Kansas

Annual Report of Accomplishments and Results

FY2005

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Table of Contents

Introduction

K-State Research and Extension continues to provide research results and educational information to Kansas people and communities, in ways they can understand, to improve the quality of their lives and standard of living.

The motto of K-State Research and Extension is to provide “Knowledge for Life.” The goal for all of our planning is to set a course that will make the most of our resources and opportunities. The work involves local extension agents, professional staff, state and area researchers, extension specialists, and representatives from administration. Strategic planning is critical to our success as a land-grant university with its tripartite mission of teaching, research, and extension. It allows us to build on core values and serves as a guide for us to respond to the needs of Kansas citizens.

This report includes programs and projects that are conducted on campus and in all counties in the state. We cannot in one report feature all of them, but those included in this report are representative of the work that has been done or is being done to make a positive difference for the citizens of Kansas and of the region, nation, and world.

In fiscal year 2005, total funding in support of the programs described in the plan totals $94,424,867 (See Appendixes A and B). This total and the program efforts included in this report represent all funding streams–not just Federal dollars.

A. PLANNED PROGRAMS

GOAL 1 – AN AGRICULTURAL SYSTEM THAT IS HIGHLY COMPETITIVE IN THE GLOBAL ECONOMY

Overview (includes sections a, b, c, and d)

K-State Research and Extension (KSRE) responds to immediate and future food and fiber production issues that affect Kansas agriculture, families, and communities. KSRE develops improved, efficient, and profitable cropping and livestock production systems while protecting the environment. Agricultural technologies, risk-management strategies, and information systems are best management practices that agricultural producers can use to develop and produce profitable, safe, and appealing food and fiber products.

Kansas is one of the nation's leading agricultural states. Long known as the Wheat State, Kansas ranks high in the production of other crops and livestock. In the year 2004, Kansas was number one in wheat flour milled, wheat flour milling capacity, all wheat produced, sorghum grain produced, and cattle slaughtered. It ranked second in sorghum silage produced, acres of cropland and prime farmland, as well as cattle and calves on farms. It ranked third in red meat production, cattle and calves on grain feed, sunflowers produced, commercial grain storage capacity, and acres of land in farm. Kansas ranked sixth in agricultural exports. Other Kansas crops include soybeans, corn, and dry edible beans. Growing in importance to Kansas agriculture is cotton production. Agriculture and agribusiness also contribute to the total economy of Kansas, directly and indirectly. Nearly 20% of all Kansans, rural and urban, are employed in jobs related to agriculture.

Kansas has one of the largest beef industries in the United States (6,650,000 head in 2004), more than $5 billion annual farm receipts from the sale of cattle and calves). Kansas processes more beef cattle than any other U.S. state. Leading the way in Kansas to establish a system of identification for all livestock, KSRE faculty are responding to producer interests by providing an understanding of the available technologies and options for assuring a safe food supply at the production level. Animal health is vital to the profitability of the beef industry. Many of the nutrition, diet, and management systems used in animal care and feeding can be traced to KSRE programs.

Kansas has one of the fastest growing dairy industries in the nation (60% production increase since 1998) with new annual product sales that exceed $80 million. Producing 450,000,000 pounds of pork, Kansas ranks 9th in state swine production with 310 operations producing 95% of the state's pork. Swine production has remained fairly constant in Kansas. Consultations with the swine industry have resulted in adoption of rations with reduced phosphorus in the diets, lessening the environmental impact of swine waste.

The 2004 Kansas Farm Facts indicates that the farm value of crops harvested in Kansas during 2003 was $3,623,255,000. The value of crops from high to low was wheat, corn, soybeans, grain sorghum, and hay. Value of horticultural related crops rank is ranked fifth in Kansas crop production. Pasture and range acreage (18,262,000 acres) is utilized to support our beef industry.

Kansas is one of the top ranked states in the U.S. with regard to agricultural exports to international countries for wheat, feed grains, live animals and meat products, and hides. KSRE projects have studied US and export food markets and evaluated the benefit of improving the quality and marketability of Kansas' agricultural grain and meat products. Research in food processing and marketing is necessary to determine which value-added products or processes are economically sustainable in Kansas. Educational

programs are essential to teach Kansans about the advantage of value-added opportunities. KSRE has explored many value-added projects for the benefit of the state and its citizens. In the area of wheat, for example, value-added projects have included pasta, starch, gluten and oriental noodle production; shellfish diets; non-food and non-feed uses; new food products; and utilizing wheat-milling by-products. A value-added project has developed industrial adhesives and resins from soybeans. The project resulted in patents being issued to K-State, and has now reached the industrial scale proof-of-concept stage in partnership with a major resin manufacturing company. Another project has explored processing sorghum for improved marketability.

Through all of these efforts, educational support has been provided to entrepreneurial farm families seeking alternative sources of farm product sales as a means of enhancing income. The Kansas Center for Sustainable Agriculture and Alternative Crops has worked with Kansas producers to develop local food systems and local markets in Kansas. Locally produced meat, vegetables and flowers are increasingly sold to local markets.

The United States Department of Agriculture granted $3 million to K-State to establish a National Agriculture Biosecurity Center. The grant was authorized in the Public Health Security and Bioterrorism Preparedness and Response Act of 2002. K-State has partnered with Texas A&M and Purdue universities to:

- evaluate disposal methods of potentially contaminated animal carcasses in case of a serious contagious disease outbreak;
- assess execution, management, and effectiveness of current agroterrorism exercises; and
- analyze ways that agricultural pathogens might enter and be distributed within the country.

K-State is a lead institution to improve early detection and rapid response methods for plant pests and diseases. This multi-state project with the National Plant Diagnostic Network (NPDN) is supported through special USDA CSREES funding to enhance the capacity of scientists to detect and report unusual occurrences of plant associated problems. These problems could be the result of a planned terrorist action to affect the nation's ability to produce food or may develop from unintentional transfer of a pest or pathogen into the country.

For more than 100 years, K-State has provided knowledge to solve or alleviate problems. For example, the droughts of 2003 and late 2005 required special study and strategies to improve conditions created in these unusually severe droughts. The Kansas Weather Data Library (KWDL), operated by KSRE, is the official source of climatological data for the state. The KWDL took on new responsibilities during the drought and provided critically important drought status reports to state and local governments. Weekly and bi-weekly crop and forage teleconferences among agents and specialists were used to keep everyone aware of changing drought conditions and issues. Information was gathered and developed for use in radio broadcasts, newsletters, newspapers, and KSRE publications. A drought resource Website http://www.oznet.ksu.edu/drought was developed to transfer timely resource materials to farmers and the public.

A series of K-State supported meetings brought livestock producers together to discuss and share new ideas for planning and decision-making. With an identified need for pasture and hay exchange information among ranchers, KSRE cooperatively supported a Website on the Kansas Farm Bureau server that enabled farmers with available pasture and hay to connect with livestock producers who needed forage. Current and historical weather data from the Weather Data Library of KSRE was provided to state and federal agencies. Agents and specialists consulted one-on-one with producers on the critical

drought-related decisions.

Agricultural risk management is vital to profitable farming and ranching operations of Kansas. A team of K-State Agricultural Economics faculty and staff has developed the www.Agmanager.info Website for improved decision making. Newsletters, decision aids, policy briefings, information updates, and current educational program offerings are provided to the agricultural business professionals, farmers, and ranchers all across Kansas. Decision-making tools to aid farmers such as budget spreadsheets and data sets are available to improve management of their operations. Information about upcoming seminars, such as the annual K-State Risk and Profit Conference, also can be found. Topics on the Agricultural Economics department Website include crop and livestock marketing and outlook reports; crop insurance; farm management; agricultural policy; human resources; income tax and law; and agribusiness. The Website contains several pages that are updated weekly as market prices and conditions change.

e. Total expenditures by funding source and FTEs
FY2005 Projected: $65,701,116 Actual: $64,114,485 FTEs: 262.32

Key Theme – Adding Value to New and Old Agricultural Products

Adding Value to Kansas Products

a. K-State and the Kansas Rural Center are leading efforts to help Kansas producers develop value-added enterprises, through a mentoring project titled Guided Explorations of Value-Added Products and Enterprises. For example, the Certified Kitchen Workshops help entrepreneurs capitalize on consumers' growing interest in buying such local products as bread, baked goods, salsa, baking mixes, jams, jellies, and more
a. In 2005, 12 products processed by Kansas producers were created; and 25 producers either began small-scale value-added processing or expanded their value-added operation.
b. Scope of Impact – State Specific

Key Theme – Agricultural Profitability

Online Classes Help Improve Farm Businesses

a. While many producers want to learn about how to better manage their farms and ranches, time, travel distance and economics have been reasons these producers are not able to receive needed education. The Management, Analysis and Strategic Thinking (MAST) program at Kansas State University offers two-day workshops to give producers high-level farm management information. Then for three months, participants learn through distance education methods and focus on various farm management tools and their application. Both crop and livestock insurance modules are available.
b. Short-term Outcomes:
MAST participants reported that: (a) they learned up-to-date modern techniques to analyze the decision process using proven approaches; (b) many of their farms now focus on increasing capital and MAST has helped them plan for the future; and (c) the MAST program provided valuable information that has helped them progress with their own farms and increase their profit, productivity, and general well-being. Total Website visits now exceed 10,000. Crop insurance, farm programs, and public policy issues have been the major focus.
Scope of Impact – State Specific

Risk and Profit Conferences, Combined Risk Management Workshops

a. Risk and Profit 2005 was the tenth annual agricultural economics sponsored conference. The fee-based 1 1/2 day program focused on farm management/economic risk issues. The objective of the workshop was to teach farmers how to manage their combined yield and price risk before harvest. A case farm is used to explain the economic principles.
b. Short-term Outcome:
Approximately 85 farmer audiences were exposed to the idea that they would be better off focusing on traditional production and financial management tasks rather than on marketing—at least as long as they produce agricultural commodities. Four thousand five hundred total contacts were made in 2005 (85% were reached at public meetings.) Several thousand farmers have participated in the Combined Risk Management Workshops that investigate both livestock and crop production price risk and profitability.
c. Scope of Impact – State Specific

Key Theme – Sustainable Agriculture

Soil Management and Cropping Systems

a. To effectively produce crops in semi-arid regions, efficient use of scarce water resources (precipitation and groundwater) must occur. Many factors affect water utilization by crops, and these must be considered in any cropping system. The goal is to efficiently capture and utilize precipitation and irrigation water, maintain or enhance the productive capacity of the soil, and maximize profit, while mitigating potentially negative environmental impact.
b. Producers in western Kansas are changing their cropping practices as indicated by the increase in dryland corn and grain sorghum acreage. Another advantage of producing corn and sorghum is that they can be utilized locally as feed grains in the animal feeding industry, while wheat usually must be exported from the region. This improves the sustainability of the producers, local communities, and the region. Economic analyses of the higher nitrogen prices suggest that nitrogen application levels should be reduced by 10-15%; a savings of $6,000 to $9,000 on a 1500 acre wheat/milo farm.
c. Scope of Impact – State Specific

Key Theme – Animal Production Efficiency

Managing Heat Stress in Dairy Cattle

a. Heat stress is a major economic and animal health issue for Kansas, U.S. and international dairy operations.
b. Three major studies were initiated during 2005 to evaluate different heat abatement techniques. In total, 45 dairies located in 20 states were utilized. Over 150,000 cows were directly impacted by these efforts. Economic impact of this project is estimated to increase annual income $200/cow.
c. Scope of Impact – Multistate Integrated Research and Extension

Ultrasound Helps Producers Boost Cattle Health and Profits

a. The importance of ultrasound technology is the ability to predict future carcass potential and cluster cattle into outcome groups for more profitable marketing. The technology allows cattle in feedlots to be evaluated, and an estimate of the number of days to feed each animal for maximum profit is computed. Then, cattle can be sorted according to the optimal number of days they should be kept in feedlots. Sorting and selling the cattle in this fashion allows producers to maximize profit.
b. Research has documented an improved profit for cattle producers of about $15 per animal from using this technology. Annually there are about 30 million cattle harvested from feedlots in the United States where this technology could be used effectively which would calculate to $45,000,000 per year improved profit for producers. In addition, it enables the industry to produce beef that better meets

consumer quality expectations.

Also, there is enormous educational value from these applications because they educate producers about the importance of carcass quality and enable them to see the merit and variability in the live animal. Finally, this is a tool that focuses on the individual unit (animal) and brings "precision agriculture" from the field to the feedlot.

Success Story:

One producer reported earning a $34 premium per head by hitting the grid on a shipment to IBP in Emporia. Having used ultrasound the past three years, they reported that 90% of the time it paid to use ultrasound to scan the cattle. Even without the premium incentive, ultrasounding is cost beneficial because it indicates whether the cattle would not benefit from more feed. This prevents adding inefficient gain.

c. Scope of Impact – Multistate Integrated Research and Extension

Key Theme – Plant Production Efficiency

K-State Wheat Breeding Returns $99M to Kansas Wheat Producers

a. Wheat is the most important crop in Kansas. Nearly one-fifth of all wheat grown in the U.S. is grown in Kansas. A majority of wheat varieties planted in Kansas originate from K-State's wheat-breeding program. One of the newest is the hard white wheat Lakin, which is adapted to southwest Kansas.
b. An economic analysis of K-State wheat-breeding programs revealed that this research has been increasing producer revenues by about $99 million annually since 1977. For each dollar invested in varietal development, nearly $12 was earned by Kansas wheat producers. An analysis of 10,000 samples of wheat has shown that through new variety development, the protein content has increased 2.5% over 10 years. Higher protein in wheat enhances bread quality and thus, export possibilities.
c. Scope of Impact – State Matching, Hatch Act Funds, and Grants

Enhancing Soybean Production Efficiency and Stability through Breeding and Genetics

a. Yield losses from pathogens, particularly Soybean Cyst Nematode, reduce farm income in Kansas by over $5 million per year. The Agronomy, Plant Pathology, Entomology, and Animal Sciences departments have worked together on an aggressive cultivar development program that strives to develop procedures and strategies to improve the selection efficiency of important traits, and to develop strategies for enhancing the durability of resistance to such pathogens as Soybean Cyst Nematode through selective deployment of resistance genes. Nine soybean cultivars were released by the Kansas Agricultural Experiment Station. Two varieties possess resistance to Soybean Cyst Nematode (SCN). Several Roundup Ready varieties are nearing release.

b. Genetic improvement of soybean varieties in Kansas increases yields by about .2 bushels per acre per year, and farm revenue by over $3 million per year. Public releases and germplasm from Kansas State University contribute to the yield improvement and protection of the yield potential by the direct utilization of the new varieties and indirectly through the use of the new improved germplasm in other public and private breeding programs. Information from this project on variety performance and SCN nematode population dynamics is essential to reduce SCN losses and enhance the durability of resistance sources.
c. Scope of Impact – State Matching, Hatch Act Funds, and Grants

GOAL 2 – A SAFE AND SECURE FOOD AND FIBER SYSTEM

Overview (includes sections a, b, c, and d)

K-State Research and Extension (KSRE) is a national leader in food-safety programs. An estimated 76 million foodborne illnesses occur in the United State every year causing 325,000 hospitalizations, and 5,200 deaths in the U. S. annually. Related medical costs and lost wages are significant, accounting for a yearly loss of up to $17 billion. In Kansas, the main bacterial causes of food-related illness are Salmonella, Escherichia coli O157:H7, Campylobacter, and Shigella. Viral pathogens, specifically Norovirus (formerly known as Norwalk-like virus) and Hepatitis A virus, are also major causes of foodborne illness in Kansas. Food-related and other diarrheal illnesses remain underreported throughout the U.S., including in Kansas. Most diarrheal illnesses resolve within 24 to 48 hours without any medical attention. As a result, many food-related illnesses are not diagnosed and associated foodborne disease outbreaks are often not recognized. This poses a challenge for public health professionals to maintain the knowledge and resources to educate and respond to this consumer health issue. Food safety education is necessary to help maintain health care cost, to help ensure public health and maintain quality of life for all Kansans.

K-State's Food Sciences Institute was created in 2002 to more efficiently draw upon food science expertise. It combines faculty in education, research, and extension to improve the coordination, visibility, and capacity of KSU's food sciences program. The Food Science Institute also offers a variety of academic programs through various KSU departments and via distance education.

ServSafe teaches the principles and practices of food safety in foodservice establishments. The course content includes: food safety hazards, how to provide safe food, the safe food handler, HACCP, keeping food safe from purchasing and receiving through preparation and service, and maintaining sanitary facilities and equipment. The manager level training course concludes with the 80-question certification exam. In 2005, 21 Manager's Level Certification training sites and 8 Employee level training sites were scheduled state-wide. K-State Extension collaborates with the Kansas Restaurant and Hospitality Association, Kansas Department of Health and Environment, local health departments and others to promote and conduct this program. ServSafe is recognized nationally as a leader in food safety and sanitation education.

In 2005, there were 17 counties participating in the Kansas Master Food Volunteer Program which provides a foundation of knowledge to volunteers in the subject areas of food safety, food science, food preparation, and food preservation. The Extension Master Food Volunteer Program allows people with interests in food, cooking, and nutrition to take their expertise to a higher level while developing new avenues for helping in the community.

e. Total expenditures by funding source and FTEs

FY2005	Projected: $2,902,848	Actual: $2,832,745	FTEs: 17.2

Key Theme – HACCP

Meat Safety and Quality

a. The purpose of the Meat Safety and Quality program is to provide technical assistance and support to the Kansas meat industry to enhance the quality, safety, and variety of Kansas meat products. In 2000, USDA provided funding for a three year cooperative project between Kansas State University, the University of Nebraska, the University of Missouri, and South Dakota State University to provide support, training, and technical assistance to meat and poultry facilities in a four-state region. This project has been funded for another three years. One primary goal was to provide programs, training,

and assistance to Kansas meat processing businesses so they could meet the challenges set by regulators and remain in compliance with additional mandates required.

b. The majority of companies serviced through this program are small and very small meat processing businesses, many with fewer than 10 employees. Had this program not been available, these companies would not be able to afford these types of services. In the past year, processors and entrepreneurs realized a savings of over $47,500 while enhancing the quality and safety of meat and meat products for Kansas consumers.

c. Scope of Impact – Multistate Integrated Research and Extension
   - With MO, NE, SD

GOAL 3 – A HEALTHY, WELL-NOURISHED POPULATION

Overview (includes sections a, b, c, and d)

Kansans are concerned about their personal health and safety as well as that of their families and communities. Statewide surveys, forums, and other data revealed that citizens have a keen interest in programs delivered by local and state organizations. Public health planning documents, such as Healthy Kansans 2000 and Healthy People 2010, call for reductions in the incidence and prevalence of certain types of morbidity and mortality. Cardiovascular-pulmonary diseases, cancer, and cerebrovascular disease leading to strokes account for 63% of Kansas' deaths that are primarily preventable by adopting healthy and safe lifestyles. Eating disorders and other weight issues are increasing problems. Arthritis affects 40 million Americans, and osteoporosis is present in 9 out of 10 women and 1 in 3 men by age 75. Limited-resource and near-poverty individuals and families, those without health insurance, the very young, and the aged are most at risk for poor health and early death.

In 2005, the Family Nutrition Program (FNP) completed its 10th year in providing nutrition education to more than 182,000 food-stamp eligible citizens in 85 counties. Participants were encouraged to increase their consumption of fruit and vegetables. They learned to choose and prepare nutritious meals and snacks; balance the food they eat with physical activity; use safe food handling practices; and manage their food resources and achieve food security. In 2005, FNP provided nutrition education to Kansans of diverse ethnic and racial backgrounds: 57,000 African American contacts; 42,000 Hispanic contacts; 17,000 Native American contacts; and 10,000 Asian contacts. Individual clients often have multiple "contacts" through a series of lessons.

The Kansas Nutrition Network (KNN), a sister program to FNP, is a partnership of state-level public and privately funded nutrition education and food assistance programs. Led by K-State Research and Extension, KNN provides nutrition education emphasizing the dietary guidelines, reliance on integrated community-based efforts, state flexibility, and use of innovation social marketing.

The Expanded Food and Nutrition Education Program (EFNEP) is available in four Kansas counties for youths and homemakers with limited resources. EFNEP reached 1290 Kansas families with 1923 children in 2005. Over 5,210 youth contacts were made through the EFNEP youth program with 684 pregnant EFNEP participants receiving prenatal nutrition lessons. Of the EFNEP families enrolled, 61% were enrolled in one or more food assistance programs in 2005. EFNEP participants completing the multi-lesson series improved nutrition, food behavior, and food safety practices. As a result of participation in EFNEP, 87% improved in one or more food resource management practice; 79% seldom or never ran short of food before the end of the month; and 93% improved in one or more nutrition practices.

In 2005, K-State Research and Extension released a program called Kids a Cookin' and Movin', which encourages basic cooking skills, good nutrition, healthy food choices, food safety, and physical activity. The curriculum helps kids make healthy eating choices, includes food quizzes, and more.

Many senior adults on limited incomes do not have adequate food resources and hence, are vulnerable to food insecurity and its associated problems. A food stamp program developed in Kansas to help senior citizens eat healthier has contributed approximately $110,000 to the economies of the 18 north-central Kansas counties where it has been tested. K-State Research and Extension has worked with other state agencies to help increase participation in the Kansas Food Assistance Program. Research shows the average benefit to each person in the program is $563 per year.

From 1999 to 2005, 2,672 Kansans living in 65 counties who attended a KSRE presentation about diabetes responded to a survey regarding diabetes management. Of these, approximately 64% attended *Diabetes Awareness and Management* and 35% attended *Dining with Diabetes*. Of those in attendance, 34% had diabetes, 59% did not, and 7% did not know if they had diabetes or not; 77% were age 55 years or older; 88% were female; 94% were white and non-Hispanic; 74% reported that their health was good or excellent.

Of those who attended *Dining with Diabetes*, 82% took the program over the course of several weeks. Of those who answered the questions, 84% had used the information from previous sessions to change their eating habits by the end of the series; those who planned to test their blood sugar rose to 89% compared to the 79% who did so before the program; 95% compared to 73% intended to eat meals that included a variety of foods from the Food Guide Pyramid; and 52% compared to 34% before intended to engage in 30 minutes or more of moderate physical activity on three or more days of the week.

A 5-year USDA-funded "Kansas Teen Leadership for Physically Active Lifestyles" project is working with teen leaders in three Kansas counties. Teens use the nationally recognized, evidence-based CATCH Kids Club curriculum in their roles of afterschool staff as well as leading community engagement campaigns to promote healthy lifestyles throughout their rural communities. Another grant, "Powerful YOUth on 4-H Trails" funded by the Sunflower Foundation, will result in the "seeding" of walking trails across Kansas through energized youth leaders from Kansas 4-H clubs, youth groups, scout troops, and school classes. The trails will add value to Kansas communities while motivating citizens to be more active. Kansas kids will not only be motivated to use these trails through Web-site prompts and leader curriculum, but they will also lead community health promotion campaigns to increase access to and use of walking trails and paths.

The United Methodist Health Ministry Fund provided financial support for K-State Research and Extension to promote stroke awareness and prevention activities. Fifty-one Kansas counties participated in the stroke awareness campaign; 67 lessons were taught with 449 people in attendance. Agents reported that 9,969 individuals visited public fair booths; 2,810 stroke promotional items with a message about stroke warning signs were given out at fairs, meetings, and places of business.

e. Total expenditures by funding source and FTEs

FY2005	Projected: $4,644,556	Actual: $4,532,394	FTEs: 39.53

Key Theme – Human Health

A Health and Fitness Program for Almost Everyone

a. Walk Kansas, a fitness challenge, has become a premier K-State Research and Extension program. This is an easy and inexpensive fitness program developed to encourage people to increase healthful physical activity. The eight-week research-based program encourages teams of six (family, friends, neighbors, coworkers, or others in the community) to log miles--or equivalent minutes of physical activity--to cover the 423 miles across Kansas. Participants receive a mileage log and newsletters with food, nutrition, and health tips during the program. Walk Kansas helps Kansans initiate and maintain a regular regime of physical activity and good nutrition. The objective of each team member is to do moderate intensity physical activity for 30 minutes a day, five days a week. Many teams choose to keep a log of the amount of fruit and vegetables consumed. In its first year (2002), 43 counties—and more than 7,000 people participated.

b. Almost 19,000 people representing 93 of the 105 counties signed up for the 2005 program. The Walk Kansas program costs vary slightly from county to county but are usually $10 or less.
c. Scope of Impact – State Specific

Key Theme – Human Nutrition

Improving Participation in the Food Stamp Program among Rural Older Adults in North Central Kansas

a. K-State Research and Extension, the K-State Department of Human Nutrition, The North Central-Flint Hills Area Agency on Aging, Inc., and the Kansas Department of Social and Rehabilitation Services are collaborating in 18 rural Kansas counties on one of the USDA Food and Nutrition Service's three-year Research Grants to Improve Food Stamp Program Access through Partnerships and New Technology. A food assistance training manual for professionals and volunteers who work with senior citizens, including KSRE personnel, and a Website with links to resources for food assistance programs, were developed, led by K-State Research and Extension Human Nutrition faculty and staff.
b. Food Assistance (Food Stamp Program) participation rates have increased in the intervention region. The economic benefit realized by older individuals newly enrolled in the FSP in the 18-county project region averaged $563 per year creating a $110,000 boost to the regional economy.
c. Scope of Impact – State Specific

Kansas Kids A-Cookin'

a. The Kids a Cookin' program seeks to affect a family's health and health behavior through the child, while teaching and modeling food skills and positive nutrition choices. This television program pairs a host "cook" with kids, who together prepare a simple meal that is both healthy and fun. Kids a Cookin' is currently used in after-school and ESL programs, as well as middle school and high school FCS (Family and Consumer Sciences) classrooms, summer child programs, public libraries, and a variety of extension settings. Indirectly, the program has also been effective with senior audiences, persons for whom English is a second language, and teen parents.

   The program also incorporates an award-winning Website www.kidsacookin.ksu.edu which features all of the recipes and health tips shown in the program.

b. Success Story/Short-term Outcomes:
   A middle school teacher of family and consumer sciences and physical education has used the curriculum the past two years in her 7th and 8th grade FCS classes and with special needs students. "The students benefited by learning simple recipes that they could make at home for themselves or their family. They also learned to make simple, healthy snack recipes that could improve their eating habits and promote healthy lifestyles."
c. Scope of Impact – State Specific

GOAL 4 – GREATER HARMONY BETWEEN AGRICULTURE AND THE ENVIRONMENT

Overview (includes sections a, b, c, and d)

Concern about the quality of the environment continues to guide K-State Research and Extension in developing programs that ensure quality and conservation of surface water and groundwater; promote community residential environmental management; develop systems for improved soil and air quality; and maintain plant diversity. Topics in this area have been making headlines recently because of new research and changing regulations. The Kansas Center for Agricultural Resources and the Environment (KCARE) coordinates research and extension efforts for this goal and has led a number of environmental efforts that have helped K-State Research and Extension's progress towards its five-year plan of work goals. Significant accomplishments are identified below for several key themes.

Water Quality: Watershed Restoration and Protection

KSRE continues to play a major role in supporting the development of Watershed Restoration and Protection Strategies (WRAPS) around the state. WRAPS are a locally led effort to bring together watershed stakeholders to identify concerns and issues regarding water quality and other natural resources, assess the condition of these resources and identify sources impacting them, and to develop an action plan that includes goals for watershed restoration and protection and best management practices (BMPs) and other activities to achieve these goals. KSRE continued its support of a WRAPS for the lower Fall River and lower Upper Verdigris watersheds in southeast Kansas. Following a successful outreach effort in late 2004 that included a watershed tour and workshop, a local leadership team was recruited in early 2005 to guide the development of the WRAPS. This team represents a collaborative effort between local stakeholders and agency staff, and includes participation by local residents, Extension, public water suppliers, county conservation districts, municipalities, SEE-KAN RC&D, Kansas Forest Service, Kansas Department of Health and Environment (KDHE), NRCS, and the Kansas Water Office. The leadership team has identified a variety of issues and concerns in the watershed, including TMDLs for fecal coliform bacteria, low dissolved oxygen, and eutrophication. Other issues include flooding, streambank stabilization, riparian areas, livestock production, and sourcewater protection. Restoration and protection goals have been established and preliminary strategies identified. The local leadership team continues to explore these issues and is identifying BMPs and other measures to address them. This project is expected to be completed by the end of 2006. WRAPS projects were also launched in the Neosho Basin in late 2005 with initial stakeholder meetings and watershed tours.

A Watershed Restoration and Protection Strategy (WRAPS) was completed for the Little Arkansas River Watershed in November 2004. This plan was developed by a watershed stakeholder group consisting of landowners, agency personnel, and other citizens. K-State Research and Extension (KSRE) faculty guided the plan development and writing. This watershed is one of the most intensive agricultural watersheds in Kansas with 97% of the land in agricultural production (78% cropland and 19% grazingland). The watershed is also considered to be one of the most impaired in Kansas with TMDLs having been set for 52% of the river and stream segments and 50% of the lakes. In the WRAPS, KSRE was given the responsibility to develop a research and education program that would lead to best management practice implementation and water quality restoration. In response to this, KSRE has committed considerable resources to the watershed. In addition to support provided by county extension agents, state extension specialists, research faculty, a full time extension water specialist was assigned to the watershed to lead extension and demonstration efforts. Five subwatersheds were selected for intensive research and extension efforts. Educational programs were delivered with the objective of increasing the use of cropland best management practices (BMPs), particularly those targeted toward reducing pesticide contamination of surface waters. County faculty have made one-on-one visits to all farmers in the

watershed with greater than 600 acres of cropland (and selected farmers with less than 600 acres) to teach them how to implement cropland BMPs. Monies provided by the city of Wichita, Kansas and the Kansas State Conservation Commission were made available as incentive payments to help farmers implement BMPs. In 2006, it is expected that greater than 50% of the grain sorghum acres in the five subwatersheds will have implemented BMPs for pesticides as a result of this program, resulting in measurable water quality improvements. Integrated Agricultural Management Demonstration Sites were developed on farmer fields at two locations in the watershed. These demonstration sites showcase BMPs, In addition, monitoring equipment was installed at the demonstration sites to determine BMP effectiveness. Farmer schools, newsletters, publications, and a Website were also used in the educational program. Automated surface water monitoring equipment was installed at the base of the five subwatersheds to determine the effectiveness of BMP implementation on a watershed level. Stream bank and stream bed erosion were also considered to be a problem in the watershed. A research project is currently being conducted to quantify sediment and nutrient load attributed to stream bank and stream bed erosion. The Soil and Water Assessment Tool (SWAT) watershed model is being used to evaluate pollutant fate and transport at the watershed level. SWAT is also being used to estimate the effectiveness of alternative management practices in the watershed. Results of the stream bank, stream bed, and SWAT modeling studies will be used to focus future watershed restoration efforts.

Additionally, KSRE provided technical support for the development of a watershed restoration and protection strategy (WRAPS) for the Smoky Hill River/Kanopolis Lake watershed. A watershed simulation model was developed to assess water-quality responses to potential watershed changes. These estimates of water-quality response are being used to refine WRAPS-document estimates of target implementation practices and areas needed to achieve specific reductions in pollutants toward meeting TMDL targets. For example with 100% adoption of reduced tillage on cropland, the watershed model estimated 29.5% reduction in annual average overland sediment yield and 8% reduction in annual average sediment yield at the watershed outlet (compared to a more-optimistic WRAPS-document target TSS reduction of 75%). Work is in progress to assess the impacts of many of the BMPs being targeted by watershed stakeholders in the WRAPS document. Prioritizing the watershed areas that should be targeted for implementing BMPs, rather than random or “first-come, first-serve” methods, shows promise for improving cost-effectiveness of water-quality improvement efforts. For example, a 10% reduction in overland sediment loss could be achieved with about 17% of cropland area in reduced tillage by using a targeted approach compared to 36% by a random approach. Similarly, a 5% reduction in sediment yield at the watershed outlet could be achieved with reduced-tillage adoption in about 17% of targeted cropland area as compared to 81% randomly selected area.

The major cause of water quality impairments in Kansas is fecal coliform bacteria. A major integrated research and extension project has been implemented in the Upper Wakarusa watershed, a high priority TMDL watershed in Northeast Kansas, to identify and abate key sources of fecal bacteria. Samples from a monitoring network within the watershed indicate fecal bacterial levels were very low during baseflow conditions during all seasons and all locations. Elevated levels of both fecal coliforms and *E. coli* were observed in major runoff events in the late spring and early summer months of 2004. Several of these event samples exceeded current Kansas bacterial standard. Lake outflow bacteria levels were consistently very low. Antibiotic resistance source-tracking methods indicated multiple bacterial sources that varied with position in the watershed. Preliminary results also appear to indicate differences related to flow conditions. These results are being used to improve watershed modeling of bacterial fate and transport. Results from a study of fecal bacteria contamination of soil samples surrounding round bale feeders indicated contamination was minimal prior to livestock access to the sites (in January). It increased during the feeding period (February, March, and April), and decreased to original, background levels within three months following removal of livestock (July). Soil bacterial contamination occurred up to 30 m from the feeding site. Studies are planned to evaluate release of fecal bacteria in runoff from bale-feeder

sites and trapping in vegetated buffers surrounding bale-feeder sites. Livestock producers in the Upper Wakarusa watershed were extensively engaged through 61 meetings, 5 presentations, 15 posters/demos, 6 media articles, and 30 farm visits. We also reached agreement with 3 farmer-cooperators to implement 7 best-management practice demonstrations in 2005.

Heartland Water Quality Initiative Project.

The Heartland Initiative integrates research, education and extension on a regional basis among Iowa State University, Kansas State University, the University of Missouri, the University of Nebraska and the CSREES National Water Quality Program. The principal objective of the Heartland Initiative is to develop productive and efficient multi-state multi-agency teams to address regional priority water quality issues. The overall goal is to make research, education and extension resources of the land grant universities more accessible to federal, state and local water quality improvement efforts. The Heartland Project selected three of the CSREES Water Program's national priority issues as the basis for regional coordination. They are Nutrient and Pesticide Management, Animal Manure Management and Community Involvement in Watershed Management. For each of these three issues, steering committees consisting of university faculty, local, state, and federal agency personnel, and other interested citizens were established to determine priorities and needs. Each issue team has conducted educational meetings across the four states, helped in setting regulatory procedures, and developed working relationships between research and extension faculty of the four land grant universities.

Water Conservation and Management: Prolonging the Life of the Ogallala Aquifer

In-canopy and near canopy center pivot sprinkler irrigation is widely practiced in the U.S. Great Plains region. These systems, which include LEPA (Low Energy Precision Application), LESA (Low elevation spray application and MESA (mid-elevation spray application), can potentially result in water savings through elimination of aerial and plant canopy water evaporative losses and a possible reduction in soil water evaporative losses for those systems that do not wet every crop furrow. However, these in-canopy and near canopy sprinkler irrigation systems are not always appropriate because of the increased potential for irrigation runoff. Research at Kansas State University has shown that irrigation nonuniformity with these systems when poorly designed and managed can result in row-to-row corn yield differences as great as 20 bu/acre. This can translate into differences in economic returns of as much as $50/acre. A cooperative effort with researchers from Texas is underway to more fully describe the concepts of in-canopy and near canopy center pivot sprinkler irrigation. The outcomes will be that producers will better know when these systems are appropriate for their operations and also how to manage these systems to avoid excessive runoff.

Subsurface drip irrigation (SDI) is another advanced irrigation technology that can reduce or eliminate non-beneficial water losses (e.g., runoff, soil evaporation, deep percolation). SDI systems are expensive investments that must have a long life to approach economic competitiveness with alternative irrigation systems. A research SDI system at K-State has been operated for 17 years with little degradation, demonstrating that these systems can have a long life when using the high quality water from the Ogallala aquifer. A free computer software tool has been developed at K-State to allow producers to easily compare the economics of SDI with center pivot sprinklers. Analysis with this software tool indicates that SDI systems can easily compete with center pivot sprinklers on small and irregular shaped fields and in situations where corn yield and price are higher.

Research at both K-State and in Texas indicates that SDI will generally result in more stability in crop production under deficit irrigation than will center pivot sprinkler irrigation. As the ability to fully irrigate a land parcel decreases in the future due to aquifer declines, SDI will probably play an increasing role in stabilizing farm income.

In many areas of the Ogallala, irrigation well capacities are dwindling and water allocations are becoming more restrictive; as a result irrigators are considering different crop combinations. To address this need, a software tool has been completed for computerized decision making. The Crop Water Allocator (CWA), which irrigators and water policy makers can use to allocate limited water to an optimized selection of crops, was released on the World Wide Web during December, 2004 at www.oznet.ksu.edu/mil. It is available for download to an individual user's computer and has attracted over 1000 visitors to the site with 1/3 of those visitors downloading the program. Optimum economic net returns are calculated from all possible combinations of crops, irrigation allocations, and land rotation patterns proposed by a user's input scenarios. Multiple runs of the model give the user indications of the sensitivities of net economic returns to water allocation, commodity prices, maximum yields, irrigation costs, and crop production costs. This tool guides irrigators and water professionals to cropping strategies that return the best value from the limited water used in irrigation from individual fields to a regional analysis. Users of CWA have included irrigators, crop consultants, extension advisors and specialists, educators, and researchers. Inquiries for use of this program for policy guidance have come from the Kansas Water Office and the Kansas agricultural crop insurance industry.

The fate of the western Kansas economy is inextricably linked to the fate of the Ogallala aquifer. Irrigated crops, livestock production, and meat processing are vertically linked industries along the food supply chain in this region and are the primary drivers of development and job growth. All these industries are water-intensive and together account for almost all water consumption in western Kansas; irrigation alone accounts for 87% of regional water use. In sum, the part of the state most dependent on water is exactly where water supplies are dwindling at the fastest rate. K-State Research and Extension economists are studying the economic forces impacting water use and are evaluating the likely consequences of policies aimed at reducing the decline rate of the aquifer. For example, one policy alternative receiving increased attention by both state and federal policy makers is a water-right buyout program, and a recently completed study estimated the cost of buying out water rights from irrigators in the Rattlesnake Creek sub-basin. Ongoing research will provide similar cost estimates for other parts of the state and will also compare the costs to those from other policy alternatives. Results such as these will give policy makers and their constituents science-based information to assess different policy proposals.

Soil Quality: Carbon Sequestration

K-State Research and Extension scientists are studying carbon sequestration, a process that could reduce global warming while also improving soil quality, and reducing soil erosion and water runoff. Carbon sequestration increases soil organic matter and reduces carbon dioxide in the air. It is good for the environment and good for crop production. K-State is leading the Consortium for Agricultural Soils Mitigation of Greenhouse Gases, a consortium of research institutions that is working to provide the tools and information needed to successfully implement soil carbon sequestration programs. K-State has been one of the nation's leaders in research on agricultural soil carbon sequestration and greenhouse gas emission.

The CASMGS research team at Kansas State University has made significant contributions to: (a) improving knowledge about carbon sequestration and greenhouse gas mitigation, (b) quantifying agricultural greenhouse gas emissions and reductions at the state and national level, (c) developing practical tools for assessing the effectiveness of carbon sequestration strategies, and (d) providing outreach and educational material about agricultural greenhouse gas mitigation.

Key results include:

1. Grain sorghum hybrids have been tested to determine if certain hybrids will be better at adding carbon to the soil. Preliminary tests have shown that there are differences among hybrids indicating that some hybrids will provide a more stable source of carbon than others. This research has also shown that

nitrogen rates used on grain sorghum have an impact on soil carbon sequestration, with higher N rates resulting in higher soil carbon levels.
2. Work is underway to determine the role of mycorrhizal fungi in stabilizing macroaggregates and thus carbon in soil. This information can be used to design crop and soil management systems to stimulate fungal development.
3. Using recommended grazing rates, as opposed to the common practice of overgrazing, has been found to increase forage productivity and belowground root production. Soil carbon levels are slightly higher where moderate stocking rates are used, compared to heavier stocking rates.
4. The effect of tillage, crop rotations, manure, and fertilization on soil carbon levels, energy use, and economics have been evaluated. No-till and manure applications resulted in the highest levels of total soil carbon. Rotations that include wheat resulted in the greatest amount of total soil carbon. Grain sorghum and corn also add considerable amounts of carbon to the soil. Where a fallow period is included in the rotation, it is very difficult to increase soil carbon levels, even using no-till production. Economics of the various management practices varies by region. Where no-till is more profitable than conventional tillage, it will be easier to encourage producers to switch to no-till and increase carbon sequestration rates within the state.
5. An electronic newsletter focus on state, national, and international activities in carbon sequestration and global warming. This newsletter goes primarily to about 350 producer groups, policymakers, educators, and researchers within Kansas. CASMGS has a national Website http://www.casmgs.colostate.edu. K-State has a carbon portal web site that is a central location for information on soil carbon. The portal address is www.soilcarboncenter.k-state.edu.

Impacts

Kansas: There are currently about 3.4 million acres of no-till in Kansas. This means that on no-till acreage alone, Kansas agricultural soils are sequestering about 2.8 million tons of CO2 per year. We hope to increase the future acreage of no-till in Kansas. Current payments for carbon credits on no-till are somewhere between $0.50 and $2.00 per acre per year. K-State CASMGS researchers are members of the Kansas Coalition for Carbon Management (KCCM). KCCM is an organization of producer groups and NRCS Resource Conservation and Development Region associations. KCCM relies on information and data provided by the K-State CASMGS team for its educational materials. KCCM and K-State are actively working to establish links between carbon credit buyers and producer groups to sell (or lease) carbon credits. This led to a recent offering through the Iowa Farm Bureau and the Chicago Climate Exchange to provide to producers the opportunity to sell C credits for a 4-yr lease period. Over 70 contracts representing 72,000 acres were signed in Kansas. A new sign-up period for the most recent phase of this project began in February, 2006.

National: Agricultural soil carbon sequestration is the most cost-effective method of carbon sequestration available to industry, and could help industry in the US meet initial CO2 reduction targets economically. The cost of a ton of CO2 credits from agricultural soil sequestration is about $1, compared to an estimated cost of $100 per ton from geological carbon sequestration pilot projects currently underway in this country. Power companies looking to buy carbon credits are finding that agricultural soil carbon sequestration is by far the most affordable type of credits at this time. The multi-state effort of CASMGS scientists is regularly called upon to provide briefings to industry and policy makers.

In general, we are finding that no-till, more intensive crop rotations, grass plantings, and manure applications result in some of the highest rates of carbon sequestration and the best overall global warming whole-farm potentials. Where these practices are not profitable, either government programs or private-sector carbon credit payment systems would be needed. The Chicago Climate Exchange, Environmental Defense, and others involved in voluntary carbon credit payments in the U.S. have come

to CASMGS researchers to determine the most realistic carbon sequestration rates to use for agricultural soils.

International: CASMGS has been collaborating with organizations in other countries (Australia, Brazil, Canada, and New Zealand) on research and outreach efforts. For Kansas State University, an Australian scientist is working with a graduate student at K-State on chemical changes in crop varieties as they relate to changes in soil carbon cycling. Recently a university in Brazil signed an agreement to facilitate scientific and student exchanges with K-State.

Air Quality: Particulate Matter and Ammonia Emissions at Beef Cattle Feedlots

Texas and Kansas are the nation's largest cattle feeding states (42% of US total). Growth of beef cattle feeding boosts the regional economy, but presents air quality challenges. Dust-related complaints rise dramatically during drought periods, while odor concerns and ammonia emissions increase during wet periods. In collaboration with Texas A&M University, KSRE scientists have been monitoring particulate matter and ammonia concentrations and emissions from open-lot feeding facilities in northwest Texas and southwest Kansas. Laboratory experiments using weight-drop test chambers have been conducted to develop relationships between kinetic energy of hoof action and feedlot dust emission at a variety of moisture contents and manure depths. Chamber studies show water sprinkling or surface amendments of sawdust or wheat straw to be effective in reducing dust emission for short periods of time. Particulate matter concentrations are being monitored upwind and downwind of a large cattle feedlot to determine the effects of weather conditions and corral surface characteristics on emissions. Ammonia emissions are also being measured at large feedlots on a continuous time basis in order to relate ammonia emissions with meteorological conditions.

Sustainable Agriculture

Role of the Kansas Center for Sustainable Agriculture and Alternative Crops

-Serve as a resource center for producers and professionals searching for information to develop a more diversified, sustainable agriculture.

-Provide and facilitate a communications network among sustainable agriculture professionals and producers for increased collaboration and multidisciplinary projects and activities directed towards research and outreach needs expressed by Kansas producer stakeholders. Current priority areas include:

- Grazing/livestock systems
- Community based food systems
- Organic production systems

Impacts of Community Based Food System Efforts

- Twenty-five Kansas producers have expanded or begun small scale value-added processing and 12 new Kansas products for sale by small scale processors.
- Approximately 40 Kansas producers made an informed decision not to add small scale processing to their operation.
- Seven new producers in the Kansas City Metro area mentored through the Growing Growers project. - -
- One new restaurant in Lawrence that uses locally raised foods.
- Kansas was the only applicant to receive a grant from the USDA to develop a State Food Policy Council.

Impacts of Organic Production System Efforts

- Two meetings on transitioning to organic production hosted by the Kansas Organic Producers.
- Organics 101 – a workshop hosted by the Douglas County Extension Office.

KCSAAC website. The number of visits to the site averages approximately 2,700 per month, up from 2,000 in 2004. The most commonly visited pages are the Publications, Calendar of Events and Grant Opportunity pages. The url is http://www.kansassustainableag.org

Participated in organizing and hosting conferences, workshops and tours.
- 2005 Organic Agriculture Conference (approximately 300 people attended)
- Farmers Market Manager and Vendor (73 people attended)
- 2005 Kansas Graziers Association Winter Grazing Conference (approximately 110 attended)
- Find Direction for Your Marketing Workshop (approximately 30 attended)
- Three Value Added Processors Bus Tours (approximately 100 people participated)
- Four Fall Grazing Tours – highlighted water development (approximately 80 attended)
- Improving Your Financial Skills Workshop (approximately 20 attended)
- Two Farmer/Rancher Grant Writing Workshops (approximately 25 attended)

Responded to 310 requests for assistance in 2005**.**
- 51% of the calls are from extension, agency and nonprofit organizations and educators
- 37% of the calls are from producers or consumers
- 12% of the calls are from businesses, educators, or the media
- The most common requests involve farmers' market and labeling information; grant sources and grant writing resources; value-added processing; and livestock/grazing systems.

Facilitated the submission of $6,811,883 of grant requests since January 2001. A total of $2,706,979 has been funded. In 2005, $1,187,330 of grant requests have been facilitated. In 2005, three grants totaling $448,539 were funded and one project totaling $149,375 is pending. The projects funded in 2005 included:
- 2005 Kansas Senior Farmers Market Nutrition Program
- Helping Farm Families Manage Successful Businesses
- Kansas Food Policy Council

e. Total expenditures by funding source and FTEs

FY 2005 Projected: $9,002,960 Actual: $10,181,564 FTEs: 64.55

Key Themes – Soil Quality and Air Quality

A Leader in Studying the Benefits of Carbon Sequestration

a. K-State Research and Extension scientists are studying carbon sequestration, a process that could reduce global warming while also reducing soil erosion and water runoff. Carbon sequestration increases soil organic matter and reduces carbon dioxide in the air. It is good for the environment and good for crop production. K-State is leading the Consortium for Agricultural Soils Mitigation of Greenhouse Gases, an organization that is working to provide the tools and information needed to successfully implement soil carbon sequestration programs. K-State has been one of the nation's leaders in research on controlling soil carbon sequestration and greenhouse gas emission.
b. It has been estimated that 20% or more of targeted emission reductions could be met by agricultural soil carbon sequestration. Other benefits of this technology are increased soil fertility, reductions in erosion, and increases in soil quality.
c. Scope of Impact – Multistate Integrated Research and Extension

Key Theme – Sustainable Agriculture

Earth Awareness Researchers for Tomorrow's Habitat (E.A.R.T.H.)

a. In 1998, a focus group was formed to address a lack of adequate middle school environmental education material in Sedgwick County. Based on the group's recommendations, Earth Awareness Researchers for Tomorrow's Habitat (E.A.R.T.H.) was created to respond to the shortfall. The hands-on program, provides curriculum, supplies, a student workshop, and teacher training focused on empowering students with skills and knowledge to take appropriate action in areas of environmental protection.
b. Short-term Outcomes:
   In 2005, 47 teachers and 2,887 students in Kansas were involved in the E.A.R.T.H. program.
   (a) Students report that they have learned skills in the classroom that they can apply to real-life situations in their community and that they now feel more qualified to be wise stewards of their environment.
   (b) Teachers report that students' experimental environmental learning has allowed the students to develop the critical thinking skills needed to succeed in life.
   (c) Students involved in E.A.R.T.H. report that they enjoy learning more and remember what they have learned longer when they use E.A.R.T.H.'s hands-on lessons.
   (d) Teacher evaluations indicate that students who participate in the program have a stronger commitment to school and greater academic success than those who do not.
c. Scope of Impact – State Specific

Key Theme – Water Quality

Citizens Take Hold of Kanopolis Lake Pollution Problems

a. Kanopolis Lake, part of the Middle Smoky Hill River watershed, faces such pollution problems as streambank erosion, fertilizer runoff, livestock fecal coliform bacteria, pollutants from urban areas, oil well site-management, and illegal dumping of sewage or trash. As in many waterways, these issues affect all local residents in different ways.
b. Intermediate Outcome:
   The number of cost-share and Environmental Quality and Incentives Program (EQIP) contracts through NRCS has increased over last year's sign-up date. Ellis County's cost-share numbers have doubled since the first sign up.
   Short-term Outcome:
   Those attending the town meetings and driving tours reported increased awareness and knowledge of why the watershed is being assessed and protected.
c. Scope of Impact – State Specific

A Partnership with Nebraska to Monitor Water Quality

a. The Blue River Compact—The Kansas- Nebraska partnership, of which K-State Research and Extension is a part, effectively monitors water quality and promotes practices to prevent runoff of pesticides into the Big Blue River. The work is being conducted under the auspices of the two states' Big Blue River Compact. Water samples regularly are collected at 22 locations through the basin and analyzed for pesticide, nutrient, and bacterial levels. New sites are being added in Nebraska and Kansas in the upper tributaries (Upper Horseshoe Creek, Lower Horseshoe Creek, Big Indian Creek, and Turkey Creek). The monitoring will help narrow the search for the highest levels of loading.
b. Numerous Best Management Practices are being put into place by both row crop and livestock producers, including many streamside vegetative buffers planted by landowners in both Nebraska and Kansas. Kansas and Nebraska Corn Growers and Grain Sorghum Producers associations and the

Kansas and Nebraska Farm Bureau organizations have been active partners in the planning, development, and implementation of this effort.

c. Scope of Impact -- Multistate Integrated Research and Extension

Key Theme – Natural Resources Management

Limited Irrigation Program Helps Farmers

a. Many farmers rely on the Ogallala Aquifer to irrigate their crops, though it is well-documented that this vast resource in parts of five Midwest states is diminishing. Kansas State University researchers are helping farmers predict which crops to irrigate by experimenting with different amounts of limited water and allocating water to limited water areas, and by selecting different crops. Researchers have developed a computerized decision aid for irrigators, water professionals and water policymakers. The model allocates water by partitioning it among one to several crops, and spreading it over all or only part of the land under irrigation.
b. According to two years' results of a crop residue management field study: (1) Irrigators will save 3-4 inches of soil water evaporation by using the limited irrigation program during the growing season. (2) The potential annual savings in pumping costs is $1,000 to $3,000 per center pivot. (3) For 99,200 acres and 182,000 acres of sprinkler irrigated soybeans in western and central Kansas, respectively, 3-4 inches of water savings is $2.5 to $2.6 million in annual pumping costs. (4) For the individual irrigator, 3-4 inches of water will generate 1,500 to 2,000 bushels of soybean, and 5,000 to 6,000 bushels of corn -- or an estimated revenue of $7,000 to $15,000 per center pivot. (5) Extending those gains in revenue over western and central Kansas shows that soybean annual impacts would be $16 to $21.6 million, and corn annual impacts would be $98 to $131 million.
c. Scope of Impact – State Specific

Establishing and Maintaining Turfgrass Systems with Reduced Water and Pesticides

a. Maintenance of home and commercial lawns would be made easier and less expensive during dry Kansas weather if minimum water requirements are known. KSU researchers are evaluating minimum requirements of turfgrasses in the state, and best methods for converting cool-season turf to water-conserving, seeded warm-season grasses.
b. Using drought-resistant turfgrass species can result in a water saving of up to 40% compared to less resistant types. The researchers have developed a novel minimal disturbance seeder to establish warm-season grasses. This affords a seed saving of up to $1,600 per acre compared to traditional establishment methods, and would allow a golf course to remain open during the process of conversion.
c. Scope of Impact – State Specific

GOAL 5 – ENHANCED ECONOMIC OPPORTUNITY AND QUALITY OF LIFE FOR AMERICANS

Overview (includes sections a, b, c, and d)

An educated and knowledgeable citizenry is the foundation of Kansas' economic productivity; democratic character and social system; and quality of life. The focus of Youth, Family, and Community Development has been on building strong, healthy communities; improving parenting skills and family relationships; preparing youth to be responsible citizens; balancing demands of work, family, community, and time for self; and developing consumer and financial management skills. Today's complex issues and problems require new perspectives and skills. K-State Research and Extension (KSRE) helps communities better themselves through economic development, leadership training, improved housing, quality child care, a skilled workforce, and welfare reform. The work involves delivering educational programs and technical information that improves skills in communication, group dynamics, conflict resolution, issue analysis, strategic planning, effective parenting, developing life skills, and helping youth to grow in healthy, productive ways.

The Kansas Saves Campaign has been launched in 39 Extension sites. The goal "Save and Build Wealth" encourages people to save more and reduce credit card debt. The Kansas Saves campaign, sponsored by K-State Research and Extension and local community partners, is part of a nationwide effort to boost savings. Participating communities feature information and local activities on how to build savings and how to reduce or manage debt wisely.

Extension agents have made hundreds of presentations and answered thousands of phone calls to help people understand the new Medicare Prescription Drug Program. Agents and volunteers also manned the Senior Health Insurance Counselor for Kansas (SHICK) hotline. Of the people helped, agents estimated that the average savings per person was conservatively $1,000 or more per year on medications and premiums.

Extension Agents collaborated with the IRS sponsored Volunteer Income Tax Assistance (VITA) sites to help low to moderate income, disabled and homebound taxpayer families, who are often also the unbanked to receive free income tax preparation and filing services; learn about tax credits for which they qualify; receive tax refunds to supplement take home pay, pay bills and provide for themselves; keep more of their funds by avoiding high cost check cashing or tax refund loan fees; receive financial education to learn to make maximum use of the refunds. For example, in 2005 in Shawnee County, 5,000 eligible individuals, with average incomes of $23,098, received refunds totaling $4.49 million and paid $500,000 in tax liabilities and 862 individuals in Salina, with average incomes of $12,000, received $570,000 in refunds.

Programs on Protecting Your Nest Egg were presented in six counties in Kansas in 2005. Eight programs were presented to 66 people who discovered how the state securities regulator works to protect and inform investors; learn why you should verify the credentials of any financial professional with whom you are considering working; recognize common tactics used to deceive and defraud investors; and learned where and how to report problems or questions.

Extension activity with family communication was generated at both state and national levels. At the state level, activity included a writing a peer-reviewed lesson (**Building Bridges within Our Communities)**, individual consultations with Extension agents on moving from county to district agent positions with more specialization in marital and family relationship education, local and state presentations, agent training, monthly ***Connections*** newsletters, twice-a-year ***CoupleTALK*** internet course, multiple news

releases with additional media inquiries, and other miscellaneous obligations. At the national level, work has revolved around the National Extension Relationship and Marriage Education Network (NERMEN) in which a select group of state specialists (including one from Kansas) are striving to expand the nationwide Extension outreach of research-based resources in the area of relationship and marriage education. One major endeavor will culminate this spring with the **2006 National Annual Family Life Electronic Seminar Series** hosted by Ohio State Extension with Kansas agents invited to participate. A Kansas Extension Specialist is an invited presenter. Additionally, on a national level, Mississippi State Extension has adopted *Stepping Stones for Stepfamilies* for statewide distribution.
In cooperation with Utah State University, *"The Strong Latino Marriage Project"* has brought together Family Studies and Human Service graduate students and a Developing Scholar (all Spanish speaking students) in a qualitative study in which ten Latino couples were interviewed on what makes their marriage strong.

"Women Managing the Farm", a workshop focusing on farm business management and family dynamics involving 11 partnering organizations was delivered at four sites in Kansas. Participants numbered 201 and 52% noted a change in behavior within 3 months because of workshop information.

e. Total expenditures by funding source and FTEs

FY2005	Projected: $12,772.529	Actual: $12,464,083	FTEs: 132.95

Key Theme – Youth Development/4-H

Junior Master Gardener Program

a. The Junior Master Gardener Program is an innovative youth gardening program that supports individual, family, or community horticulture learning opportunities. Through involvement in this hands-on project, youths learn about horticulture as well as health, nutrition, food safety, and decision-making. Junior Master Gardeners are encouraged to give back to their communities through service learning projects, which enhances the involvement of master gardener volunteers within communities.

   Classroom teachers, Head Start teachers, volunteers, and extension staff participate in a series of in-service training sessions across the state utilizing the FNP approved youth nutrition curriculum while focusing on the experiential learning model.

b. Intermediate Outcomes:
   The year-long Kansas 4-H Centennial Community Service "Hunger Project" was launched in September 2005 to engage 4-H members in providing food, meals, or volunteer service to low income families in local communities across the state.

   Twenty-five new Junior Master Gardener groups were formed at Head Start locations, under the leadership of 45 newly trained Head Start teachers. Results of the eight-week follow-up survey indicated that 100% of the participants understand experiential learning methods; 92% feel competent using experiential learning methods; 85% know how to create a quality learning environment; and 100% understand the characteristics of a quality learning environment.

c. Scope of Impact – State Specific

4-H Military Programs

a. The Kansas 4-H Military Program efforts are designed to address the needs of Army, Air Force, National Guard, and Army Reserve children and their families. Working in collaboration with the

U.S. Army Child and Youth Services, CSREES, and National 4-H Headquarters, the program received a second year $30,000 grant which provides funding for staff development, organizational structure, and programmatic needs for the Military 4-H Clubs at Ft. Riley, Ft. Leavenworth, and McConnell Air Force Base. A $100,000 grant provides funding for Operation Military Kids (OMK), a two-year effort which was launched in the fall of 2005 to reach National Guard and Army Reserve children and their families who have suddenly become "military kids" when their parent is deployed on active service.

b. Intermediate Outcomes
4-H Clubs are organized and active on the three military installations in the state—Ft. Riley, Ft. Leavenworth, and McConnell Air Force Base—involving over 600 youths and youth services staff members in monthly meetings, activities, and special events. Staff development training efforts have positioned the 4-H clubs and programs to be sustained after the grant ends in 2007.

An OMK Project Director has been hired to work with the State Operation Military Kids Team, which includes partners from Army Reserve, Army National Guard, Air Guard, American Legion, and K-State Research & Extension 4-H Youth Development.

c. Scope of Impact – State Specific

4-H Exchange Programs

a. Exchange programs provide age-appropriate experiential educational opportunities that help young people and their families understand the importance of knowing about Kansas, the United States, other countries, and their respective cultures. The learning experiences are designed to instill cross-cultural attitudes and skills that enhance mutual understanding and acceptance of all peoples, expand the opportunities for young people to experience global citizenship responsibilities, increase self-esteem and confidence through adapting to new situations, and learn languages and communications skills.

b. Intermediate Outcomes:
Twelve foreign high school students from Japan and the newly emerging republics of the former Soviet Union increased their knowledge and comprehension of the American lifestyle and life within a democratic republic by participating in the year-long student exchange program. Fifty-one Japanese students and five Japanese adults increased their comprehension of life in the United States during their summer 2005 school break. Four American youths increased their comprehension of life in Japan during their summer 2005 school break. Eight youths from Kansas and Europe experienced cultural immersion in the United States, Finland, and Sweden and gained new insight into world citizenship issues. Kansas 4-H was recognized as one of three states having an Outstanding Quality Program Citation by the 4-H International Programs Committee. Kansas was cited for 100% Summer Placement in the 4-H Japan Inbound Exchange Program in 2005.

c. Scope of Impact – State Specific

Key Theme – Community Development

Assisting Local Communities

a. KSRE is increasingly valued by state agencies, regional health providers, the Legislature, and private organizations as the most engaged entity in local communities. As a result, KSRE receives an increasing number of requests to convene, facilitate, or broker comprehensive planning efforts that assist local residents in sorting out and prioritizing the programs and technical assistance needed for healthy individuals, families, and communities.

b. Mobilized with a continuum of knowledge for their lives, Kansans can tap deep sources of knowledge and skills beginning with prenatal care and extending to making decisions regarding the long-term needs of seniors.
b. Scope of Impact – State Specific

Key Theme – Family Resource Management

Health Insurance Education—Medicare Part D

a. Numerous local K-State Research and Extension offices partnered with SHICK (Senior Health Insurance Counseling of Kansas) to reach more than 15,000 people through extensive public education presentations and individual consultations. As educators, agents framed complex and confusing information into a step-by-step package so people could understand Medicare Part D options and make wise choices.
b. Agents reported, "People came to the program confused and overwhelmed. They left with a clear understanding of what to do and when." Agents conservatively estimated an average yearly savings per person assisted was at least $1000 on medications and/or premiums.
Success stories included: A couple who couldn't afford the $450/mo cost had stopped taking some drugs. Now they will have no premium and each will pay only $25-30 for drugs. They were thrilled! Also, an 80ish grandmother caring for three teenage grandsons was in tears because she couldn't afford her prescriptions and provide for the boys. She qualified for extra help and will now get the medications for $2 and $5 co-pays.
c. Scope of Impact – State Specific

B. STAKEHOLDER INPUT PROCESS (includes sections a, b, and c)

Stakeholder input is a cornerstone to the prioritizing processes for educational programs for K-State Research and Extension. Stakeholder input comes through a plethora of external advisory councils, elected officials, strategic planning, and program review processes. The stakeholder input process is a comprehensive effort to seek focus on critical issues and problems needing research and answers that fit well within our defined mission priorities. This input continues throughout planning, project implementation, and program delivery. Examples of stakeholder engagement include external advisory groups for each academic department who meet with department leadership, Dean's advisory, research center advisories, campus-based institute and center advisories, state 4-H program advisory, and state Extension advisory. Each of these advisories provides strategic input to the associated program or departmental unit once or twice each year. Additionally, the Kansas Cooperative Extension Service law dictates election of local advisories and an executive board in each of our 105 counties. This amounts to publicly electing 2520 individuals across the state to provide program development input to local Extension staff for each program area of agriculture, family and consumer sciences, economic development, and 4-H youth development. Of those 2520 individuals, 945 are further elected to executive boards and are required by law to oversee the program, staff, and budget of our local Extension units across Kansas. These executive boards meet monthly to provide such oversight in cooperation with administrative leadership within K-State Research and Extension. Such ongoing stakeholder input into the decentralized decision-making processes of this organization play heavily into the priority programs and direction to K-State Research and Extension programming, especially for Cooperative Extension.

In 2005, a strategic planning process for the Cooperative Extension mission of K-State Research and Extension was completed. The 34-member task force that worked to complete this process was carefully constructed to involve a balance of key leadership among our broad stakeholders and personnel within our faculty and agent ranks. The purpose of the strategic planning was to identify key principles that must be given attention to assure the future to a relevant, sustainable, quality Extension Service in Kansas. The process included three facilitated day-long meetings and interim reports posted on our Website to solicit further external input. Focus was given to organizational structure and staffing, resource development, systems of education and information dissemination, and constituent development and marketing. A series of recommendations was identified by the task force. Since that time, the strategic planning recommendations have been distributed widely within the organization, and planning and implementation processes developed to address key issues. Some of those issues include strengthening professional development, increasing program depth and focus of our local extension programs, moving forward on multi-county models of program delivery, multi-state programming initiatives, and enhanced training for stakeholders in the advocacy process.

Our research and extension centers make use of advisory committees composed of stakeholder leadership and clientele from the local area. For instance, interested producers, agribusiness concerns, and interested members of the public are brought together to help prioritize some of the projects being considered for deployment at off-campus research locations. New extension program suggestions often develop from these deliberations. During the year we also meet informally with a large number of diverse organizations to discuss collaborative efforts, consider sharing of resources, review prioritization process, assess progress reports and realized outcomes, and to design complementary educational efforts. Feedback examples include commodity commissions (e.g., deliberations that help prioritize the awarding of producer-funded extramural grants involving check-off dollars) and helping citizens to understand options associated with regulatory decisions made by the EPA, Kansas Department of Health and Environment, Kansas Department of Agriculture, and other groups. Successful programs involve co-sponsorship of watershed specialist positions to improve water quality within drainage districts, creation of third-party educational vendor partnerships with NRCS, facilitation of multidisciplinary certified crop

advisor training programs, a wide range of projects involving community organizations, school programs (i.e., school enrichment), and social services (e.g., Area Agencies on Aging and SRS).

Our State Extension Advisory Council (SEAC) meets biannually. SEAC membership is composed of County Board/District Governing Body Chairs from each administrative area within Kansas. K-State administrators present topics for discussion that include restructuring areas of emphasis, suggestions for better local delivery that include debating staffing alternatives, and subject-matter coverage. Issues range from budgetary challenges to program prioritization.

Our five-year plan steering committee engaged in internal and external discussions with stakeholders to select new core mission themes, long-term intended outcomes, and strategies that will result in their implementation. We received comments via e-mail, a Website, and targeted stakeholder discussions.

Subsets of participants in these endeavors are given the opportunity to comment on the effectiveness of individual and interdisciplinary outreach efforts. College Leadership, Unit Leadership, and State Extension Leaders collectively use this feedback to reallocate resources and determine programming efforts so greater effectiveness and more comprehensive outcomes are attained.

Strategic planning process for 4-H youth development programs involved a series of facilitated meetings with a balance among youth and adult users/stakeholders and extension agents, University faculty, and administrators. The input provided through this facilitated process was distributed widely and is currently being used to set the direction for program enhancement, staff development, resource development, and program delivery in 4-H Youth Development.

While these techniques and processes for stakeholder input do not appear to have a single focus, we believe such processes by the various segments and audiences across our broad areas of work do in fact give us more focused and comprehensive feedback on the value of our work, its impacts, and where our future focus needs to be in a comprehensive way. Experience in conducting a statewide, comprehensive, single process has been frustrating in the huge volume of information that comes in across the work of the system and a lack of ownership or clarity to that body of information. Focused input with key stakeholder groups creates ownership, understanding, and effective implementation planning for the relevant, critical issues that coincide with the needs of the state and the mission of K-State Research and Extension.

C. PROGRAM REVIEW PROCESS

Most aspects of the program review process described in the current Five-Year Plan remain unchanged. In response to budget pressures and a mandate from the Kansas Board of Regents and KSU administration, we have undertaken a comprehensive effort to review and prioritize all K-State Research and Extension programs. The program prioritization process began in 2002 and concluded during 2003. The process was designed to ensure active participation by all levels of the organization, and stakeholder input is being solicited in public meetings. The goal has been to group research and extension programs in several priority clusters so that lower priority programs will be the first to be eliminated as state budget cuts come to bear. We anticipate that this process will help us avoid the organization-wide shift towards mediocrity that would result from across-the-board cuts. Our strategic intention is to ensure continued delivery of the most essential programs during a difficult financial period, and to leave the organization poised to grow in new and important directions when better times return. As an initial step in this process, unit administrators were asked to prioritize vacant faculty positions with highest areas of research, teaching, and extension program needs. Through that process, 58 positions were identified across K-State Research and Extension.

D. EVALUATION OF SUCCESS OF MULTI AND JOINT ACTIVITIES

Planning and Evaluating Multi and Joint Activities

K-State Research and Extension continued to place a high priority on Interdisciplinary, Integrated Research-Extension and Multistate activities in 2005. The President's budget proposal for FY2006 (delivered in early 2005) called for a radical restructuring of federal formula funds for Multistate research and other types of projects, moving to a competitive system for allocating Hatch and other funds. The proposal called for creation of a dynamic new State Agricultural Experiment Station competitive grants program, which would allocate federal funds with a strong emphasis on funding new integrated Multistate projects targeting critical national needs. One key goal was to achieve more flexibility in the federally-funded project portfolio, and make it more responsive to changing needs. Although the President's plan was not instituted, the proposal triggered a wave of analysis and planning that helped us better evaluate and understand the impacts of our project portfolio. It was enlightening to determine, for example, how differently Hatch funds are used by the Land Grant institutions across our Region. In KSRE, no Hatch funds go for faculty salaries, but more than 90% go for graduate student and technician salaries plus research operating funds. These are spread across a wide range of projects. In one other North Central Regional Association (NCRA) institution, 99% of the Hatch funds go for faculty salaries. These differences have profound implications for the capacity of Land Grants to absorb changes in the mechanism for allocation of Multistate funds. We believe that KSRE is relatively well-positioned to respond to change.

In addition, a major effort was launched in 2005 to re-tool CRIS (the Current Research Information Reporting System) and make it more user-friendly towards projects that address integrated research-extension-educational objectives. By the end of the year, we found ourselves weighing our investment of effort versus the new CRIS "Knowledge Areas," as opposed to the former "Research Problem Areas." It has been enlightening to determine which Knowledge Areas are well-covered, and which are relatively neglected, in the current portfolio, both for the North Central Regional Association and KSRE. In the coming year, we intend to work with our colleagues across the system and here at K-State to extend this analysis to include our State-supported and grant-funded projects portfolio. We have yet to determine what responses are appropriate in view of this newly-generated information. It may not be a wise investment, for example, for all Land Grant institutions, or all Regions, to address all Knowledge Areas, or to address all Knowledge Areas equally. Instead, it will be important to determine where our State, Regional and National priorities lie and make sure that our investment of effort matches strategic needs.

One remarkable shortcoming in the Multistate project portfolio in KSRE, the NCRA, and apparently even across the nation, is that there are no Multistate projects focused on energy or bioenergy, *per se*. The need for such an effort seems self-evident, given the run-up in energy costs for consumers, farmers, and all sectors of the economy. The President's challenge to intensify efforts to reduce our dependence on petroleum must be a clarion call to action in the Land Grant system. The Kansas State University Engineering Experiment Station has some effort devoted to energy efficiency and consumer education, but a vigorous integrated research-extension activity is lacking. We have identified a suitable faculty member in Engineering with broad knowledge and experience in this area, and we have given him a partial AES appointment in KAES. Our intention is to work with him to build an energy-focused research-extension team in the coming year, and possibly challenge him to pull together a similar Multistate research team.

Teamwork is essential to meaningful progress in multi and joint activities. In 2005, K-State Research and Extension continued to make progress with implementing teamwork across a broad front. Although we have made significant progress on developing a team-oriented culture, we recognize that much work remains to be done for teamwork to become the norm within our organization. Many teams have been formed within administrative units, while others cut across disciplines and organizational boundaries. Some teams are informal, while others are more structured.

All are aligned with one or more of our twelve long-term intended outcomes that address critical issues and serve as the pillars of our 5-year strategic plan. Teams provide an important means of organizing faculty and other resources in a way that helps us address larger-scale objectives and enhance overall productivity.

Reporting takes place via annual impact reports, which are individual, comprehensive accomplishment documents that go to each unit leader. Teams have the opportunity to highlight joint efforts through the filing of collaborative impact reports or project member reports against an Action Plan, and we continued to see more of those in 2005. Administrative support, incentives, reports of outstanding achievements, and the passage of time will increase our success in this area. The concept of integrated research and extension teams has been very positive for the effective transfer of new knowledge gained from research and it has also provided a mechanism for the insights of extension faculty to be used in designing new research programs. K-State will continue to promote teamwork that features integrated research and extension programs.

K-State Research & Extension has long used an outcome-based approach for planning our extension and research activities. We have invested substantial effort in making sure our planned programs describe the expected outcomes and intended impacts, and we are in a good position to determine if we are delivering results that make a difference.

We have continued to make progress with implementation of comprehensive electronic data-gathering software (RETORIC) to support planning and reporting needs for both research and extension. We have learned the importance of having an outcome-based orientation rather than an issue-based orientation. We anticipate that clear outcome goals will give us much better evaluation of results.

We have also continued to implement the Logic model as our primary project management framework for joint research/extension projects. We have made some minor language changes to the model that make it more user-friendly to researchers. We now put the greatest emphasis on the short- and medium-term outcomes and the long-term impacts that we anticipate from our work. Crisp, specific outcome statements provide a benchmark that makes the evaluation process much easier. We have determined that different levels of evaluation should be used for different issues. For some, examples of how K-State Research and Extension has solved the problem and how stakeholders have used the science-based information in their business/life meet the accountability requirements. For others, more extensive evaluation is needed to convey the social, environmental, or economic impact that has been achieved; decisions need to be made during the planning phase as to what level of evaluation/documentation will be utilized with a given project.

Survey information generated through a scientific process by an independent, credible source is very powerful. We have found that these data, along with examples of project impacts, are very effective ways of communicating with decision-makers at all levels of government.

In 2005, we initiated the concept for a K-State Research and Extension Advocacy Board, which will create a cadre of trained citizen advocates across the state. These advocates will complement our CARET representatives, and be available to respond to advocacy needs wherever they arise at the state and local level, in both public and governmental arenas. Plans will be advanced and implemented in the coming year.

KSRE's "Expanding 4-H Opportunities Team" is a cross-cutting effort designed to expand the reach and saturation of 4-H youth development movement to all school-aged youth of Kansas. In 2005, this team made significant progress. Working with Extension Agents, the team succeeded in obtaining two awards from the State General Fund for Afterschool Enhancement Projects. Of the nine awards from federal 21st Century Community Learning Center funds for school projects beginning in 2004, four awards included 4-H learning experiences. In 2005, eight awards were given to 4-H learning experiences at the local level. Obtaining this funding has helped the team make real progress towards its goal of extending 4-H experiences to urban and minority youth. Along the way, redefining the essentials of a 4-H club/group, new models of long-term, continuous contact mentoring, knowledge,

and skill mastery environments are being tested, acknowledged, and sustained across Kansas.

The Expanding 4-H Opportunities Team has continued its move give people with all types of life experiences the freedom to form their own clubs/groups based on the four-fold youth development model. Partnerships have developed with other community-based organizations where young people find themselves. K-State Research and Extension is involved in more than 40 of the 48 21st Century Community Learning Grants in Kansas. In addition, healthy 4-H places are now supported with funds from the Juvenile Justice Authority, Social and Rehabilitative Services, Center for Substance Abuse and Prevention, Big Brothers and Big Sisters, and Boys and Girls Clubs.

Two of the nineteen awards from state general funds for Afterschool Enhancement projects for the 2005-2006 school year were awarded to local 4-H programs. Of the nine awards from federal 21st Century Community Learning Center funds for school projects beginning in 2004, four awards included 4-H learning experiences. In 2005, eight awards were given to 4-H learning experiences at the local level.

Extension faculty and staff in counties surrounding Fort Riley are collaborating to develop strategies and marketing materials targeting military families. With an expectation of more than 30,000 people coming to the area, this is an opportunity to increase the reach of extension programs to nontraditional, underserved, and emerging audiences. It is essential they learn about basic military practices and procedures so that we might better serve and partner with this new audience.

Through a two-year grant from the Department of the Army that began October 1, 2005, K-State Research and Extension will receive $50,000 each year. Operation Military Kids involves designing a statewide effort to deal with stress when parents are unexpectedly deployed to help in the war effort. Kansas was invited to apply because of the state's high number of Army Reserve and National Guard members—whose families will be the project focus. Families left behind are ill-equipped to deal with changes—financial and social—and the new demands on the youth themselves and how they should fit in with a community that may not know their family situation. These families aren't in large urban areas or on military installations—they're scattered across the state! A mock deployment activity helps kids understand what deployment means for their parents and families.

Wyandotte County (Kansas City, Kansas) has seen a recent dramatic increase in Latino population going from 9% to 17% of the county's population in just five years. The Wyandotte County (Kansas City, Kansas) Extension Council Executive Board and County Extension Director, through long range strategic planning, provided leadership in establishing a Latino community outreach program through Extension in Wyandotte County. Wyandotte County has a Spanish-speaking population of around 30,000 residents that will benefit from the educational programs offered by the Wyandotte County Extension Council. They are demonstrating the K-State Research and Extension slogan, "Knowledge for Life," by developing this effort to reach out with educational programs that will improve the lives of an audience that has been traditionally under served.

A bilingual Family and Consumer Sciences Extension agent hired in 2004 has developed excellent collaborations with human service agencies and other organizations that are reaching out to this community. Because of Wyandotte County's commitment to this audience, the Extension Council Executive Board was successful in opening an office within El Centro, Inc., a social and community development NGO service with the Argentine Community of Kansas City, Kansas. They also leveraged the services of four bilingual Kansas State University students to live in Kansas City and work with the targeted audience during the summer months. This K-State Community Service Program allowed Spanish-speaking students interested in working with youth and community development to gain valuable leadership experience while assisting Latino residents of the Argentine community.

Short term outcomes have been reached through targeted program involvement of the Latino community around health issues of diabetes, obesity, and hypertension. Furthermore, Extension educational programs are opening doors and helping the various governmental service employees,

police, fire, and community services to better understand the Latino people living in the Kansas City, Kansas area and their unique culture, interests, and needs.

KSRE conducts Integrated, Multistate and Interdisciplinary activities because they offer one of the most effective means of addressing critical issues, meeting the needs of under-represented clientele, achieving important outcomes and making the most efficient use of our resources. The following descriptions of interdisciplinary and integrated activities are provided as instructive examples of KSRE's multi and joint activities.

The Midwest Institute for Comparative Stem Cell Biology

The Midwest Institute for Comparative Stem Cell Biology, located at K-State, was formed in 2005 to further basic and applied research in stem cells and related biotechnology in animals and humans and to extend that discovery through education and commercialization. The institute is uniquely situated to leverage research capabilities through collaboration among Kansas State University, the University of Kansas and the Kansas University Medical Center, and scientists with similar interests at other Midwest institutions.

The institute has strong potential for economic development and attainment of external funding. It positions basic research, discovery and development of specific applications, commercialization, and education in a strong scientific environment with the further purpose of partnering with other research institutions and with corporate and governmental entities with related activities and interests.

The Institute is based on the strength of the discovery, by Kansas State University scientists, of unique postnatal stem cells within the umbilical cord matrix of humans and several animal species. These cells have been shown to have remarkable adaptive capacity. Kansas State University has a patent pending on methods to harvest, grow, and store umbilical cord matrix stem cells and the use of matrix cells for therapy, tissue engineering, and biotechnology. This foundational research has identified, and stands to make available, a plentiful and potentially low cost source of stem cells that are extremely adaptable and free of ethical controversy. The institute connects this initial discovery with a strong array of related biotechnological research and development.

Thus the Institute is well positioned to contribute to the development of important stem cell technologies and to participate in the economic benefits that will be associated with stem cell research and applications in animal agriculture and in human and animal medicine.

As of 2005, use-specific licenses have been awarded to two commercial entities, one in human medicine and one in equine medicine. In addition, one startup company has been initiated.

In addition to basic comparative research, the Midwest Institute for Comparative Stem Cell Biology has the following research goals to:

- Create new tools for treatment of degenerative and other diseases in humans and companion and competitive animals
- Develop technologies for production of pharmaceutical and biological agents
- Create high throughput techniques for safety testing of pharmaceutical and biological agents
- Enhance food safety
- Increase efficiency of animal-based food production
- Preserve endangered species

These research goals are complemented by:

- Creation and furtherance of education and training in this field of biological research and commercialization
- Development and commercialization of intellectual property resulting from the research program

Hard Winter Wheat Improvement

Wheat varieties developed at the Kansas Agricultural Experiment Station continue to be widely

grown in the Great Plains. Overley was released in 2004 and had its first large scale planting in 2005. It is expected to occupy large acreages in central Kansas and Oklahoma in 2006. Efforts to use minor gene resistance to leaf and stripe rust are also paying dividends, both by increasing the level of resistance in the Kansas program and by providing adapted germplasm to other wheat breeding programs in the region. The continued success of the Kansas wheat breeding program depends on many different collaborations across Kansas State, the Great Plains and internationally. Collaborators share ideas for genetic improvement, actual germplasm and concepts for new wheat uses, including white wheats that promise to change the nutritional habits of the nation with regard to consumption of whole grain wheat products.

KS00F5-14-7, an experimental hard red winter wheat line, was placed on increase for possible release in 2006. This line is highly resistant to all prevalent races of leaf rust in the Great Plains and is also resistant to stripe rust. It also has excellent end use quality characteristics. It is expected to do especially well in central Kansas and adjacent areas of Oklahoma.

Efforts to identify DNA markers linked to minor genes for leaf rust are progressing. Genes for this type of resistance each add an incremental unit of resistance. A single gene is not particularly effective, but a variety with four or five of these genes is highly resistant and is more likely to be durably resistant. We have sought to genetically map minor gene resistance to facilitate more efficient breeding strategies. The phenotypic data has been collected and the molecular marker work is in progress to accomplish this objective. This type of resistance has also been broadly integrated into the breeding program with more than 70% of the F2 breeding populations planted in the Fall of 2005 have a minor gene resistant parent in the pedigree. Numerous lines with this type of resistance have also entered the yield testing phase of the program.

Research designed to identify chromosomal regions associated with heat tolerance from the cultivar ‘Ventnor’ is nearing completion. Essentially all the necessary data have been collected and are being analyzed and summarized. As an extension of this work, experiments to look at differential gene expression between tolerant and susceptible materials have been initiated in hopes to corroborate the initial mapping data, as well as identify additional genes that influence the trait.

Efforts to integrate resistance to Karnal bunt into Kansas wheat continue to progress as part of our participation in the Multistate project, NC1015. This project involves partners as diverse as Punjab Agricultural University in India, CIMMYT in Mexico, Texas A&M, and Oklahoma State. Currently, the second backcross cycle for the incorporation of resistance from Indian sources into Great Plains adapted wheat is underway. This work is being accomplished through the use of DNA markers. A similar effort has been used to improve the tolerance of hard white wheats to pre-harvest sprouting.

Projects designed to map resistance to stripe rust and pre-harvest sprouting tolerance have been initiated. Also, Kansas materials have been tested in Kenya for resistance to the new, highly virulent stem rust strains present in East Africa.

Integrated Agricultural Management Systems for Improving Water Quality in Kansas

Best management practices have been recommended for controlling nutrient, herbicide, or sediment losses in surface runoff. This study was designed to determine the best overall combination of tillage and chemical management practices for improved water quality. Runoff was collected from two Kansas sites in sorghum-soybean rotation for three crop years and tested for sediments and a variety of nutrient and herbicide contaminants. At Franklin County, sediment losses from a chisel/disk (CH) tillage system were 2.5 times greater than from the no-till (NT) systems. At Crawford County, no cumulative difference was seen for sediment loss. Greater runoff water volume was found in NT than in CH at both locations. The runoff from no-till also contained upwards of eight times more atrazine, three times more metolachlor, and two times more soluble P than runoff from CH. No consistent trend for nutrient and herbicide loss was seen between banded fertilizer/split herbicide application (H, high management) and broadcast applications at planting (L, low management). CHL generally had small losses for all tested parameters and may be the best practice to simultaneously control nutrient,

herbicide, and sediment losses for the study sites used in this experiment. Two modeling efforts were associated with this project. The first is a calibration of models against runoff data from the field study. Both SWAT and ADAPT water-quality models did well in predicting runoff and erosion from field terraces with different tillage and chemical application treatments. A second modeling effort is attempting to model at the watershed scale to help determine the net impact of best management practices on water quality in the basin. SWAT model runs have been completed for various combinations of management scenarios related to tillage (conventional tillage, no-tillage, mulch tillage with 20 and 50% residues), grass buffer strips (10 and 20 m), contouring, terracing, and an all mixed-grass prairie scenario. Modeling results generally have indicated that reductions in sediment, total N, total P and atrazine loading to streams in the Lower Little Blue River subbasin can be achieved through implementation of various BMP combinations. Economics work examined the impact of the adoption of less tillage practices on the cost efficiency of a sample of farms. Cost efficiency was measured using the economic total expense ratio which is computed by dividing cash costs, depreciation, and opportunity costs for unpaid labor and owned assets by the value of farm production. Results indicated that farms that have reduced tillage were relatively more cost efficient. To further explore the differences in production and financial characteristics across farms, a less tillage index was used to categorize farms into three groups: bottom one-third, middle one-third, and top one-third. Farms in the top one-third category, in addition to being relatively more efficient, tended to be larger, had relatively higher purchased input cost in proportion to total economic costs, and relatively lower labor and capital costs in proportion to total economic cost.

Outreach efforts have included involvement in the Three Rivers Chapter of Kansas Alliance of Wetlands and Streams (KAWS) and discussions with this group and KDHE regarding the Watershed Restoration and Protective Strategies (WRAPS) in the Blue River Basin. Results from our extension modeling project are hoped to compliment WRAPS efforts, especially for recommendations of BMPs for meeting water quality goals within the basin. K-State Agronomy has also continued to participate with the Blue River Compact, KDHE and USDA-NRCS to evaluate procedures for focusing implementation of BMPs in the basin, and it appears that cooperation is developing amongst these groups to deliver BMPs through the WRAPS process. Data from the project have also been used to validate the Kansas Phosphorus Site Index. Several research publications have been submitted and are under review.

Impact of Climate and Soils on Crop Selection and Management

This project uses crop simulation models to examine the impacts of cropping systems within the 10 states of the North Central Region. Because a systems approach is the desired variable to examine, DSSAT 4.0 is a crop model used to simulate the appropriate cropping systems throughout the region. Previous work was completed using only corn and soybean simulations on three soils in three selected counties in each state. This approach is limited because the corn-soybean rotation, which dominates much of the eastern two-thirds of the region, does not represent the western portion of the region where irrigated agriculture and diverse dryland cropping systems occur. As a result, a different approach will be taken during the next phase of our project.

The USDA has subdivided the US into Major Land Resource Areas (MLRAs). Approximately, 50 MLRAs of variable size are encompassed within the 10 states of the North Central Region. Simulations will be conducted on three cropping systems, where applicable, on the three predominant soil series for each MLRA. Soils will be identified using the State Soil Geographic (STATSGO) database for each state. Soil physical properties to be used for simulations will then be selected from the NRCS Soil Survey Laboratory Database. Historic weather data will be selected from a location within each MLRA in order to maintain uniform coverage of the region.

Results from previous modeling projects involving this region indicated that model performance was below desired standards. As a result, model calibration for the High Plains environments has

become a priority. The addition and subsequent evaluation of new crop models will also enable the evaluation of traditional corn-soybean and wheat-corn rotations compared with systems that contain alternative crops and intensified rotations via simulation.

Model calibration will be accomplished through the use of existing research results in the region. Model calibration datasets are being developed that contain research results for corn, grain sorghum, wheat, cotton, soybean, sunflower, and canola so that model calibration and evaluation can be completed more rapidly. Field studies have also been initiated to collect datasets designed to compliment the database and to address model deficiencies. Current field trials include corn, grain sorghum, and cotton trials located above the Ogallala Aquifer in western Kansas. The Ogallala region contains high concentrations of irrigated agriculture that has an uncertain future.

This work will verify that crop models are useful tools in studying cropping system performance within a region. These results will provide an excellent baseline for future cropping systems simulation. The use of crop models to develop profitable dryland and limited irrigation cropping systems in this region is essential as irrigation water reductions will increase the need for this type of research.

Crop Yield Responses in Water-Stressed Environments

Minimizing risks of nitrate contamination along the waterways of the U.S. Great Plains is essential for continued irrigated corn production and quality water supplies. We quantified nitrate (NO3) leaching of Pratt loamy fine sand and evaluated the effects of N fertilizer and irrigation management strategies on NO3 leaching with irrigated corn. Two irrigation schedules (1.0x and 1.25x optimum) were combined with six N fertilizer treatments broadcast as NH4NO3 (kg N/ha): 300 and 250 applied pre-plant; 250 applied pre-plant and sidedress; 185 applied pre-plant and sidedress; 125 applied pre-plant and sidedress; and 0. Porous-cup tensiometers and solution samples were installed in the four highest N treatments. Soil solution samples were collected during two corn seasons. Maximum corn grain was achieved with 125 or 185 kg N/ha, regardless of irrigation schedule (IS). The 1.25x IS exacerbated the amount of NO3 leached below the 152-cm depth in preplant N treatments: mean of 146 kg N/ha for the 250 and 300 kg N preplant applications compared with 12 kg N/ha for the same N treatments and 1.0x IS. With 185 kg N/ha, the 1.25x IS treatment resulted in 74 kg N/ha leached compared with 10 kg N/ha for 1.0x IS. Profit and risk in water management depend on the underlying crop yield-water use relationships. We described development of, and tabulated, yield—water supply relationships of six major crops of the central High Plains. Soils were deep silt loams that developed from loess; input weather data were mean, long-term observations; and crop growth patterns were consistent with full-season cropping in the central High Plains. Yields modeled with the NRCS net irrigation requirement (NIR) for 80% chance rainfall ranged from 92 to 97% of the maximum attainable yields. This illustrated that if net irrigation exceeds the recommended NIR, there will be no appreciable yield increase.

This project documented that improved N management efficiencies on sandy soils with irrigated corn can be achieved through appropriate irrigation scheduling and N fertilizer rates. Yield—water supply relationships of six major crops that were developed and published will aid in studying water resource optimization and the associated economics. With recent rises in energy costs, the importance of crop yield—water supply relationships for use in economic analyses has been magnified.

Center for Sorghum Research

The United States is a major producer of grain sorghum with nearly 8 million acres of production in 2005. Despite the national importance of this crop for farmers in drought prone environments, many public and private sorghum research positions and programs have been lost to attrition and corporate consolidation. Consequently, farmers and seed industry programs are becoming more reliant on public research programs to address new or recalcitrant problems. This ominous trend threatens the economic stability of those farmers that rely on this crop to maintain the profitability of their farms. Grain sorghum is one of the most important dryland crops in the Central Great Plains of the United States,

particularly in areas where low and erratic rainfall or high temperatures limit the production of other summer crops. Although economically important around the world, the genetic potential of sorghum has not been explored nearly to the extent of corn, wheat, or other cereals. Sorghum yields have not improved nearly as dramatically as corn in the past two decades; however, there is great potential waiting to be tapped. The objective of this project is to develop the genetic resources needed to improve the performance and value of grain sorghum through plant breeding and genetic improvement.

Efforts to improve sorghum performance will focus on grain yield, drought and heat tolerance, lodging resistance, as well as resistance to disease (particularly stalk rots which cause lodging) and other pests. Phenotypic variation has been documented in sorghum for many of these traits; however, complex genetic inheritance has constrained efforts in crop improvement. The goal of this project is to identify and characterize the genes that control these economically important traits and to move these genes into U.S. adapted genetic backgrounds. Our efforts are currently focused on the development and characterization of a core collection of 288 genetically diverse sorghum land-race varieties from around the world. These exotic sorghum landraces and a set of the most elite sorghum parent lines and varieties will be characterized for differences in yield and yield components as well as grain and forage quality characteristics. These data sets will be combined with genetic fingerprinting in an effort to map genes that govern important traits through association mapping. An array of 20 recombinant inbred sorghum mapping populations also are being developed that will serve as a community resource to facilitate crop improvement as well as mapping and cloning of economically important genes. Once developed, these populations will be freely available and represent a resource for future research.

The development of sorghum lines with improved drought tolerance and increased yield potential should translate into improved profitability of sorghum producers in the U.S. Furthermore, efforts to develop of a set of community resources that can be used to better understanding of the genetic architecture that underlies the expression of these traits holds promise for continued improvement of sorghum and other summer crops.

Collaborative efforts of K-State, Texas A&M, and Texas Tech University succeeded in obtaining funding to support the Great Plains Sorghum Improvement Center in FY2006. This Multistate, integrated effort will include marketing and outreach projects, together with work on new food uses and genetic improvement of the crop.

Mobile Irrigation Laboratory

The Mobile Irrigation Lab (MIL) is a K-State Research and Extension team program. Biological and Agricultural Engineering (BAE) faculty members provide much of the leadership and effort for this program, but important input is provided by faculty in Agronomy, Agricultural Economics, and the KSU Southwest and Northwest Research and Extension Centers. The team has developed, tested, and demonstrated effective physical and electronic water management tools for irrigated agriculture in Kansas. This includes the KanSched Irrigation Scheduling software program that farmers and crop consultants can use to easily schedule applications of water during the growing season of a crop so that water is used efficiently. This software has been adopted by the USDA Natural Resources Conservation Service as a BMP for Kansas. MIL team members are also working with irrigation professionals and colleagues in Texas to extend the MIL success into other areas of the Ogallala Aquifer region.

Watershed Restoration Team

Effort is underway in Kansas to restore function to all water bodies in the State through the development of stakeholder-led watershed restoration and protection strategies (WRAPS). A team of K-State scientists, engineers, and extension specialists are guiding implementation of these efforts. Biological and Agricultural Engineering (BAE) faculty and staff are leading a nationally recognized effort to provide local watershed stakeholders and decision makers with science-based information to guide restoration efforts. The BAE team is developing watershed water-quality models and stream-

monitoring data for a dozen watersheds covering one-fifth of the land area in the State. The team also is making critically important contributions to implementation and monitoring of the Republican River Watershed Compact between Colorado, Nebraska, and Kansas.

Sorghum Bioconversion Research

Renewable liquid fuel sources are extremely important for the stability and longevity of the U.S. economy. The sorghum bioconversion research team includes scientists from Biological and Agricultural Engineering (BAE), Grain Science, USDA Grain Marketing and Production Research Center, and StrathKirn Inc. The main focus is to understand key factors such as composition, chemical structure, and physical properties impacting the bioprocessing of selected products such as ethanol and lactic acid and to analyze the relationship among the "genetic-structure-function-bioconversion". Potential results-based improvement will be evaluated in an Energy Life Cycle Analysis Model, and outcomes are communicated to the processing industry for implementation. While fermentable starch has received growing attention as a valuable trait in corn, the process is less well understood in sorghum. However, grain sorghum is a very good dryland crop and requires fewer external energy inputs for production than irrigated corn. The results from research will benefit both grain producers and the bio-industry.

Bioretention Cells for Stormwater Quality Improvement

Vegetated stormwater management systems (i.e., bioretention cells, bioswales, and vegetated in-line retention systems) are being developed and monitored to assist urban area compliance with the EPA NPDES permitting program. Faculty in the department of Biological and Agricultural Engineering (BAE) are working with the cities of Topeka and Mission, Kansas for the design and installation of several ecological engineered stormwater systems. Four of the sites are being monitored to determine system effectiveness and develop design guidance for the municipalities. This work is pioneering usage of these systems to help solve nonpoint pollution concerns in urban environments throughout the Central U.S.

Enhancing health-promoting components of wheat

Antioxidant activity in foods is well recognized by nutritionists and the public to be healthful. Antioxidants eliminate free radicals, thus reducing the risk for cancer induction. While antioxidants have been found in many foods, little work has focused on their presence in grains and linking this presence with cancer suppression. Work initiated in the KSU Grain Science department demonstrated the wide range of antioxidant activity in wheat varieties. Working with scientists in the department of Biochemistry, they demonstrated that mice fed wheat with high, medium, and low antioxidant levels, resulted in the same trend in antioxidant activity in the blood of the mice. Model systems using growing human cancer cells also responded to the bran of the wheats, with high antioxidant wheat bran actually killing the cancer cells. Low antioxidant wheat bran had no effect.

Collaborators at Wichita State University participated by feeding diets containing wheat with varying levels of antioxidants to mice with a genetic defect that leads to colon tumors. Once again, the mice with high antioxidant diets experienced the lowest level of tumor development; those with lowest antioxidant content were similar to the control. Subsequent animal studies are in progress at the University of Missouri with animal models designed to determine effect on prostate and mammary tumors. In the meantime, researchers at KSU's Human Nutrition department conducted a study to show that plant lignans could be a major component to explain the observed effects. The high antioxidant wheats also had the highest lignan content; lowest antioxidant wheats, the lowest lignan content. Research on wheat antioxidants is now proceeding at Cornell University, University of Maryland, and University of Manitoba. The work coordinated by KSU has led the way in demonstrating the link with cancer suppression in animal models.

With growing interest in whole grain foods, there is recognized value to the consumer in healthful components in the bran fraction of grains. The direct benefit of this research is to help

marketers recognize that certain varieties and environments enhance the antioxidant content of whole grain foods that the consumer has interest in. Wheat breeders now are looking at metabolic pathways that may be enhanced to increase the level of antioxidants in future wheat varieties. Work at KSU is now focused on improving the understanding of analytical methodologies for measuring antioxidant compounds and free radical scavenging capacity. More specific and rapid methods will be valuable tools in helping both marketers and breeders make better use of high antioxidant grains and make them more available to the consumer in the future.

Enhancing Profitability of Large Dairies in Kansas

In 1995, two large dairies in Western Kansas milked approximately 5,000 cows. Currently approximately 20 dairies milk 70,000 cows in Western Kansas. Kansas State University dairy research and extension has taken a multidisciplinary approach to including expertise from Biological and Agricultural Engineering, Agricultural Economics, and Animal Sciences and Industry. The majority of the programs have been directed at improving the competitiveness and sustainability of dairy producers. The K-State dairy research and extension group has been active in developing local, regional, multi-state, and national programs. A variety of approaches including conferences, regional meetings, county meetings, allied industry meetings, tours, dairy days, and farm consultations have been used to provide the dairy industry with research-based information. The group has been effective in conducting research trials on commercial dairies and distributing this information nationally and internationally. Examples of this include the group's work in dairy facilities, expansion, nutrient management, heat stress, and reproduction. In the past, the group has been instrumental in developing a number of regional and national/international conferences including the Western Dairy Management Conference, Midwest Dairy Management Conference, and Heart of America Dairy Management Conference. These conferences have taken research based information from multiple sources and created an environment of "one stop shopping" for individuals who work in the dairy industry. These programs have largely been funded by registration fees and sponsorship of allied industry.

Kansas has become a major dairy state during the past decade. In 1995, Kansas ranked 30th in total milk production and dairy cow numbers and 36th in milk production per cow in the U.S. Since that time, a major revitalization of the industry has occurred. Kansas has experienced an 88% increase in total milk production, a 38% increase in dairy cow numbers, and a 36% increase in milk yield per cow during the past 10 years. At the end of 2004, Kansas ranked 18th in total milk production, 19th in dairy cows, and 11th in milk production per cow. K- State dairy extension programs have been active in helping dairy producers to grow while increasing milk production per cow. Local governments are aggressively recruiting dairies to relocate to their communities. Expansion of the dairy industry in these areas may be the most viable economic development example in many years. One dairy cow will generate $3,000 to $3,500 in gross income annually. Over the last ten years, cow numbers have increased by more than 30,000. These additional 30,000 cows represent an additional $90 to $105 million dollars that annually multiply throughout the Kansas economy. Kansas is considered to be a major dairy expansion state and will continue to expand.

Swine Production Research and Outreach

The Kansas swine industry is a robust industry with Kansas producers marketing approximately 2.5 million pigs with a gross market value of about $390,000,000. The overall goal of the K-State Research and Extension (KSRE) swine team is developing, evaluating, implementing, and disseminating the latest technology to improve the economic competitiveness of swine producers. To impact economic competitiveness, the swine research and extension team concentrates on the main drivers, cost of production and productivity.

The integrated nature of the KSRE swine program has led to several high profile impacts in the industry to improve profitability of swine producers. The program is characterized by rapid and practical application of research findings. The following highlights are offered as examples of the impact: Base ingredient (premix, base mix, starter diet) recommendations that have become the

standard for comparison in the industry. These recommendations led the major reduction in feed cost in the swine industry in the 1990s. In addition, application of the award-winning weaning age research has led a move in the industry towards increasing weaning age from approximately 17 days to 22 days. At a net value of $0.60/pig/day, the change is worth over $120,000/year to a 3,000 sow farm. Moreover, education and dissemination of feed budget calculators have led to wide-spread application of feed budgets by the swine industry. These budgets have greatly simplified feed delivery and reduced overfeeding. Furthermore, a simple idea that originated in the extension group, feeder adjustment pictures, has been placed in barns in production systems around the world and is credited in many situations with improvements in feed efficiency worth more than $3/pig. Finally, the most recent innovations of the swine team that will have a major impact on the industry are in the areas of objective gestation feeding programs and replacing feed-based antibiotics with water-based delivery of water medication.

Enhancing Safety for Meat and Food Processors

Meat processing and prepared meat products manufacturing make up the largest share of food processing in the state. This industry provides employment for over 18,700 people in Kansas (Kansas Department of Labor). Currently the meat industry has multiple needs. Lack of management, quality assurance, quality control, and regulatory personnel have become acute with increased demands of providing a safe, high quality product to consumers. Kansas State University plays a significant role in providing training for these future employees. Food safety, HACCP, packaging, meat quality and value-added technology lead an expanding list of research and extension topics needed to keep Kansas as a leader in the meat industry.

The meat industry has been challenged to meet the Pathogen Reduction, HACCP Final Rule of USDA FSIS. Recent guidelines also were issued to address pathogen lethality in jerky. Kansas State University has been actively involved with validation studies for jerky that would provide information to assist the Kansas meat processing businesses so they could remain in compliance with current programs. As a result of this initiative, a cooperative project with the University of Wisconsin-Madison was initiated through a newly funded USDA project. After processors were surveyed and commercial jerky samples were analyzed, a jerky validation study was designed. Kansas State University meat extension faculty serve as the State HACCP Information Coordinator for Kansas. Kansas has been part of a four state food safety program for the past seven years. This program will continue for an additional two years through a USDA funded cooperative project between Kansas State University, University of Nebraska, University of Missouri, and South Dakota State University to provide support, training, and technical assistance to meat and poultry facilities in a four state region. Kansas State University serves as a lead in this effort. This effort also will design Listeria intervention validation research on ready-to-eat meat products, develop a national train-the-trainer program, and provide local workshops and assistance. The HACCP assistance program is crucial to continue hands-on support to the Kansas meat industry following training programs. Subsidized training programs in HACCP are offered in the four-state region. A HACCP extension assistant also works one-on-one with plants.

Businesses have been able to be more competitive with availability of nutrition facts panels on product labels, product lines have been extended, new products have been developed and shelf life evaluated, products have been reformulated to enhance product safety for all consumers, and plants have been made HACCP compliant. A variety of meats related industries have been assisted through this program, including the exotic meat industry. It is important to note that the majority of companies serviced through these programs are small and very small meat processing businesses, many with fewer than 10 employees. Had these programs not been available, these companies would not be able to afford the services.

U. S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Actual Expenditures of Federal Funding for Multistate Extension and Integrated Activities
(Attach Brief Summaries)
Fiscal Year: 2005

Select One: **__ Interim** **X Final**
Institution: **Kansas State University**
State: **Kansas**

			Multistate	
		Integrated	**Extension**	**Integrated**
		Activities	**Activities**	**Activities**
		(Hatch)	**(Smith-Lever)**	**(Smith-Lever)**
Established Target %		4%	3%	3%
This FY Allocation (from 1088)		3,214,672	5,590,756	5,590,756
This FY Target Amount		128,587	167,723	167,723
Title of Planned Program Activity				
Collaboration at National and Regional committees, meetings, and projects			170,875	
NC 205		10,501		
Pecan Fields		46,764		23,416
Plant Biotechnology		94,508		
Crop Systems				8,615
Environmental management of livestock systems				43,946
Cooperative Leadership Development				30,499
Cooperative Integrated Administration				98,198
	Total	151,773	170,875	204,674
	Carryover			

SUPPLEMENT TO THE 5-YEAR PLAN OF WORK
Actual Federal Expenditures for FY 2005

MULTISTATE EXTENSION ACTIVITIES

The multistate interaction at Kansas State University, as listed in the approved 5-Year Plan of Work, represents participation at national and regional professional meetings, panels, conferences and seminars by extension specialists, administrators and faculty.

INTEGRATED ACTIVITIES - HATCH ACT FUNDS

NC 205: Ecology and Management of European Corn Borer and Other Stalk-Boring Lepidoptera.

Pecan Field: Joint research and extension activity to study pecan hybrids as alternative agriculture.

Plant Biotechnology – NC 316

INTEGRATED ACTIVITIES - SMITH LEVER FUNDS

Pecan Field: Joint research and extension activities to study pecan hybrids as alternative agriculture. Cropping Systems Design & Management: Action Plan number AIC 1.1

Environmental Management of Livestock Systems - Action Plan number NREM 1.3

Cooperative Leadership Development - Action Plan number YFCD 1.1

Cooperative Integrated Administration

Appendix A

KANSAS STATE UNIVERSITY

FISCAL YEAR 2006 ESTIMATED SOURCE OF FUNDS

FISCAL YEAR 2005 ESTIMATED & ACTUAL SOURCE OF FUNDS

February 6, 2006	FY 2005 Estimate	FY 2005 Actual	FY 2006 Estimate
RESEARCH			
Base Programs	3,474,23	3,493,147	3,493,147
Special Research Grants	10,000,000	4,628,687	4,700,000
Competitive & Other Grants	10,500,000	12,318,447	12,000,000
Total Federal Distribution	23,974,233	20,440,281	20,193,147
State Appropriation and Match	29,676,506	29,676,506	30,534,014
Total Research Funding	$53,650,739	50,116,787	50,727,161
EXTENSION			
Base Funding (Including CSRS Ret.)	$5,357,941	5,378,964	5,378,964
National Priorities	2,500,000	2,967,056	2,973,000
Other Extension Programs			
RREA	45,000	46,583	46,583
FERS Retirement	196,537	211,580	211,580
Total Federal Distribution	8,099,478	8,604,183	8,637,127
State Appropriation and Match	18,511,367	18,511,367	19,031,991
County Contribution	16,500,000	17,192,530	17,500,000
Total Extension Funding	$43,110,845	44,308,080	45,169,118
TOTAL RESEARCH & EXTENSION	$96,761,584	94,424,867	95,896,279
Kansas State University Research and Extension			
Research and Extension: Federal	$32,073,711	29,044,464	28,830,274
Research and Extension: State	48,187,873	48,187,873	49,566,005
Research and Extension: County	16,500,000	17,192,530	17,500,000
Total Appropriation	$96,761,584	94,424,867	95,896,279

APPENDIX B

Kansas State University

Fiscal Year 2006 Estimated Source of Funds

Fiscal Year 2005 Estimated & Actual Source of Funds

February 6, 2006	FY 2005 Actual	FY 2006 Estimate
Research Base – Federal	3,362,696	3,362,696
Research Base - Animal Health	130,451	130,451
Total Federal Research	3,493,147	3,493,147
Research Base - State		
Base	29,676,506	30,534,014
Others	0	0
Total State Research	29,676,506	30,534,014
Extension - Federal		
Base + CSRS	5,358,964	5,358,964
Others	0	0
Total Federal Extension	5,358,964	5,358,964
Extension - State		
Base	18,511,367	19,031,991
Others	0	0
Total State Extension	18,511,367	19,031,991
County Expense	17,192,530	17,500,000
National & Other Priority		
Integrated Pest Mgmt	169,356	170,000
FCS POW	15,000	15,000
4-H Air Force	614,604	614,000
ENUT	667,699	668,000
FERS	211,580	211,580
RREA	46,583	46,583
KS Agribility	150,000	150,000
Army School Age	449,500	450,000
Healthy Homes	3,000	3,000
Community Health	134,000	135,000
CYFAR	763,897	768,000
	3,225,219	3,231,163