

Kansas

Annual Report of Accomplishments and Results

FY2004

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Introduction

K-State Research and Extension is engaged with Kansas people and Kansas communities by working with them on their issues, in their neighborhoods, in ways they can understand, and through education 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 it serves as a guide for us to respond to the needs of Kansas citizens.

This report includes programs and projects being carried out 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 difference for the citizens of Kansas and of the region, nation, and world.

In fiscal year 2004, total funding in support of the programs described in the plan totals \$96,197,392 (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 problems that affect agriculture, families, and communities. KSRE is developing improved, efficient, and profitable cropping and livestock production systems while protecting the environment. Agricultural technologies, agricultural risk-management strategies, and information systems aid agricultural producers to develop and produce profitable, safe, and appealing food products.

Kansas has one of the largest beef industries in the United States (more than \$5 billion annual farm receipts from the sale of cattle and calves). 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 back to KSRE programs. Kansas has one of the fastest growing dairy industries in the nation with at least 260 new jobs created during the last eight years. New annual product sales have exceeded \$80 million. Consultations with the swine industry have resulted in adoption of rations with reduced phosphorus in the diets, lessening the environmental impact of swine waste.

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 productions; 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 drought of 2003 required special study and strategies to improve conditions created in this unusually severe drought. 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

FY2004	Projected: \$56,546,981	Actual: \$65,318,029	FTEs: 266.67
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Key Theme – Adding Value to New and Old Agricultural Products

Feeding Flaxseed to Cattle Helps Improve Health, Carcass Quality

- a. Current studies show that adding modest levels of flaxseed (5 to 10% of the diet dry matter) to cattle diets dramatically improves carcass value, strengthens the natural immunities of calves, and may enhance the fatty acid profile of beef. Flaxseed can be added to cattle diets either in ground form or as a processed oil.
- a. In addition to finding that flaxseed strengthens the immune systems of calves, which may require fewer antibiotics, KSRE scientists found that it also improves marbling in beef products and increases carcass value, which is likely to mean more money for cattle producers. In another study, feeding flaxseed to finishing cattle increased omega-3 fats in their muscle tissues. Omega-3 fats are “the good fats” that have been found to lower the risk of cardiovascular disease and stroke in humans.
- b. Scope of Impact – Multistate Integrated Research and Extension

Partnering with Local News Media to Deliver Educational Information

- a. K-State Research and Extension local office personnel work with the news media to address timely subjects and reach more people. For example, Shawnee County Research and Extension staff developed partnerships with local newspapers and television stations on:
- b.
 - A weekly gardening column published each week in the Topeka Capital-Journal since 1978. It currently appears in the Saturday “At Home” section that is sent to 60,000 subscribers and distributed free at 75 locations. It also is posted on the newspaper’s Website. According to a newspaper source, the value of the space this column appears in would cost \$1,500 each week and \$78,000 annually.
 - A monthly nutrition column by K-State Research and Extension agents appears in the “Here’s Kansas” monthly magazine of the Topeka Capital-Journal that has a circulation of 65,000. The value of the space for the column is \$1,263.60 each month or \$15,163.20 annually.
- c. Scope of Impact – Multistate Integrated Research and Extension

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 that they need. Then for three months, participants learn through distance education methods focusing on various farm management tools and their application.
- 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 are now focused 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.
- a. Scope of Impact – State Specific

Risk and Profit Conference

- a. Risk and Profit 2004 was the ninth annual agricultural economics sponsored conference. The fee-based 1 1/2 day program focused on farm management/economic risk issues.
- 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.
- 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 a feed grain 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.
- c. Scope of Impact – State Specific

Key Theme – Animal Production Efficiency

Using Ultrasound to Improve the Efficiency of Beef Production

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

Creating a Model to Maximize Profit

- a. A large current project addresses implant choice on feedlot steers at implanting time. The objective is to create a model to maximize profit that includes variables such as remaining days to feed, the Choice Select spread (implanting adversely affects carcass quality but this effect is related to the time interval from implanting to slaughter), cost of gain (implanting improves feed efficiency), and amount of intramuscular fat at re-implanting time (is the interaction of implanting and marbling potential?).

- b. Modeling documents that there is an ideal day to harvest each animal to maximize profitability. These models also show that there is approximately \$1 loss in profit from each day the animal is marketed off of the optimal day. It is conservative to estimate that there is an average error of 20 days in selling the 5,000,000 cattle fed in Kansas each year. Therefore this research has the potential to improve cattle profitability as much as \$100,000,000 per year.
- c. Scope of Impact – Multistate Integrated Research and Extension

Increasing Weaning Age Boosts Pig Producer's Profits

- a. Multi-site swine production has evolved through the implementation of an age segregated production technology called segregated early weaning (SEW). SEW involves removing weaned pigs from the sow herd and rearing them separately from other age groups of pigs. While the concepts of segregation and all-in, all-out management (i.e., depopulating and cleaning of facilities between groups of pigs) appear to be essential for improvements in performance, the importance of younger weaning age is less clear. Kansas State University researchers conducted trials to determine the effects of weaning age on pig performance within a multi-site production system.
- b. For every day the age at weaning is increased, the improvements in growth rate and feed efficiency result in a profit of \$0.94 per pig. If swine producers with approximately 500 sows were to increase pigs' age at weaning by two days, it would generate \$20,000 of added income.
- c. Scope of Impact – Multistate Integrated Research and Extension

Key Theme – Plant Production Efficiency

K-State Wheat Breeding Returns \$52.7M 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 the average economic benefit to Kansas wheat producers is \$52.7 million. For each dollar invested in varietal development, nearly \$12 was earned by Kansas wheat producers.
- 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

K-State Research and Extension is a national leader in food-safety programs. K-State scientists and educators are focusing on developing and promoting a safe food supply from production to consumption. The goal of food safety programs is to prevent food borne illnesses. Between 6.5 and 81 million cases of food borne illnesses, including 9,000 deaths, occur each year in the United States. One of the goals of Healthy People 2010 is to reduce food borne illness by increasing the proportion of consumers and commercial food handlers who follow key food safety practices.

A Food Science Institute was created in 2002 to more efficiently draw upon food science expertise. Combining resources in education, research, and extension has improved the coordination, visibility, and capacity of KSU food science programs. The Institute builds on the university's outstanding reputation in food sciences. The Food Science Institute also offers a variety of academic programs through various KSU departments and via distance education through the Division of Continuing Education. A recent survey by the Institute of Food Technologists rated K-State's food science distance education program as the most comprehensive in the nation.

- a. K-State Research and Extension began playing a leading role in agricultural biosecurity by directing resources and research toward precautions that will help protect agriculture and food systems in the Midwest and the nation. Scientists are working with the U.S. Center for Domestic Preparedness to train "first responders" in Kansas.
- b. The Master Food Volunteer program provides base knowledge to volunteers in the areas of food safety, food science, food preparation, and food preservation. Nearly 300 participants attended the two-day ServSafe workshops representing a variety of foodservices including restaurants, schools, hospitals, "quick-service" stores with gas stations, and private caterers. A Meat Safety and Quality program was presented to KSU students, Kansas Department of Commerce and Housing personnel, and Kansas meat processors.

Eighty-six volunteers in 17 counties were trained in the Master Food Handler program, with each volunteer participating in 40 hours of training. Since that time, the volunteers have logged hundreds of hours of payback time and have conducted demonstrations, Lunch-and-Learn sessions, and delivered after school nutrition programs. Many ServSafe participants have commented that they will change certain practices as a result of the training activity. ServSafe-trained people possess new food safety knowledge and skills. Many Kansas food and meat processors received training and assistance in developing, implementing, and maintaining GMPs, SSOPs, and HACCP which enabled them to provide consumers with safer foods, stay competitive in the market, and comply with regulatory agency directives.

Research has been conducted on the microbiological safety of meat and poultry products, especially on development of slaughter interventions that may be applied on-farm and during fabrication of sub-primals, irradiation and chemical treatments, and post-process pasteurization. A food irradiation education project was funded by a grant from CSREES and researchers are testing a foam application that kills anthrax spores for use in food and agriculture sectors.

The Impact of KSU's food safety research program can be seen throughout the meat industry. Beef carcasses are routinely pasteurized in almost all major beef slaughter plants. The ground beef industry is implementing a technology which was evaluated at KSU for decontaminating beef trimmings prior to grinding - the Sanova process. The research on control of *Listeria monocytogenes* in processed meats has resulted in the commercial development of a post-process steam pasteurization system

offered to the industry in 2002. In addition, the industry is implementing chemical treatments that were evaluated at KSU for *Listeria* control. KSU's research on slaughter interventions has been widely implemented by the meat industry. As a result, carcasses are visually and microbiologically cleaner than at any time in our history. The extension of antimicrobial treatments to include pre-harvest and post-slaughter applications will further reduce the risks of microbial hazards in meat and poultry products.

- c. Graduates of the Master Food Handler program are volunteering to give back to their communities. They share what they have learned and contribute to a safer and higher quality diet for those they reach. Agents who plan and conduct ServSafe workshops gain visibility in their communities for knowledge and expertise in food safety among the foodservice commercial and noncommercial sectors, thus expanding their traditional audience. Graduates of ServSafe are sought for managerial positions in food service. Food safety and HACCP assistance programs are enabling meat and food processors to comply with regulations and improve their products. Based on the types of assistance provided to plants, the USDA announced the successful implementation of HACCP in all federal- and state-inspected small plants. The direct impact of the biosecurity program is an increase in the value of Kansas products. By incorporating biosecurity principles, the indirect impact may be to decrease the potential food borne pathogens that leave the farm.
- d. Substantial progress has been made in Kansas to reduce food borne illness, improve food production and management practices, and comply with HACCP guidelines. K-State Research and Extension faculty have contributed greatly to this progress and are recognized at state and national levels for these contributions.
- e. Total expenditures by funding source and FTEs

FY2004	Projected: \$2,498,394	Actual: \$2,885,921	FTEs: 19.1
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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

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 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.

- a. In 2004, the Family Nutrition Program (FNP) provided nutrition education to more than 189,000 food-stamp eligible citizens in 84 counties and included education to improve skills in food resource management, obtain safe and nutritious foods, and balance physical activity with food eaten. 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 uses social marketing techniques to mobilize Kansans with limited incomes to use available nutrition education and food resources to improve their health. The Expanded Food and Nutrition Education Program (EFNEP) is available in three counties for youths and homemakers with limited resources. EFNEP reached 1,551 Kansas families with 2,096 children in 2004. The Kansas Senior Farmers' Market Nutrition Program was launched in collaboration with the Kansas Department of Aging and other state organizations. The program encouraged eligible seniors with limited resources to apply for \$30 worth of checks that could be exchanged for health-promoting fruits, vegetables, and culinary herbs at participating farmers' markets and authorized roadside stands. The program helped 7,000 low-income older adults in the state improve their health and nutrition through eating more fresh fruits and vegetables and also benefited local growers and community economies. Walk Kansas is a research-based, physical activity program that helps Kansans initiate and maintain a regular regime of physical activity. Several educational programs were introduced to help the aging Kansas population, including: Healthy Pets, Healthy Elderly, developed as a way to educate senior pet owners on the importance of maintaining a healthy lifestyle for themselves and for their pet; Communicating Effectively with Healthcare Professionals, designed to teach family caregivers how to use more effective communication techniques with health care professionals, so they can better advocate on behalf of their loved one; and Replenishing the Working Caregiver addressing issues facing the sandwich generation when caring for a loved one and maintaining a career. A USDA/CYFAR New Communities Project grant will help increase physical activity levels among rural teens through afterschool pilot programs in three counties. K-State's Office of Community Health offers distance learning, networks, help with training, evaluation systems, process surveys, and basic and applied research expertise and support to help communities change unhealthy environments into places that allow children, youths, and adults to make healthy choices.
- b. The FNP program resulted in significant learning and intention to change behavior, including 45% intending to eat more servings of grain per day; 56% intending to eat more servings of fruit and vegetables per day; 43% intending to move closer to the Dietary Guidelines recommending that Americans include a greater variety of foods in their diets; and 34% intending to increase their level of physical activity. More than 93% of the EFNEP participants showed improvements in dietary intake after completing the series of EFNEP lessons. EFNEP participants increased frequency of reading food labels (77%), adapted use of a safer method of thawing frozen food (71%), seldom or never ran short of food before the end of the month (79%), and improved in one or more food resource management practice (87%). After food assistance training sessions, professionals and volunteers who work with

senior citizens, including KSRE personnel, improved their understanding of and attitudes toward the Food Stamp Program (FSP). For instance, more of those attending believed that they could explain the FSP, and that program benefits can be used to buy vegetable seeds or to contribute towards congregate sites meals. Use of program benefits at Senior Centers rose dramatically during the two-year education campaign, and congregate meals sites participants who had heard of the Vision card rose from 35% up to 58%. Because of the Senior Farmers' Market Nutrition Program, 36% of those who redeemed checks went to a Farmers' Market for the first time, 84% indicated that they ate more fresh produce this past summer than usual, and 28% more of them ate three or more servings of fruits and vegetables per day. Walk Kansas reached nearly 17,000 people across the state. Participants who were active prior to Walk Kansas increased activity from an average of 306 minutes per week to an average of 396 minutes per week, a less active group increased activity from an average of 65 minutes to an average of 231 minutes, and an inactive group went from 0 minutes per week to an average of 238 minutes. After six months, Walk Kansas participants from the two more active groups continues to average 30 minutes of moderate physical activity per day, while the inactive did not maintain this level of activity. A series of call-in radio shows on Healthy Pets, Healthy Elderly answered dozens of questions about the topic from people all over the state.

- c. Dietary behavior improvements that resulted from the nutrition education programs could affect the risk for a variety of chronic diseases over the next decades. The same is true for the results of the physical activity programs. The programs addressing the Kansas elderly helped to improve the quality of care being delivered and the well-being of the caregivers.
- d. KSRE programs are contributing to improvements in health and nutrition behaviors, especially with low-income individuals who are at particular risk. Whether these behaviors lead to improvement in health status remains to be seen. KSRE faculty are seen as experts in the state, providing guidance so that citizens of Kansas and beyond become more healthy and live in safer environments.
- e. Total expenditures by funding source and FTEs

FY2004	Projected: \$3,997,430	Actual: \$4,617,475	FTEs: 41.86
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Key Theme – Human Health

A Health and Fitness Program for Almost Everyone

- a. Walk Kansas is an easy and inexpensive fitness program developed to encourage people to increase healthful physical activity. The eight-week 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. The Walk Kansas program costs vary slightly from county to county but are usually \$10 or less. Participants receive a mileage log and newsletters with food, nutrition, and health tips during the program. In its first year (2002), 43 counties—and more than 7,000 people—participated. In 2003, more than 12,000 people representing 82 of the 105 counties in Kansas signed up for the program. Almost 17,000 people representing 94 of the 105 counties signed up for the 2004 program!
- b. Success Story:
One participant's husband decided that he also needed regular exercise, so joined his wife's Walk Kansas team. He became affectionately known to the other team members as the "Walk Nazi" due to his commitment to keeping everyone walking at their maximum and staying on target throughout each week. After the eight-week program in 2003, he kept walking . . . and walking . . . and walking . . . lost 40 pounds and was the team's top walker in 2004.
- c. Scope of Impact – State Specific

K-State Leads Research on Umbilical Cord Matrix

- a. Mentioning stem cell research can stir up controversy because it is believed by many that a fertilized embryo constitutes a human being. But K-State Research and Extension scientists have discovered a novel and potentially inexhaustible source of stem cells isolated from the matrix of umbilical cords. The emphasis has been on stem cell biotechnology to develop stem cells as a source of replacement cells for somatic cells damaged or lost due to degenerative disease, trauma, or aging and their use in targeted delivery of therapeutic peptides or proteins. Current studies are focusing on characterizing these cells and developing them for stem cell therapies in animals and humans. Animal and human umbilical cord matrix cells exhibit the tell-tale characteristics of all stem cells, the capacity to self-renew and to differentiate into multiple cell types. The cells can be obtained in a noninvasive manner from an abundant source of tissue that is typically discarded.
- b. Umbilical cord matrix cells could provide the scientific and medical research community with a noncontroversial and easily attainable source of stem cells for developing treatments for Parkinson's disease, stroke, spinal cord injuries, cancers, and other conditions. The discovery of the matrix stem cells may also lead to important new technologies in animal agriculture and for the preservation of endangered species. The KSU Research Foundation has filed for U.S. patent protection for the recent discoveries, the method of culturing the stem cells, and a kit for salvaging umbilical cord stem cells after birth.
- c. Funding for this research has come from the National Institutes of Health and a Centers of Biomedical Research Excellence/COBRE award to the University of Kansas, with matching support from the state of Kansas, Kansas State University, University of Kansas, the Terry C. Johnson Cancer Center, the K-State College of Veterinary Medicine, and K-State Research and Extension.

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.

In 2004, 46 television programs were produced and distributed via DVD and VHS tapes, complementing 59 programs produced in previous years. Also, 8 volumes of "enhanced" programs

with additional teaching tips and techniques were distributed. Each DVD or VHS tape has 10-13 programs in English and Spanish. 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. In 2004, four commercial television stations and four cable systems regularly aired the Kids a Cookin' program.

b. Short-term Outcomes:

Using pre-test and post-test surveys:

** Participants improved knowledge of foods with the most calcium and lowest fat from 42% to 50%.

** Participants improved knowledge of safe foods for a packed lunch from 56% to 70%.

** Participants improved knowledge of which foods in the Food Guide Pyramid to eat the most of from 28% to 41%.

** Participants improved knowledge of how long to wash hands from 64% to 79%.

Learning took place through a combination of watching Kids a Cookin' programs and actual cooking lessons. Total participants in 2004: Pre-school through Kindergarten: 1,198; 1st-2nd grades: 1,260; 3rd-6th grades: 3,646; 7th-8th grades: 39; 9th-12th grades: 55.

c. Scope of Impact – State Specific

Expanded Food and Nutrition Education Program

a. K-State Research and Extension makes a difference in the lives of Kansas families because of its research-based information and because of local response to county needs. Low-income families with children can learn through the Expanded Food and Nutrition Education Program (EFNEP) to develop skills and attitudes needed to improve their diets.

b. Success Story:

A nutrition assistant teaches EFNEP classes to women at the Topeka Correctional Facility. One inmate, "Susan," is the mother of young children, and her mother is keeping her children while she is incarcerated. After completing the lesson on feeding young children, Susan asked her mother to stop insisting that the children take two bites of everything at mealtime. She encouraged Grandma to let the children choose what they wanted. The grandmother thought that this was "hogwash" but finally agreed to try it. When Grandma came back to visit the next month, she was happy to report that the children were eating well, and mealtime was relaxed and enjoyable. She was thankful to have one less problem to deal with in caring for her grandchildren. Grandma is now ready to let the children help with grocery shopping and cooking.

c. Scope of Impact – State Specific

Research Targets Eating Habits of Children

a. Computers are being used in seven Kansas counties to assess children's eating habits. Kansas is only the second state to use "FIRSS" (short for "Food Intake Recording Software System"), a dietary software system that measures fruit and vegetable servings that children eat. The students in the study are at the ages when children typically begin making their own food choices. Increasing the intake of health promoting fruits and vegetables is important. The assessment targets 180 third through fifth graders enrolled in the USDA's Family Nutrition Program (FNP). If nutrition educators can help children learn to make healthier choices, they also help them improve their health and reduce health risks associated with obesity—heart disease and some cancers are examples.

b. Preliminary data from the computer-like game survey identify carrots as the most frequently eaten vegetable and apples as the most frequently eaten fruit. Bananas placed second among the fruits. Students also indicated that they are most likely to eat the fruits and vegetables at home. Findings show that students are eating two fruits and vegetables rather than the five recommended for health.

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

The state of Kansas' approach to water quality improvement and to meeting TMDLs is to promote watershed planning, assessment, and management through locally led watershed restoration and protection strategies (WRAPS). KCARE and other units within KSRE are playing a major role in community organizing, watershed assessment and planning, and supporting implementation of Best Management Practices and other actions to improve water quality. A good example of this effort is the Fall River Watershed Restoration and Protection Strategy. The Office of Local Government and KCARE initiated an outreach effort in May 2003 to help organize stakeholders in the upper Fall River Watershed in southeast Kansas to develop a Watershed Restoration and Protection Strategy (WRAPS). A local leadership team was recruited to guide the development of the WRAPS. The team represents a collaborative effort between local stakeholders and agency staff, and includes participation by local residents, Extension, Fall River Watershed District, rural water districts, Flint Hills RC&D, Kansas Rural Center, Kansas Department of Health and Environment (KDHE), NRCS, and the Kansas Water Office. Several events and activities were implemented to organize and educate stakeholders, including a watershed tour, watershed protection workshop, stakeholder focus groups, as well as several meetings of the leadership team. Concurrent with these stakeholder involvement efforts, a water quality monitoring study was conducted by the Department of Biological and Agricultural Engineering to better understand the extent and sources of fecal coliform bacteria and other pollutants in the watershed. (The Kansas Department of Health and Environment established a high priority TMDL for the Fall River in 2002.) Based on the results of the monitoring and input from stakeholders, the local leadership team has developed a strategy to reduce E.coli bacteria from both rural and urban areas and increase dissolved oxygen concentrations in the river. This two-year long process will culminate in Summer 2005 with an additional stakeholder workshop and publication of the WRAPS report.

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.

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

LEPA (Low Energy Precision Application) sprinkler irrigation and SDI (subsurface drip irrigation) are two advanced irrigation systems that can potentially save water through more uniform application and less non-beneficial losses (e.g., runoff, soil evaporation, deep percolation). K-State Research and Extension has been actively engaged in examining these technologies for over 16 years. Research is ongoing to compare corn, soybean, and sunflower production under both LEPA sprinkler irrigation and SDI. Results from the corn production study, which is further along, are indicating that there is a differential crop response between irrigation systems as affected by the weather conditions. Corn yields were 15 to 20 bushels/acre higher in extreme drought years with the LEPA system than with SDI. However, corn yields were 15 to 20 bushels/acre higher with SDI in normal to wetter years. Differences were attributed to changes in the yield components contributing to yield, in this case, the numbers of kernels/ear and the kernel weight. It is anticipated that now that these differences have been verified, further work will identify the exact causes for the yield component shift and suggest changes in irrigation management for both system types to avoid the yield reduction problems. High corn yields (200+ bushels/acre) were obtained under both systems, but the differential yield response could represent a \$30 to \$50 change in profitability.

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. For producers who have limited irrigation because of depletion, software has been completed for a computerized decision aid, Crop Water Allocator (CWA), which irrigators and water policy makers can use to allocate limited water to an optimized selection of crops. CWA was released on the World Wide Web during December, 2004 at www.oznet.ksu.edu/ml. It is available for download to individual users' computers. Optimum economic net returns are calculated from all possible combinations of crops, irrigation patterns, and land allocations proposed by a user's input scenarios. Multiple runs of the model give the user indications of the sensitivities of net returns to water allocation, commodity prices, maximum yields, irrigation costs, and 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. To date the users of CWA that we are aware of have included irrigators, crop consultants, extension specialists, 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 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.

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.
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. Work is underway to find out what effect this has on soil carbon levels.
4. The effect of tillage, crop rotations, manure, and fertilization on soil carbon levels, energy use, and economics have been evaluated. No-till 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. Rotations, that reduce or eliminate fallow periods, result in the greatest increase in soil carbon. 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. Two electronic newsletters are ongoing. One newsletter focuses on state, national, and international activities in carbon sequestration and global warming. This newsletter goes primarily to about 350 producers groups, policymakers, educators, and researchers within Kansas. The other newsletter focuses on activities within the CASMGS research group, and reaches a national audience. K-State has a carbon sequestration Website <http://www.oznet.ksu.edu/ctec> and CASMGS has a national Website <http://www.casmgs.colostate.edu>. K-state is developing a new carbon portal that will be the 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 were signed in Kansas.

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, and grass plantings 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 from open lot feeding facilities in northwest Texas and southwest Kansas. Weight-drop test chambers have been used to develop relationships between kinetic energy of hoof action and feedlot dust collected by filters at a variety of moisture contents and manure depths. Pen surface amendments will be tested for their effectiveness in reducing dust and ammonia emissions. Chamber studies show surface amendments of sawdust or wheat straw to be effective in reducing dust for short periods of time. Ammonia emissions are being measured at large feedlots on a continuous time basis in order to relate ammonia emissions with meteorological conditions.

Sustainable Agriculture

The Kansas Center for Sustainable Agriculture and Alternative Crops assists farmers—especially those with small operations—to identify and develop markets for products by collecting and analyzing basic information on the Kansas food system and by providing opportunities for improved food crop production and direct marketing. This K-State Research and Extension project also provides farmers with new research and information on organic products; energy-saving technology; investments that are less capital-

intensive; and agricultural practices that reduce soil erosion and restore soil health. Alternative crops that represent new marketing opportunities for Kansas farmers include canola, safflower, dry beans, and cotton. KSRE hosted the first Organic Agriculture Conference in Kansas this past year. It was attended by about 150 producers and agency personnel and led to many inquiries and requests for information on organic production.

- e. Total expenditures by funding source and FTEs
- | | | | |
|---------|------------------------|----------------------|-------------|
| FY 2004 | Projected: \$9,244,057 | Actual: \$10,677,911 | FTEs: 63.96 |
|---------|------------------------|----------------------|-------------|

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:

The program, now in its sixth year, has grown to serve 15 teachers and 1,150 students in Sedgwick County, and 1,700 students and teachers in five other counties across the state of Kansas.

 - (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

Increasing Value of Horticulture

- a. Horticulture is now listed as the part of the Kansas agricultural economy with the third highest gross crop value, behind the state's traditionally-strong wheat and feed corn industries. According to the Kansas Agricultural Statistics Service, horticulture's crop value is \$586 million (wheat is \$939 million

and feed corn is listed at \$853 million). Master Gardeners have become a vital part of Kansas State University's ability to provide accurate, up-to-date and research based information to clientele.

- b. In 2004, Master Gardeners volunteered more than 64,567 hours. This is equivalent to more than 30 full time extension staff positions and is conservatively estimated to be worth \$1,067,938. A Master Gardener volunteer from Johnson County, Beverly Plapp, said the following about the program: “I have been an Extension Master Gardener since 1990, and the program has not only made me a better gardener but also a better volunteer. Working on the hotline, in our demonstration gardens, at garden shows, and on our public tour has allowed me to share my gardening knowledge and skills with the public, and the public has come to rely on the Johnson County Extension Master Gardeners for unbiased, researched-based answers to their gardening questions.”
- c. Scope of Impact – State Specific

Key Theme – Water Quality

The Kansas Environmental Leadership Program (KELP)

- a. K-State’s Kansas Environmental Leadership Program (KELP) is a 10-month-long program that focuses on enabling citizens to become better versed in environmental knowledge and hone their leadership skills. Participants participate in a variety of applied leadership projects to gain practical experience. Gratemates and Classmates was one such project in which 100 middle school students were involved in installing and monitoring storm drains to evaluate and demonstrate nonpoint source pollution. Another of the several projects the class undertook was to develop a public education program for Hays, KS that educated citizens about the irrigation water needs of various lawn turfgrasses and how to select and use turfgrasses that conserve water. The KELP program received the eighth annual CF Industries National Watershed Award presented by The Conservation Fund. The award recognizes model programs that protect local watersheds. More information about KELP is on the Website: <http://www.oznet.ksu.edu/kelp/>.

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

CD-ROM Released with Irrigation Scheduling Software

- a. The Mobile Irrigation Lab at Kansas State University began offering a new edition of the Tool Kit and Resources CD-ROM (version 2.0) to help farmers and ranchers use water efficiently in production agriculture. Hand calculation to track soil water balance requires time, and the repetitive nature of the job is unattractive. The resources available in the CD can make the task simpler, faster, and attractive.
- b. By utilizing the software, which is called KanSched, producers can water crops when they need it. The software program gives rates on real-time crop-water use for individual crops based on current weather conditions and evapotranspiration rates. Those farming records can remain on the computer for future consultations. The irrigation scheduling tool is especially useful for producers in western Kansas, and it can help producers conserve water from the Ogallala Aquifer. Instead of providing an equalized daily amount of water, the scheduling from KanSched conserves water and might prolong the life of the aquifer.
- c. Scope of Impact – State Specific

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

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.

- a. As public resources come under pressure allocating tax revenues, cooperation and partnership among units within and outside of the university are essential. Building upon the successes of the three previous years, KSRE is recognized as the community-based agency to support change and positive outcomes in Kansas communities. KSRE's physical presence in each county as well as networks established by local educators brings knowledge of community dynamics and social interactions. In 2001, inroads were made with the Kansas Association of Counties to communicate the potential opportunities available through local engagement with KSRE involving planning and economic projections for local governments; community based individual, family, and youth development programs; and local leadership capacity building to support and sustain communities of all sizes throughout the state.
- b. Since 1999, when research and extension were aligned to form KSRE, our Youth, Family, and Community Development (YFCD) programs have been more interconnected, with fewer faculty and local community educators who continue to work in isolation. After four years of team-building efforts, issues are being tackled with cross-disciplinary interests, state policy development, and agency collaboration to benefit the lives of Kansans, their families, and communities. Working with other regulatory agencies, KSRE provides prevention education to audiences who might not otherwise participate due to fears of being cited or penalized.

Older youths, especially teens, have positive and constructive voices in community issues. In 2003-2004, KSRE led a planning process to develop a new strategic plan for reaching out to youths across Kansas. The Strategic Plan for 4-H Youth Development is accessible through the Web at <http://www.kansas4h.org>. This plan will provide program, staffing, and resource management for the coming years as we continue to grow and develop the Kansas 4-H Youth Development program. Tolerance education and the development of conscience in young people are centered in the home. While community environments can reinforce norms, intentional instruction and role modeling from parents and/or care providers are powerful factors in shaping these life skills.

Rural communities with aging median populations and restricted economic enterprises are most at risk of disappearing from the Great Plains. KSRE leadership education is helping communities begin from within to identify strengths and existing capacities upon which they can reconstruct a viable future. External consultants can evaluate needed changes, but they do not effectively impact community development over time. Community change occurs from within the existing population when it is tapped and empowered. Leadership programs have increased the capacity of individuals within communities for political participation, managing not-for-profits, community service volunteering, and involving the voices of youth to discuss community futures.

- d. Structured out-of-school programs directly increase the quality of the youth learning environment. 4-H Youth Development included more than 38,000 Kansas youth in long-term, continuously mentored clubs and groups where skills were mastered and recognized. About 20% of Kansas' school-aged population participated in some type of KSRE 4-H youth development educational program in 2004. Childcare provider training and parent education strengthen individuals, families, the workplace, and communities. Children are more prepared to engage in learning while in school and to cope with life's issues.
- d. KSRE has adopted the Healthy People 2010 goals and is cooperating in the development of Healthy Kansans 2010. Positive social behaviors across the life span of people are significant part of the 2010 goals. KSRE adopted the standards of the National Research Council and Institute of Medicine of the National Science Academies for its youth development. Family relationships, parent education, 4-H Youth Development, and community leadership education are now customized within each community's context. KSRE is perceived to be more relevant to a greater number of Kansans than it was in 1995, and measurable indicators (once only anecdotally documented) are charting progress on outcomes in positive social behaviors.
- e. Total expenditures by funding source and FTEs
- | | | | |
|--------|-------------------------|----------------------|--------------|
| FY2004 | Projected: \$10,992,933 | Actual: \$12,698,056 | FTEs: 143.76 |
|--------|-------------------------|----------------------|--------------|

Key Theme – Youth Development/4-H

The Junior Master Gardener Program

- a. A variety of groups may participate in the Junior Master Gardener Program, including 4-H programs, school groups, community centers, day camps, scouting programs, and after-school groups. The curriculum covers such topics as Plant Growth and Development, Soils and Water, Ecology and Environmental Horticulture, Insects and Diseases, Fruits and Nuts, Vegetables and Herbs, Landscape Horticulture, and Life Skills and Career Exploration.
- b. Intermediate Outcome:
This is a program that teaches young people to garden while encouraging good nutrition and physical activity. Young people improve their social skills while working on hands-on projects with other youth and an adult leader/teacher, and they increase their community involvement through participation in public service projects.
- c. Scope of Impact – State Specific

2004 Citizenship Washington Focus

- a. Forty-one Kansas 4-H members, ages 15-18, traveled to Washington, D.C., last summer to get a first-hand look at how government works. The trip was planned to give 4-H members a close-up look at history and government.
- b. Upon returning home, the students set up community service projects to apply what they learned on the trip. The projects are ways members can show the community what they learned and put their citizenship and leadership skills to work by giving back to the community.
- c. Scope of Impact – State Specific

SpaceTech and KidVenture

- a. One program leading 4-H into its second century is SpaceTech, supported by the Federal Aviation Administration, K-State College of Technology and Aviation, The Kansas Cosmosphere, and the Wichita Exploration Place. The program sent 10 Kansas participants to 2004 KidVenture, sponsored by the Experimental Aircraft Association in Oshkosh, WI. The group taught Kansas 4-H SpaceTech skills in an international forum involving more than 6,000 youths and adults.

- b. Short-term Outcome:
The Kansas 4-H Aerospace program has become known for quality work and for providing the largest number of volunteers—including Ben Schwantes of McPherson, who recently won a national aerospace award for KidVenture.
- c. Scope of Impact – State Specific

Key Theme – Communication Skills

Bringing Children and Older Adults Together

- a. Personal Actions to Health (PATH) helps to create bonds between children and older adults in Kansas. Evaluations of that program show that such interactions are valuable and meaningful. More than 50 sites across Kansas receive funding through the program. Each site develops its own plan for the interactions. PATH is an intergenerational program funded by the Kansas Health Foundation.
- b. Intermediate Outcomes:
Children who participate have said they are less fearful of older adults—they recognize that older adults have knowledge to share. Children reported a positive view of aging and older adults. Older adults reported developing meaningful relationships with the youth, an indicator of positive well-being. Also, older adults feel they are contributing to the children’s lives in a meaningful way. They viewed their interactions with youth as a uniquely supportive relationship for the youth in their community.
- 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.
- c. Scope of Impact – State Specific

B. STAKEHOLDER INPUT PROCESS

The stakeholder input process is a comprehensive effort to seek comments throughout planning and project implementation. Ongoing oversight and review by stakeholders involve several components, including: (a) each county uses the Program Development Committee to determine current priorities; (b) an integrated Research and Extension Advisory Network plus a variety of informal and subject-specific presentations and interactions are used to identify issues and priorities for area Extension and off-campus Research faculty; and (c) biannual meetings of the State Extension Advisory Council. Additionally, in 2004, a strategic planning process to review the state 4-H youth development program was completed. Also, in 2004, a strategic planning process for the sustained delivery of the Cooperative Extension Program was initiated. Both processes involved a balance of input from external stakeholders and users of the Kansas Cooperative Extension system. A specific recommendation from the Organizational Structure and Staffing portion of the Extension Strategic Plan is to increase the reach of Extension programs to the underserved and emerging audiences across Kansas. This will be accomplished through a proactive plan to: (a) Develop new partnerships with key leaders who are connected to underserved and emerging audiences; (b) Develop and maintain a diverse workforce to reach targeted audiences with culturally appropriate information and educational programs; and (c) Expand Program Development Committees (PDCs) to be representative of potential audiences.

The PDCs are 24 citizens elected by other local citizens according to Extension law. The committees represent four subject matter areas (six elected to each): Agriculture, Family and Consumer Sciences, 4-H Youth Development, and Economic Development. The 24 PDC members meet as a whole or as individual committees to provide advice on issues for which Extension develops programming in that county. Extension agents develop Action Plans based on this input. Locally developed Action Plans influence statewide issues as plans are designed at the state level. Both state level and locally developed Action Plans are adjusted on the basis of input from the PDCs.

Our research and extension centers make use of advisory committees composed of clientele from the local area. For instance, interested producers, agribusiness concerns, and members of the lay 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.

The Cooperative Extension segment of K-State Research and Extension also underwent a strategic planning process that began in 2004 and will be completed in 2005. This process involved appointing a 34-member committee. Seventeen members were external stakeholders and users of the system and 17 were faculty, including extension agents. The process included three facilitated day-long meetings and interim reports posted on our Website to solicit further external input. The outcome is a series of recommendations on delivery structure and staffing, resource development, staff and volunteer development, educational delivery methods, and constituency development and marketing. Implementation of this strategic plan will begin in 2005 and continue through the intended 7 to 10 year life of the plan.

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. Of those 58 positions, 23 were further identified as most critical and were released to be filled late in 2004. These positions coincide with the overall program review process priorities.

D. EVALUATION OF SUCCESS OF MULTI AND JOINT ACTIVITIES

Planning and Evaluating Multi and Joint Activities

Interdisciplinary, multi-state and integrated research-extension activities are key components of achieving success in K-State Research and Extension. The following sections of this report describe several representative projects and programs that are currently in progress. The summaries are presented to show how these projects and programs have:

- addressed critical issues,
- met the needs of under-served and under-represented clientele,
- achieved important outcomes and impacts, and
- improved effectiveness and/or efficiency of K-State Research and Extension.

Teamwork is essential to meaningful progress in multi and joint activities. Teams of all types are increasingly common across K-State Research and Extension. 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 the 12 long-term intended outcomes that address critical issues and provide the focus for our efforts. 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. Although we have made significant progress on developing a team-oriented culture, consultants have told us that it may take years for teamwork to become the norm within our organization. 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.

In FY2004, K-State Research and Extension submitted an Update of our 2000-2004 Plan of Work and operated for a sixth year under its terms of reference. We have now begun the implementation of our new strategic 5-Year Action Plan for 2005-2009. We have consistently used an outcome-based approach for this and related planning activities. Thus, 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.

The recently-completed planning cycle provided important organizational learning. We have continued to move ahead with the implementation of comprehensive electronic storage and retrieval 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.

Expanding the reach and saturation of the 4-H youth development movement to all school-aged youth of Kansas is particularly challenging, and K-State Research and Extension has formed a cross-cutting team, the Expanding 4-H Opportunities Team, to make plans for meeting this challenge. While the club/group delivery method is clearly substantiated in science to have the most positive potential in promoting positive youth development, 4-H has traditionally been difficult to enter and sustain without some previous type of Extension or 4-H heritage. By 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 gone back to 4-H basics to remove the veneers of traditional activities and expose the beauty of the original 4-H philosophy. By giving people with all types of 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.

The following descriptions of interdisciplinary and integrated activities are provided as instructive examples of KSRE's multi and joint activities.

Protecting Stored Grains Against Insects Through Use of Spinosad Insecticide.

Most chemicals traditionally used to protect stored grains against destructive insect pests are rapidly being phased out due to provisions of the 1996 Food Quality Protection Act. For example, chlorpyrifos-methyl (Reldan®), widely used since the mid-1980s on stored wheat and other small grains, was prohibited as of December 31, 2004. Newer and safer chemicals are needed to prevent insect infestations in stored grains such as wheat. This sector of the grain industry has traditionally been under-served because of the reluctance of risk-averse chemical manufacturers to develop insecticides for use on grains that will be directly processed into food products. In anticipation of this challenge, beginning in 1999, K-State investigators undertook a variety of multi and joint laboratory and field research projects testing alternative compounds. These efforts rapidly focused on spinosad, a reduced-risk chemical derived from natural fermentation products of the bacterium *Saccharopolyspora spinosa*.

Integrated multi-state research and extension efforts have shown that spinosad is effective against 13 species of stored-product insects, including the lesser grain borer, a devastating pest of stored wheat in the US and around the world. The registrant, Dow AgroSciences, recognized the potential for use of spinosad on stored grains, but numerous challenges and concerns initially prevented them from pursuing registration for this use. Over the years, a steady stream of positive results from the K-State program brought Dow and the rest of the industry to a recognition of the importance of registering Spinosad for use on stored grains.

As a result of this joint effort, in January 2005, Dow AgroSciences received US-EPA registration for spinosad on coarse and small stored grains. Spinosad has been registered for use at the surprisingly low rate of 1 ppm as opposed to rates nearly ten times higher for traditionally-used grain protectants. This product will be commercially available in 2007 pending approval of international tolerances. The active ingredients of spinosad are certified organic by the USDA, and commercial formulations can be used on organic and non-organic stored grains. The impact of this registration is expected to be enormous, in terms of protecting stored grains more effectively than in the past, without compromising food and feed safety.

The spinosad program was a multi-institution and multi-state project, led by scientists at K-State's Department of Grain Science and Industry, and including USDA's Grain Marketing and Production Research Center in Manhattan KS, Purdue University, Oklahoma State University, Montana State University, Kentucky State University, Texas A & M, and the University of Georgia. The industrial partner, Dow AgroSciences, provided necessary materials and a measure of financial support, but the concept for the use of Spinosad on stored grains originated among University research and extension faculty. Producer groups were involved in all of the field tests, and extension specialists shared the research information at many producer group annual meetings and seed certification meetings. Extension specialists are now engaged in developing educational materials to help the industry make optimal use of this new tool for combating insect pests.

Beef Cattle Grazing Systems that Improve Production and Profitability while Minimizing Risk and Environmental Impacts.

Faculty at the Southeast Agricultural Research Center have continued their participation in project NC1020, "Beef Cattle Grazing Systems that Improve Production and Profitability while Minimizing Risk and Environmental Impacts." The primary purpose of this project is to optimize the amounts of dietary nutrients supplied by grazed forages for beef cattle throughout the year, while sustaining rangeland ecosystems.

Project participants have aimed to develop strategies that better match nutrient requirements of grazing cattle to the quantity and nutritional value of the forage supply in the North Central Region by: (a) evaluating the adaptability, yield, and quality of summer annual forages across the NCR for use in complementary forage systems; (b) evaluating forage quality from September to March of different cultivars from 24 perennial forage species grown in monoculture and stockpiled from mid-July; (c) evaluating the ability of the grain processing co-product, distillers grains, to substitute for forages in summer and winter grazing systems of growing cattle; and (d) evaluating the economic and environmental potential of alternative forages and/or distillers grains in cow-calf production systems with different resource or animal management systems.

Participants have also aimed to develop educational materials and outreach programs to improve decision-making for grazing-based beef production systems by: (a) creating databases that can be used to expand the relevance of (i) 1996 Nutrient Requirements for Beef Cattle model to grazing conditions in the NCR and (ii) existing models/decision support tools for forage management and utilization (e.g., KansasGrazer and Grazing Land Applications) to annual and perennial forages in the NCR; (b) conducting systems-based educational programs on integrated forage/cattle management systems for cattle producers; and (c) developing an educational program on the utilization of grain co-products.

Multiple disciplines have been involved in this work, including Animal Sciences, Agronomy, and Agricultural Economics. Both research and extension faculty have been active participants. The states involved include Illinois, Iowa, Kansas, Nebraska, Ohio, Pennsylvania, and South Dakota.

This research and outreach program is improving the profitability and reducing the economic and environmental risks of grazing beef cattle in the NCR by: (a) increasing the uniformity of nutrient supply consumed by grazing cattle through use of alternative forages or low-cost supplements at times when the quantity and/or nutritional value of conventional forages are limiting and (b) providing producers with the tools and skills to better balance the diets of grazing cattle in the NCR. This project will continue to provide information and recommendations needed by producers to improve their economic and financial performance, reduce pressures to convert pasture and rangeland to crop production, improve the marketing opportunities for co-products, and strengthen value-added agriculture in the NCR.

Heat Treatments for Insect Control.

K-State Research and Extension teams are leading the way in developing methods for the control of insects in food and grain handling facilities through the use of heat treatments. These methods are gaining popularity because of the 2005 phase out of methyl bromide, an insecticidal fumigant widely used in food-processing facilities since the 1940s. Heat-treatment technology is an important pest management option for USDA-certified organic facilities, which cannot use methyl bromide or other alternative fumigants. The United States is one of the signatories to the 1987 Montreal Protocol to phase out production and use of ozone-depleting substances such as methyl bromide. Protecting stratospheric ozone is important for reducing the amount of UV-B radiation reaching the earth and for reducing the incidence of human skin cancers and cataracts. According to the Clean Air Act Amendments of 1990, the United States must satisfy its obligations under the Montreal Protocol. However, the use of methyl bromide is deemed to be so important to the continued functioning of some food and grain industries that the US-EPA established a critical use exemption to meet the needs of users who do not have technically and economically feasible alternatives available to them. It is

vitaly important to find suitable options for these under-served segments of the food and grain industry and fully eliminate the use of methyl bromide.

Although heat treatments have been known to be effective for over 100 years, very little quantitative data have been collected to document the benefits of this technology as an alternative to methyl bromide. KSRE research has resulted in the development of a user-friendly software program called the Heat Treatment Calculator to determine the amount of heat energy required to raise the temperature of a facility from the ambient to a desired temperature. In addition, we have identified stages of red and confused flour beetles that are heat tolerant and developed a novel model for predicting survival of heat tolerant stages of these species during facility heat treatments using time-dependent temperature alone. The model has been validated and found to be effective in gauging heat treatment effectiveness on pests and for making corrective actions during heat treatments to achieve 100% mortality of insects. Besides this applied research, we have determined proteins in insects responsible for conferring thermotolerance in insects and identified genes responsible for heat shock protein production.

In addition to conducting necessary research, heat treatment workshops have been held yearly since 1999 at K-State's pilot flour and feed mills. These workshops show how effective heat treatments can be done using gas, electric, or steam heaters. The workshops provide first hand experience on issues, challenges, and benefits of heat treatments. To date, over 300 participants, mostly from the US and a few from Canada, Peru, Australia, New Zealand, Switzerland, Portugal, Germany, and Belgium attended our workshops. Kansas State University has been a pioneer in conducting research and educational programs in this area and has been instrumental in generating interest among the food, feed, and pest control industries about the viability of this technology as a methyl bromide alternative.

Conservation Irrigation: Sustainable Crop and Livestock Production under Limited Irrigation.

The Ogallala Aquifer, in western Kansas and the Texas High Plains, is declining at an unacceptable rate. Aquifer depletion rates of one to three feet per year are commonplace in rural areas. Agricultural irrigation use accounts for nearly 90% of the groundwater withdrawals in much of the region. A growing livestock industry accounts for another 3%. Rural communities depend on the sustainability of these agricultural industries for their viability. Water availability, cost, and policy, as well as technology development and adoption rates, will shape the rural landscape in the coming decades, especially in the southern High Plains region, which encompasses the Texas and Oklahoma Panhandles, the western third of Kansas, southeastern Colorado, and eastern New Mexico.

To ensure the sustainability of rural communities in this region, a team of researchers and extension faculty from Kansas and Texas have conducted an irrigation management and agronomic research and extension project aimed at improved water use efficiency, hydrologic assessments of water availability and sustainability, socioeconomic considerations including wise water-rights public policy, and public outreach engaging all stakeholders. Team members include agronomists, irrigation engineers, and economists. Water availability and quality issues will affect the region's agriculture, socioeconomic structure, and the biodiversity and environmental quality of the landscape.

Although surface water is severely limited in this region, the Ogallala Aquifer has provided water for the regional development of a significant agricultural economy. This region produces about 4% of the nation's corn, 25% of its hard red winter wheat, 23% of its grain sorghum, and 42% of its beef. Local grain production is used primarily as feed for intensive beef, dairy, and swine production, thus adding stability to the regional economy. The Ogallala Aquifer is a finite resource, with the rate of aquifer recharge being much less than that of withdrawals. As the water table declines, pumping costs escalate. With depressed commodity prices, water becomes a commodity with potential competing uses. Research into the complex nature of water availability, potential uses, technological improvements, and water pricing will drive discussions and decisions relative to water policy.

The Ogallala initiative has made solid progress on producing a sound database for developing a fair and equitable water policy, with the following goals:

- Develop, evaluate, and disseminate information and technologies for water users that will result in

balancing economic, environmental, and social concerns for using, conserving, and protecting the Ogallala Aquifer.

- Provide scientifically sound data and knowledge to help planners and policymakers develop effective water management policies that balance use of and protect the aquifer while sustaining rural economies of the region.

Objectives of this initiative include:

- Investigate water management within existing crop systems and conceptualize new crop systems.
- Develop and evaluate integrated crop and livestock systems that reduce dependence on underground water resources while optimizing productivity, product quality, and profitability.
- Investigate designs, performance, and management of equipment and systems used for irrigation.
- Estimate economic impacts of various water management activities and strategies.
- Assess groundwater resources in the Ogallala Aquifer and their relationships with climate.
- Enhance the knowledge base of producers, water professionals, and policymakers about soil water, crop water use, precipitation management, and irrigation principles.
- Develop an information program for youth about the Ogallala Aquifer and its importance and use.
- Develop and evaluate water-saving technologies for concentrated animal feeding operations and industries that process agricultural commodities.

Studies in Kansas have emphasized evaluation of water use and marginal yield response in cropping sequences that are typical of the region. Important results from this work have been communicated to stakeholders through various means including publications, Limited Irrigation Field Day workshops, and hands-on training in the Mobile Irrigation Laboratory. Useful developments include the discovery that water use and yield relationships which include effects of yield thresholds will more accurately reflect the marginal yield response to additional water use than the standard water use efficiency convention. Also, more intensive crop sequences using feed grains (corn, grain sorghum) and oilseeds (sunflower, soybean, canola) may reduce evaporative losses in fallow periods and increase land productivity. Additionally, evidence is mounting that crop rotations involving crops other than corn may reduce irrigation requirements without a loss of economic gain. Farmer planting decisions over the next few summer seasons will show whether the desired impacts are being achieved.

Enhancing Productivity and Reducing Environmental Impact of Large Dairies in Kansas.

Kansas is the fastest growing dairy state in the United States. The dairy industry has added over 70,000 cows in Southwest Kansas, which represents an investment of more than 100 million dollars in facilities and the creation of more than 700 jobs. Kansas State University has a team of biological and agricultural engineers and dairy scientists working with the dairy industry in Kansas and across North America. KSU engineering contributions to this effort focus on issues related to environment, cow comfort, facilities and heat abatement. A major challenge facing the industry is sand bedding in free stalls or handling sand-laden manure. Economists estimate usage of sand results in a net return of \$150 per cow per year or for the Kansas dairy industry and additional \$18M in revenue. Outreach and cooperation with Kansans resulted in development of gravity separation systems. These systems separate sand and manure from the liquid portion of the waste stream on dairies flushing and scraping cow traffic allies. Lactating cows become heat stressed as temperatures rise above 21 °C and milk production decreases 20 to 40% depending on the duration. The team has worked for the past five years on heat stress abatement on dairies. Currently, dairies in at least 30 other states have adopted some portion of KSU efforts in handling sand-laden manure or heat-stress abatement. The KSU team works with engineers/scientists from other universities, allied industries, and state or federal agencies.

Integrated Sorghum Activities in the Kansas Sorghum Improvement Center.

Sorghum is a critically important crop in Kansas, and other hot, dry regions of the world. Recent developments indicate that we may begin to see a reversal of the long-term trend that has led to a net loss

of acres planted to sorghum in favor of crops such as corn. Research and outreach is conducted on all aspects of sorghum production and utilization by KSRE faculty, whose efforts are coordinated through the Sorghum Improvement Center. New disease- and lodging-resistant “stay green” parent lines developed by KSU sorghum breeders are rapidly being utilized by the seed industry to produce improved hybrids. Soil fertility research is increasing yield, improving fertilizer use efficiency, and protecting the environment. No-till and strip-till cropping, together with careful timing of irrigation around flowering is enhancing the value of limited rainfall and irrigation water, and reducing wind and water erosion. As a “minor” crop, investment by the agricultural chemical industry in new herbicides for sorghum is extremely limited, and weed control is a challenge. K-State Research and Extension weed scientists, together with agronomists and plant breeders are exploring the use of herbicides registered for other crops such as corn as tools to increase weed control options in sorghum. Work is also underway on utilizing sorghum products as human food, particularly for people allergic to gluten in wheat. A team of plant breeders and cereal chemists are working to develop new breads and bakery products for those suffering from Celiac disease.

Integrated Programs Coordinated through Biological and Agricultural Engineering.

Kansas Environmental Leadership Program (KELP)

KELP is a program that delivers environmental education and leadership training to selected citizen leaders in Kansas. KELP has just graduated its fifth class. This unique program was recognized by CF Industries in 2003 with one of four national awards for outstanding leadership in protecting America’s water resources. This team program is supported by the Kansas Department of Health and Environment and administered in partnership with K-State Research and Extension and the Department of Biological and Agricultural Engineering. Curriculum is developed and presented by KSRE faculty. Annual classes of about 25 continue to be trained by this nationally-recognized program.

Mobile Irrigation Laboratory

The Mobile Irrigation Lab is a team program in K-State Research and Extension. Biological and Agricultural Engineering faculty members provide much of the leadership and effort for this program, but important input is provided by faculty in Agronomy and Agricultural Economics Extension. Critical input is also provided by the State Climatologist, who maintains the Weather Data Library in the Department of Communications. The team has developed, tested, and demonstrated effective water management for irrigated agriculture in Kansas. This includes a system to easily schedule application of water during the growing season of a crop so that water is used efficiently. The system has been adopted by the USDA Natural Resources Conservation Service as a water-saving technique for which producers receive payments if they use it.

Watershed Modeling Team

The Watershed Modeling Team in the BAE Department has provided watershed water quality assessments for five watersheds in Kansas, and it is developing a major upgrade in its activities to support the new Watershed Restoration and Protection Strategy Program under development by the Kansas Department of Health and Environment. The Watershed Modeling Team is also making critically important contributions to implementation and monitoring of the Republican River Watershed Compact between Colorado, Nebraska, and Kansas.

Bioretention Cells for Stormwater Quality Improvement

Vegetated stormwater management systems (i.e., bioretention cells) are being developed and monitored to assist urban center compliance with EPA NPDES permits. The BAE department assisted with the design and installation of several bioretention cells in Topeka and is currently monitoring two of the sites to determine system effectiveness. Additional demonstrations of bioretention systems for stormwater control will begin this spring in Johnson County. This work

is pioneering usage of these systems to help solve nonpoint pollution concerns in urban environments throughout the Central U.S.

Kansas Agribility Project

The Kansas Agribility Project provides assistive technology resources to disabled agricultural producers to assist them in returning to their enterprise(s) as quickly as possible. The four year project, funded by USDA, employs eight professionals and is a joint effort between the BAE Department, Southeast Kansas Independent Living Center – Parsons, KS, and the Assistive Technology for Kansas Project – Parsons, KS.

Animal Identification Research and Outreach Project.

In April, 2004, USDA announced the National Animal Identification System (NAIS) program, which is aimed at developing and implementing a national system capable of identifying and tracking animals as they come into contact with or commingle with animals other than herd mates from their premises of origin. The goal is to make it possible to trace sick or diseased animals back to their point of origin and develop a rapid understanding of where a disease may have originated or where there may be a risk of it spreading.

Years before NAIS was announced as a national priority, K-State Research and Extension formed an animal identification research and outreach team, with a focus on the beef industry that is so critical to the economy of Kansas and the central Great Plains. This animal ID team has achieved national and international recognition for groundbreaking work on the development of integrated animal ID systems that are functional and economically viable, meeting the needs of producers and government agencies alike. The team has focused on the use of radio frequency equipment, studying various types of animal tags and readers, as well as methods for integrating them into animal processing systems. The education program uses a variety of approaches to deliver updated information to beef producers throughout Kansas and the United States. A statewide field day is conducted on an annual basis. The team has also created a Website, <http://www.beefstockerusa.org> that is utilized to convey information related to beef production and animal identification technologies. This program has also developed a strong partnership with BEEF magazine (Primedia Publications). This relationship has resulted in strong support in program advertisement and articles related to animal ID systems and the KSRE animal ID program.

About 4,615 beef producers and veterinarians from 18 states and representing 5,500,000 beef stockers and 7,500,000 beef cows have attended 71 meetings, conferences and tours where team members have participated as speakers or resource persons. A USDA grant for \$805,000 was successfully procured to evaluate mobile transport systems for the identification of beef cattle. The [beefstockerusa.org](http://www.beefstockerusa.org) Website had 73,365 visits representing over 23,000 unique visitors during 2004. Visitors to the site downloaded over 30,000 fact sheets and 1,000 copies of cattle management software developed by KSU faculty. The typical client spent 12.29 minutes on site. This level of programmatic interaction with off-site clientele is equivalent to direct contact by 8.4 extension personnel on an FTE basis delivering educational offerings at a rate of 2000 hours per year. Finally, the Beef Stocker Unit has been used as an educational site for producers to gain hands on experience with existing and emerging animal identification technologies. The Kansas Farm Bureau is utilizing the resources at this University facility to educate their clientele who will be working with their new animal identification and records program.

The KSRE animal ID team will continue to develop cutting edge educational materials and events for beef producers. The team is in the process of developing a world-class animal ID research and testing center which will be used to evaluate animal identification technologies and educate beef producers from Kansas and throughout the United States.

Center for Postnatal Stem Cell Research at Kansas State University.

A team of KSRE investigators in the Colleges of Agriculture and Veterinary Medicine has pioneered the use of a new class of postnatal, non-embryonic stem cells that appears to have high potential for applications in medicine and animal agriculture. Use of non-embryonic stem cells (i.e., postnatal cells) eliminates the moral and ethical concerns associated with embryonic or fetal cells. The long-term goals of this program are to develop an international center for excellence for postnatal stem cell research and to foster collaboration between industry and academia within Kansas. Current industrial collaborators include TheraStem, Inc. (Manhattan, KS biotech start-up), ViaCell, Inc. (Cambridge, MA; human umbilical cord blood company), OB/GynCellSecure (Cleveland, OH; human umbilical cord matrix company), Vet-Stem (San Diego, CA; equine stem cell therapeutics company). Stem cell therapies are currently used to treat humans and animals and are expected to play a much bigger role in the future. In agriculture, stem cells may provide avenues to enhance food safety, enhance production efficiency, and treat or prevent disease while improving animal products to benefit consumers.

Postnatal stem cells within the umbilical cord matrix were discovered by the KSRE team. The discovery has been documented in the scientific literature and protected by US Patents, both pending and issued. The umbilical cord matrix is the most highly enriched source of postnatal, primitive stem cells currently known. Furthermore, the matrix cells are harvested in large numbers and noninvasively. The umbilical cord contains large numbers of two types of stem cells: the matrix cells and umbilical cord blood cells. Both types of cells have applications in human medicine and animal agriculture. For example, teams around the country are investigating umbilical stem cells for treating stroke, Parkinson's disease, cardiovascular repair, bone repair, muscle diseases, cancer treatment, etc. KSU has methods to harvest, grow, and freeze the matrix cells for later use. These cells could be valuable in agriculture in a variety of ways.

Stem cell transplants are used worldwide to treat more than 44 deadly illnesses in humans, such as cancers and inborn metabolic disorders. Also, burn victims receive skin stem cell grafts and horses with tendon injuries are treated with stem cells. Trials are in progress using stem cells to treat diabetes, to grow new corneas for glaucoma patients, and to grow blood vessels and heart valves for repair of cardiovascular disorders. Stem cell therapies for stroke, neurological diseases and inoperable cancers are likely to become routine procedures in the future. In agriculture, stem cells provide the potential to deliver drugs, antibodies, and other substances to particular tissues to enhance traits like growth, reproduction, disease resistance, and carcass composition. The umbilical cord matrix cells appear to maintain embryonic stem cells. Thus, research on the matrix cells may pave the way for the creation of transgenic food animals, thereby benefiting consumers by providing safer, cheaper, and more useful animal products.

Using Cell Phone Technology to Report Cattle Disease.

Veterinarians with K-State Research and Extension are working with scientists at Sandia National Laboratories in New Mexico on a system that rapidly detects and reports infectious disease outbreaks in cattle. The Internet-based system, called the Rapid Syndrome Validation Project for Animals (RSVP-A), uses cellular telephones that allow veterinarians to work through a series of questions on the tiny screens of those telephones. The questions represent various syndromes the veterinarians may see in their daily work with cattle. The information then goes into a central database. The RSVP-A project may be the tool to fill a gap in this country's livestock disease diagnostic systems. Such a system is needed because historically not much emphasis has been put on quickly detecting emerging diseases.

E. MULTISTATE EXTENSION ACTIVITIES

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

Institution Kansas State University
 State Kansas

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

Title of Planned Program/Activity	Actual Expenditures				
	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Collaboration at National and Regional committees, meetings, and projects.	58,614	111,924	167,670	169,668	167,031
Total	58,614	111,924	167,670	169,668	167,031

Form CSREES-REPT (2/00)

SUPPLEMENT TO THE 5-YEAR PLAN OF WORK
MULTISTATE EXTENSION ACTIVITIES

Actual Expenditures for FY 2004

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.

F. INTEGRATED RESEARCH AND EXTENSION ACTIVITIES

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

Institution Kansas State University
 State Kansas

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

Actual Expenditures

<u>Title of Planned Program/Activity</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>FY 2004</u>
NC 205	8,663	39,146	57,812	61,667	9,170
Pecan Fields	25,478	39,209	72,745	40,692	43,445
Institutional engagement	672	9,392	1,135	89	0
Plant Biotechnology	0	0	0	30,000	82,530
Total	34,813	87,747	131,692	132,448	135,145

Form CSREES-REPT (2/00)

SUPPLEMENT TO THE 5-YEAR PLAN OF WORK
INTEGRATED ACTIVITIES - HATCH ACT FUNDS

Actual Expenditures for FY 2004

NC 205: Ecology and Management of European Corn Borer and Other Stalk-Boring Lepidoptera.
The amount reported represents actual federal expenditures for FY 2004.

Pecan Field: Joint research and extension activity to study pecan hybrids as alternative agriculture.
The amount reported represents actual federal expenditures for FY 2004.

Institutional Engagement: Attendance at regional research and extension meetings.
The amount reported represents actual federal expenditures for FY 2004.

Plant Biotechnology – NC 316
The amount reported represents actual federal expenditures for FY 2004.

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

Institution Kansas State University
 State Kansas

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

Actual Expenditures

<u>Title of Planned Program/Activity</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>FY 2004</u>
NC 205	0	17,989	0	0	0
Crop Systems	0	0	0	10,000	9,844
Pecan Fields	0	21,113	25,040	24,964	17,879
Environmental management of livestock systems	11,309	61,290	12,075	13,078	41,702
Grazing, land, and forage issues	37,226	47,294	57,161	55,184	59,852
Plant Biotechnology	20,325	28,716	10,994	11,481	6,479
Digital Technology Exchange	0	0	11,736	12,192	13,566
Precision Ag Technology	0	0	25,007	32,458	23,444
Cooperative Leadership Development	0	0	24,787	25,645	26,142
Total	68,860	176,402	166,800	185,002	198,908

SUPPLEMENT TO THE 5-YEAR PLAN OF WORK
INTEGRATED ACTIVITIES - SMITH LEVER FUNDS

Actual Expenditures for FY 2004

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

The amount reported represents actual federal expenditures for FY 2004.

Cropping Systems Design & Management: Action Plan number AIC 1.1

The amount reported represents actual federal expenditures for FY 2004.

Environmental Management of Livestock Systems - Action Plan number NREM 1.3

The amount reported represents actual federal expenditures for FY 2004.

Grazing Land and Forage Issues - Action Plan number A1C 2.5

The amount reported represents actual federal expenditures for FY 2004.

Plant Biotechnology - Action Plan number A1C 5.3

The amount reported represents actual federal expenditures for FY 2004.

Digital Technology Exchange - Action Plan number A1C 5.1

The amount reported represents actual federal expenditures for FY 2004.

Precision Ag Technologies - Action Plan number A1C 5.2

The amount reported represents actual federal expenditures for FY 2004.

Cooperative Leadership Development - Action Plan number YFCD 1.1

The amount reported represents actual federal expenditures for FY 2004.

Appendix A

KANSAS STATE UNIVERSITY
 FISCAL YEAR 2005 ESTIMATED SOURCE OF FUNDS
 FISCAL YEAR 2004 ESTIMATED & ACTUAL SOURCE OF FUNDS

March 29, 2005	FY 2004 Estimate	FY 2004 Actual	FY 2005 Estimate
RESEARCH			
Base Programs	3,396,548	3,475,331	3,474,233
Special Research Grants	2,600,000	10,296,759	10,000,000
Competitive & Other Grants	7,000,000	11,972,211	10,500,000
Total Federal Distribution	<u>12,996,548</u>	<u>25,744,301</u>	<u>23,974,233</u>
State Appropriation and Match	<u>28,343,979</u>	<u>28,343,979</u>	<u>29,676,506</u>
Total Research Funding	<u>\$41,340,527</u>	<u>54,088,280</u>	<u>53,650,739</u>
EXTENSION			
Base Funding (Including CSRS Ret.)	\$5,031,483	5,371,162	5,357,941
National Priorities	1,808,402	2,495,893	2,500,000
Other Extension Programs			
RREA	50,000	46,583	45,000
FERS Retirement	205,000	196,537	196,537
Total Federal Distribution	<u>7,094,885</u>	<u>8,110,175</u>	<u>8,099,478</u>
State Appropriation and Match	17,586,786	17,586,786	18,511,367
County Contribution	<u>17,257,597</u>	<u>16,412,151</u>	<u>16,500,000</u>
Total Extension Funding	<u>\$41,939,268</u>	<u>42,109,112</u>	<u>43,110,845</u>
Kansas State University Research and Extension			
Research and Extension: Federal	\$20,091,433	33,854,476	32,073,711
Research and Extension: State	45,930,765	45,930,765	48,187,873
Research and Extension: County	<u>17,257,597</u>	<u>16,412,151</u>	<u>16,500,000</u>
Total Appropriation	<u>\$83,279,795</u>	<u>96,197,392</u>	<u>96,761,584</u>

APPENDIX B

Kansas State University

Fiscal Year 2005 Estimated Source of Funds

Fiscal Year 2004 Estimated & Actual Source of Funds

March 29, 2005	FY 2004 Actual	FY 2005 Estimate
Research Base – Federal	3,369,233	3,369,233
Research Base - Animal Health	106,098	105,000
Total Federal Research	<u>3,475,331</u>	<u>3,474,233</u>
Research Base - State		
Base	28,343,979	29,676,506
Others	0	0
Total State Research	<u>28,343,979</u>	<u>29,676,506</u>
Extension - Federal		
Base + CSRS	5,371,162	5,357,941
Others	0	0
Total Federal Extension	<u>5,371,162</u>	<u>5,357,941</u>
Extension - State		
Base	17,586,786	18,511,367
Others	0	0
Total State Extension	<u>17,586,786</u>	<u>18,511,367</u>
County Expense	<u>16,412,151</u>	<u>16,500,000</u>
National & Other Priority		
Integrated Pest Mgmt	164,871	164,000
Farm Safety	13,732	13,700
4-H Air Force	370,370	384,000
ENUT	597,066	600,000
FERS	196,537	196,537
RREA	46,583	46,500
Penalty Mail	51,355	40,000
Ks Agribility	145,497	145,500
Army School Age	649,867	650,000
Extension Cares	48,500	48,500
Spray Table	25,000	25,000
Community Health	131,831	130,000
CYFAR	250,000	250,000
Pesticide Impact	47,804	47,800
	<u>2,739,013</u>	<u>2,741,537</u>