminated through a weekly, interactive teleconference forum for discussing crop diseases, insects, and weed concerns as well as crop progress. This forum allowed the county agents to request specific specialists and in-depth information on problems that were encountered in the counties. Also, the discussions that

followed allowed the county agents to provide information to fellow agents and also established a platform for standardizing information given out at the county level, specifically on technical requests such as crop insurance requirements and the county agents' roles in answering questions and providing assistance with these programs. Agents from both states have emphasized the timely help that has come from this crops teleconference forum.

Teamwork Reaps Sweet Success for Sugar beet Producers

Sugar beet growers in North Dakota and Minnesota produce 50 % of the United States beet sugar. The total business activity of the sugar beet industry in North Dakota and Minnesota was estimated at $2.3 billion in 1997. Cercospora leaf spot is the most serious leaf disease of sugar beets in North Dakota and Minnesota. This disease cause reductions in tonnage and sucrose, increases impurities, and roots of diseased plants do not store well in sugar beet piles. In 1998, sugar beet growers in North Dakota and Minnesota lost $75 M because of Cercospora leaf spot, despite spending $38 M in fungicide applications. Researchers from North Dakota State University and the Northwest Research Outreach Center, Crookston, University of Minnesota, and researchers from the Southern Minnesota Beet Sugar Cooperative conducted studies to determine control and management strategies for Cercospora leaf spot. These studies contributed to the fungicide Eminent being granted a section 18 label for controlling Cercospora leaf spot in North Dakota and Minnesota in 1999 and 2000. Extension specialists recommended that sugar beet growers rotate Eminent with fungicides having different modes of action for Cercospora leaf spot control and management of fungicide resistance. Cercospora leaf spot severity in sugar beet was very high in 1999 and moderate in 2000, but growers had excellent field control using Eminent and other fungicides in alternation. Ninety -seven percent and 94 % of growers surveyed in 1999 and 2000, respectively, indicated that they rotated the use of Eminent. The percentage of sugar beet growers who stated that Cercospora leaf spot was their worst production problem dropped from 36 % in 1998 to 6 % in 1999 and 3 % in 2000!

U.S. Department of Agriculture
Cooperative State Research, Education and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Multistate Extension Activities and Integrated Activities

Institution **NDSU**
State **North Dakota**

Check one: **____ Multistate Extension Activities**
____ Integrated Activities (Hatch Act Funds)
X Integrated Activities (Smith-Lever Act Funds)

	Actual Expenditures
Title of Planned Program/Activity	**FY 2000**
Renewable Resources	8,154

Beet Education	18,342	
Entomology Education	10,104	
TOTAL:		36,600

Form CSREES-REPT (2/00)

F. INTEGRATED RESEARCH AND EXTENSION ACTIVITIES

Renewable Resources

EDUCATION:

* **Twelve-month grazing and forage planning workshop (2- and 3-day)**: Four intensive grazing and forage sessions were held in North Dakota for livestock producers. Ranchers learned to improve their rangeland management skills and develop year-long forage use strategies. There were 84 ranchers participating in this program. Roughly 47% of the ranchers were beginners in developing new grazing strategies while the remaining individuals looked to further improve their current grazing and forage programs. These four workshops impacted almost 116,000 acres of native rangeland, pastureland, and hayland. Over 75% of the participants were planning to add new range improvement practices, and over 90% planned to implement the training strategies learned in the workshops. Two employees of the US Forest Service and the Commissioner of the North Dakota Game and Fish Department participated in the program. These three individuals response to the workshop included trying to incorporate new strategies on a potential 1 to 2 million acres of public lands.

* **Trace and macro mineral management workshops**: Four workshops were conducted in western North Dakota for livestock producers. Ranchers learned mineral needs for livestock, mineral status on rangeland and pastureland, and balancing mineral needs to improve management skills of the grazing livestock animal and became proactive in maintaining and understanding a well-balanced mineral program. These workshops were designed to teach livestock producers potential problems in mineral deficiencies and how to balance a supplement program to improve livestock health. Over 150 ranchers participated in these workshops, having a direct impact on the health and production potential of an estimated 30,000 head of livestock.

***Educating youth on the importance of the range resource**: A 4-day range youth camp was conducted in western North Dakota for youth interested in the range resource and range judging. Youth learned the importance of range to livestock producers, the environment community, and wildlife enthusiasts. They learned basic fundamental range management practices and how to judge the resource for health and value for forage and wildlife habitat. Over 40 youth ages 13-18 participated in the 4-day camp and over 140 participated in the State Range Judging Contest. We believe any involvement of youth in the importance of the range resource and fundamental needs for managing these lands will create a more well-rounded adult.

RESEARCH:

***Nutritional composition and mineral status on native rangeland and introduced grass plants**: The NDSU Extension Service in cooperation with the Animal and Range Sciences Department and Hettinger Extension and Research Center has conducted three nutritional studies in western and south central North Dakota. This research has recognized nutritional composition and mineral status of 36 different grass varieties (20 cool-season and 16 warm-season grasses). These results will allow forage growers, livestock producers, and wildlife managers to select one or more grasses that fit their needs and goals to provide a more economically efficient operation. They can select a grass that fits a specific program and problem area. Example: if a livestock producers need to add spring and fall pastures and a summer haying field, they can select a grass that fits each specific need while providing nutrients and forage at optimal levels (meadow brome 'Regar' for spring, switchgrass 'Forestburg' for summer hay ground, Russian wildrye 'Mankota' for fall use while complementing the native pasture for summer grazing). Mineral status was also determined for native prairie with overwhelming results showing copper deficiencies during the entire growing season, zinc deficiencies in many years after mid July, phosphorus deficiencies by early July on all rangelands e xcept lowlands associated with adjacent uplands, and potassium deficiencies after mid September. We also know calcium and iron are adequate during the entire growing season, and potassium high until mid September.

***Effects of sheep grazing using a multi-species and single-species grazing approach on leafy spurge infested rangeland**: NDSU Extension Service, in cooperation with the Animal and Range Sciences Department and Hettinger Extension and Research Center, has conducted grazing trials on leafy spurge infested rangeland throughout North Dakota. Sheep effectively controlled leafy spurge after one year using a single species grazing approach and after three years using a multi -species grazing approach. Leafy spurge stem densities were reduced by 94 % and 82 % on single-species and multi-species grazing treatments, respectively, after five years. Seasonlong grazing using a multi -species approach provided a quicker, more efficient grazing of leafy spurge than rotational grazing. However, both reduced leafy spurge stem densities by 92 % and 32%, respectively, after five years.

Entomology Research & Education

Small Grains - Field studies were completed that investigated orange wheat blossom midge and its impact on durum wheats. Though no natural resistan ce was detected in current varieties, the information provides a benchmark for future evaluation of resistant durum wheats for the state and region. Educational efforts continue on wheat midge management. The sixth statewide survey for assessing overwintering populations of midge was conducted. The results help identify risk potential for midge infestations in the upcoming season. This information is made available through the state survey, grower meetings, newsletters, and news releases. Meetings conducted during the year addressed a broad scope of topics. One emphasis area was aphid management in small grains due to their abundance in 1999 and prevalence of barley yellow dwarf virus.

Corn- Field studies were completed that were designed to make univoltine European corn borer (ECB) emergence and moth activity more predictable using a degree model. This will improve our ability to identify when the most serious threat from corn borer can occur in the field and improve scheduling of field scouting activities. In addition, ECB yield-loss studies provided information on the impact of larval feeding when infestations occur at different growth stages. Though tunneling from univoltine borers may be more extensive at the end of the season, the

overall impact on yield follows the same trend reported by earlier researchers working with bivoltine corn borers.

Pesticide Impact Assessment / Regional Pest Management Centers - A three year proposal was submitted and funded. Cooperative surveys with neighboring states to acquire information on pesticide use and pest management programs are being developed. In addition, a proposal was submitted and funded for conducting a statewide pesticide use survey for the state of North Dakota. The scope of the survey will cover the 2000 production year. A Web page is maintained for this program. Pesticide use surveys for North Dakota crops are currently available at the Web site. Crop profiles, which are overviews of a states crop production and pesticide use, were completed for dry edible beans, wheat, barley, and potato. These are submitted for inclusion in a OPMP/PIA national profile database. Additional profiles completed are sunflower and dairy. Others that are be ing developed are canola, sugar beets, and corn.

North Dakota Crop and Pest Report - The newsletter is coordinated through the entomology office. Responsibilities include subscriber database, final editing, distribution, and web page publishing. There was an extensive reformatting of the web page for the newsletter to improve access of the information in a timely and more appealing fashion *(http://www.ag.ndsu.nodak.edu/aginfo/entomology/ndsucpr/index.htm)*. Published information is regional in scope and distributed to clientele in neighboring states.

Entomology Updates for North Dakota - An extension entomology web site has been developed to provide current information on insect pest management issues being faced within the region. The site provides links to relevant information that often is in more detail than newsletters, extension circulars, and other outlets may provide (http://www.ag.ndsu.nodak.edu/aginfo/entomology/entupdates/index.htm).

Integrated Beef Research Extension Activities

North Dakota beef producers have access to a number of grain processing byproducts. About 1000 tons of wheat middlings are produced in the state every day. Wheat middlings are used by the feed industry as base ingredients for supplements, creep feeds, and other products. While many ranch operators would prefer to use these types of byproducts, many are hesitant to switch from traditional feedstuffs until more research data is available. Another factor which influences their decisions is labor concerns. Average age of ranchers in the state is increasing and average number of cows per ranch is increasing as well. This has increased the need for labor saving methods of production. Typically in beef backgrounding operations, rations are either h and fed (labor intensive) or fed with tractors and mixer wagons (capital intensive). Our integrated beef research extension program has investigated the use of wheat middlings as a self fed ration for backgrounding cattle and reported the results back to producers. Based on our research data, wheat middlings can be placed in a self feeder and cattle allowed to "self feed." Similar levels of performance are achieved compared to mixed rations. This saves labor and capital investment for the producer. Producers are very interested in this type of

information, which has immediate

application to their operation. Research is ongoing to determine further methods of reducing labor and capital investment inputs into the beef backgrounding operation.

U.S. Department of Agriculture
Cooperative State Research, Education and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Multistate Extension Activities and Integrated Activities

Institution NDSU
State North Dakota

Check one: __ **Multistate Extension Activities**
__ **Integrated Activities (Hatch Act Funds)**
X **Integrated Activities (Smith-Lever Act Funds)**

Title of Planned Program/Activity	Actual Expenditures FY 2000
Renewable Resources	8,154
Beet Education	18,342
Entomology Education	10,104
TOTAL:	36,600

Check one: __ **Multistate Extension Activities**
X **Integrated Activities (Hatch Act Funds)**
Integrated Activities (Smith-Lever Act Funds)

Title of Planned Program/Activity	Actual Expenditures FY 2000
Renewable Resources	3,105
Beet Education	4,196
Entomology Education	1,332
TOTAL:	8,633

Form CSREES-REPT (2/00)