Kansas

Annual Report of Accomplishments and Results

FY2002

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Table of Contents

Introduction

This report is representative of the many ways that the Kansas State University Agricultural Experiment Station and Cooperation Extension Service (K-State Research and Extension) affects the lives of Kansans.

It shows that we are continuing to fulfill our mandate to provide scientific and educational information that helps to solve problems and improve the lives of people of all ages.

Because of a shortfall in state funding, we are dealing with a $5 million cutback that is being met in various ways, including closing positions, not filling positions, changing programs, and seeking early retirements. We also will be reducing the number of full-service area extension offices from five to four.

These challenges and subsequent changes will affect the way in which our public mission is being met, but we will not change our commitment to maintain excellent generation and dissemination of research and development for the citizens of Kansas.

We are nearing the end of our current five-year plan and have begun planning for 2004-2008. Our guiding principle is summarized by our motto: “Knowledge for Life.”

Our core programs remain strong. Despite the setbacks, we will strive to meet the expectations of Kansans.

We appreciate the support of state, county, and federal governments and cooperating individuals, businesses, and community leaders. Together, we can boost Kansas and make the present and the future better.

This Annual Report describes K-State Research and Extension program impacts and accomplishments for Fiscal Year 2002, as required by the Agricultural Research, Extension, and Education Reform Act of 1998. K-State Research and Extension is involved in numerous projects and has built working relationships with many other agencies, businesses, universities, and foundations to support and advance research, education, and international programs for the betterment of people everywhere and especially in Kansas. We believe that those who support K-State’s Research and Extension land-grant mission are chief beneficiaries of its knowledge, programs, and improvements. Our achievements have been and will be keys to progress.

In fiscal year 2002, total funding in support of the programs described in the plan totals $82,654,912 (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 is working to develop better cropping systems; develop more efficient and profitable livestock production systems while protecting the environment; enhance the value of Kansas agricultural goods; develop agricultural risk-management strategies; develop agricultural technologies and information systems, and develop new and appealing food products.

Advances in **food processing and marketing** come from adding value to existing commodities and products. Research is necessary to determine which value-added products or processes are economically possible in Kansas, and educational programs are essential to teach Kansans how to take advantage of value-added opportunities.

K-State Research and Extension has been working on 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 production from wheat; starch and gluten from wheat; uses of wheat in shellfish diets; nonfood and nonfeed uses of wheat; new food productions from wheat; utilizing wheat milling by-products; and use of wheat for oriental noodles.

One of the projects intended to add value to soybeans involved developing industrial adhesives and resins from that commodity. The project has resulted in patents being issued to K-State, and it has now reached the industrial-scale proof of concept stage in partnership with a major resins manufacturing company.

A number of projects also have focused on improving quality and marketability of agricultural products, including improving the grain marketing system, expanding export markets, evaluating food marketing, and 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, providing renewed emphases on growing food crops and developing local markets in Kansas. One such example has involved working with a local beef production cooperative to create a niche market.

K-State Research and Extension also responds to immediate problems that affect agriculture, families, and communities.

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 will team with Texas A&M and Purdue universities to work on evaluating disposal of potentially contaminated animal carcasses in case of an outbreak; to assess execution, management, and effectiveness of current agroterrorism exercises; and to analyze ways that agricultural pathogens might enter and be disseminated within the country.

Additionally, K-State is lead institution on development of improved early detection and rapid response for plant pests and diseases. This multistate project in **agricultural technology**, supported through special USDA CSREES funding, will enhance the capacity of scientists' ability 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.

For more than 100 years, K-State has provided knowledge that helps solve or alleviate problems. For example, the **drought of 2002** required special emphases and study of the problems created across the state, and strategies to work with the conditions created in this unusually severe drought. The Kansas Weather Data Library, operated by K-State Research and Extension, 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 government. 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, a drought resource Web site <http://www.oznet.ksu.edu/drought> and resource materials that farmers could use. In midsummer, a teleconference on specific decisions for livestock producers resulted in a series of in-depth radio programs and news articles aimed at those producers. Also, a series of K-State supported meetings brought livestock producers together to discuss and share new ideas for planning and decision-making.

Field Code Changed

With an identified need for pasture and hay exchange among ranchers; K-State Research and Extension cooperatively set up a Web site on the Kansas Farm Bureau server that brought together those who had pasture or hay with those who needed them. Current and historical weather data from the Weather Data Library of K-State Research and Extension was provided to state and federal agencies needing it. Agents and specialists have consulted one-on-one with producers on the critical drought-related decisions. They also provided local drought-related information through newspaper columns, radio programs, and K-State Research and Extension publications.

Agricultural risk management is vital to the farming and ranching industries of Kansas. With the passage of the 2002 Farm Bill, K-State Research Extension created an information and education plan to provide decision aids to landowners and agricultural producers. The use of the decision aids across Kansas improved the selection of most appropriate options for producers and landowners that provided expected benefits of $2.50 per acre. This benefit amounts to an estimated $10.8 million in value to Kansas producers annually for the duration of the current farm program.

Kansas has one of the largest beef industries (more than $5 billion annual farm receipts from the sale of cattle and calves) in the United States. Animal health is vital to the profitability of that industry. Many of the nutrition, diet, and management systems used in animal care and feeding can be traced back to K-State research and extension programs. Kansas has developed one of the fastest growing dairy industries in the nation with at least 260 new jobs created during the last eight years. New annual sales have exceeded $80 million in products produced. Work with the swine industry has resulted in the adoption of rations with reduced phosphorus in the diets, such that the environmental impact of the swine waste has been reduced.

e. Total expenditures by funding source and FTEs
FY2002 Projected: $56,326,191 Actual: $56,135,477 FTEs: 275.17

Key Theme – Risk Management

Taking Knowledge to the People–An Example of How K-State Assists Kansans

a. When the Farm Bill of 1996 expired at the end of September, 2002, Kansans were concerned about how they would be affected. According to Kansas Farm Management Association records kept on over 2,000 farms, an average of 116% of net income came from government payments in 2000. The 2002 farm bill will have a big impact on farming management decisions and operations.
b. Short-term:
To provide the latest information, K-State Research and Extension ag economists presented national farm bill training sessions in cooperation with the Farm Foundation. Farm bill seminars across Kansas were also presented to 750 participants. A decision aid Web site <http://www.agecon.ksu.edu/agpolicy> was created to assist farmers in making best decisions regarding program sign-up options. The seminars provided background on the politics involved and proposals under consideration including emphases on commodity and environmental programs.
Long-term:
The estimated increase in program funds flowing to Kansas farmers is $10.8 million annually through the informed decisions supported by the research and educational programs.
c. Source of Funding – State Matching, Private Funding through Farm Foundation
d. Scope of Impact – State Specific

Field Code Changed

Crop Revenue Insurance Opportunities

a. Crop Revenue Coverage (CRC) guarantees each farmer by unit a minimum revenue guarantee based on individual yields and the market price at planting time. If the grower fails to reach the guaranteed revenue caused by a combination of low prices and/or low yields, then the insurance company pays the difference. The CRC contract was developed through K-State Research and Extension faculty involvement in a public-private partnership with a private insurance company. Because CRC effectively guarantees inventory, farmers may forward price up to 85% of their expected crop. Farmers will either produce enough to cover their preharvest sales or their CRC coverage will increase enough to replace that lost production at current market value.

b. CRC is currently the number 2 selling crop insurance contract. In 2002, CRC liability was over $10 billion with over $850 billion in sales. Revenue Assurance generated $5.8 billion coverage and $542 million in sales. The combined revenue insurance exceed MPCI coverage of $15.2 billion of coverage on $1.2 billion of premium.
c. Source of funding – State Matching and Smith-Lever
d. Scope of impact – Multistate Extension

Farm Management Association

a. The Kansas Farm Management Association (KFMA) program is one of the largest publicly funded farm management programs in the U.S. Through on-farm visits, whole-farm analysis, and other educational programs, Association Economists assist producers in developing sound farm accounting systems; improving decision making; comparing performance with similar farms; and integrating tax planning, marketing, and asset investment strategies.
b. KFMA Economists assisted approximately 40-50% of their clients in preparing to sign-up their farms for the new farm bill utilizing K-State Research and Extension's Farm Bill Spreadsheet. This analysis generated an additional $2.50/acre per year over the next best option for KFMA member farms. The average size of these farms is 1,154 crop acres. KFMA also has been instrumental in determining the economic effect of the current drought on Kansas agriculture. Crop losses were estimated at $1.1 billion and livestock at $300 million in 2002. Preliminary Net Farm Income estimates for 2002 are just over $10,000, a 75% decline from the 5-year average.
c. Source of funding – State Matching, Smith-Lever funds, and Grants
d. Scope of impact – State Specific

Key Theme – Agricultural Competitiveness

Regional Beef Reproductive Task Force

a. The North Central Bovine Reproductive Task Force was organized to coordinate extension programs in reproductive technology to increase the adoption of technology by producers. The 1997 NAHMS report indicated that adoption of reproductive technology in the beef industry was very low. The estimate of the proportion of operations using artificial insemination (AI) ranged from 6 to 12%. A two-day workshop with labs and published proceedings was planned to update veterinarians and others in the industry on the current state of knowledge in applied technologies.
b. Attending the meeting were 134 veterinarians, industry representatives and producers from 11 states representing over 1.7 million beef cattle and 7.6 million dairy cattle. An economic analysis presented at the program indicated that for a herd size of 100, the use of a simple estrous synchronization and AI program could reduce weaned calf breakeven costs by $.32/cwt to $1.32/cwt. If implemented in the beef herds represented, the added profit to the beef industry would range from $2.7 to 11.3 million per calf crop.

   Bull fertility issues were also part of the program. If improvements were made in bull breeding soundness examinations so the number of cows exposed per bull was increased from

an average of 25 (NAHMS, 1997) to 35 cows, cost per pregnancy could be reduced an estimated $11.26. For the segment represented at this meeting the impact could translate into a savings of $16.2 million to the industry. Oral and written evaluations of the program indicated those in attendance found the material extremely valuable. The meeting has generated many follow-up questions and requests for additional information.

c. Source of Funding – Private sources, State Matching, and USDA CSREES special funding
d. Scope of Impact – Multistate Integrated Research and Extension
   • KS, NE, SD, ND, MN, IA, MO, WI, IL, CO, WY

Beef Production Systems and Facilities Management

a. Beef producers are continuing to explore expansion and improvement in existing facilities. Beef production facilities information sought is related to environment, handling facilities, or animal feeding system. Information was conveyed to beef producers through field days and tours, public meetings, and communication or individual assistance. Programming efforts are being expanded to include non-point environmental issues from grazing operations.
b. During 2002, over 100 producers were provided individual assistance in addressing their needs. More than 500 producers attended public meetings, and over 200 attended field days where production facilities or environmental issues were addressed. Improvement in facilities has been shown to increase profitability, provide greater environmental protection, and keep the feeding system more agriculturally competitive.
c. Source of funding – Smith-Lever Act funds, State Agency grant funding
d. Scope of impact – State Specific

Economic Competitiveness of Swine Producers – Extension component

a. The Kansas Swine Industry is robust, with producers marketing approximately 2.5 million pigs with a gross market value of about $300,000,000 in 2002. Swine producers had a challenging year in 2002. They were challenged with low market hog prices and are currently battling a relative shortage of local feedstuffs due to drought conditions that plagued most of Kansas during the summer of 2002. Our constituents continue to want low-cost options while finding new opportunities for increasing productivity. Thus, the overall goal of our swine program is developing, evaluating, implementing, and disseminating the latest technology to improve the economic competitiveness of swine producers. To impact economic competitiveness, we concentrate on the main drivers, cost of production and productivity. The other major concerns voiced by producers are: (1) availability of quality labor, (2) environmental sustainability of their operation, and (3) maintaining consumer confidence in pork to maintain or increase market demand. Certainly, county, state, and national boundaries have less relevance as technology has expanded our clientele base and allowed new audiences to find expertise at K-State Research and Extension. As a result, many of our programs have become national and international in scope.
b. Being 10% below the lysine requirement from 200 to 250 lb body weight would cost a producer about $1.80/pig while being 10% above the lysine requirement would only cost $0.40 per pig. The findings of this research became available in March, 2002 and by the end of April, we had altered the swine diets for all of our producers. In a traditional technology transfer model, the implementation would have taken at least 12 to 18 months to become adopted.

c. Source of funding – Hatch Act funds and State Matching
d. Scope of impact – Multistate Integrated Research and Extension

Dairy Systems Competitiveness

a. Providing the information and education conducive to developing and growing an efficient, profitable, and environmentally sound dairy industry in Kansas has been a goal of the dairy team.
b. The impact of this extension program has been to encourage research on developing greater cow comfort in the harsh environment of the Great Plains. Design and management options for dairy producers have been delivered through field trials, tours, seminars, and individual consultations. Interest in our work is evidenced by participation in dairy builder tours by contractors, bankers, engineers, and producers from Kansas, Colorado, Michigan, Ohio, Indiana, Pennsylvania, and California. New dairies over the past four years have increased cow numbers in Kansas by an estimated 15,000. The dairy team has been instrumental in providing guidance and management decision aids for over 90% of the new dairies started in Kansas during this period.
c. Source of funding – State Matching, Special Grants
d. Scope of Impact – Multistate Integrated Research and Extension
   • KS, CO, MI, OH, IN, PA, CA

Key Theme – Agricultural Profitability

Kansas Crop Variety Testing

a. K-State Research and Extension conducts performance testing on such important Kansas crops as wheat, sorghum, corn, soybeans, alfalfa, and sunflowers. Testing is done around the state at K-State fields and centers and on farms of growers. The performance figures are summarized and published each year in reports of progress that are printed and posted electronically on the Web: <www.ksu.edu/kscpt/>.
b. Farmers use the information because it can add value to their enterprises. For example, if wheat performance tests in western Kansas show a 202 kilogram per hectare advantage for a top-yielding hard white wheat compared to hard red varieties, then shifting only 5% of those acres to that variety would produce an additional $1.8 million in gross farm income for western Kansas.
c. Source of Funding – State Matching, Special Grants, and Fees
d. Scope of Impact – Multistate Integrated Research and Extension

Crop Management and Marketing

a. Several core areas form this Research and Extension program: (1) economics of precision agriculture, (2) machinery economics, (3) land economics, (4) environmental economics and policy, and (5) risk management.
b. The impact of this extension program comes chiefly in enhancing profitability for Kansas agricultural producers. When times turn sour for Kansas and U.S. farmers, belt-tightening is often least painful in the area of farm machinery management. For example, making sound

business decisions regarding lease vs. purchase of machinery can enhance profitability and reduce financial risk. Much more exciting is the increased producer awareness of economic advantages associated with sharing machinery and services with other producers. The impact of this program results from producers learning to better manage their risks, which ultimately leads to short-term survivability and long-term viability of Kansas farms.

c. Source of funding – State Matching
d. Scope of impact – Integrated Research and Extension

Nutrition and Feed Management for Dairy Herds

a. Knowledge of the impact of diet change and physiological status on rumen fermentation will enable nutritionists to improve diet formulation techniques for transition dairy cows. The inclusion of non-forage fiber sources in dairy diets has the potential to improve annual income from milk sales by $216 per cow or $22,896,000 for Kansas' dairy producers. The use of acid detergent fiber as an internal marker provides an environmental and cow friendly method of determining diet digestibility.
b. Over 150 producers were informed of these studies through Dairy Day reports and KSU Dairy Report of Progress materials. More than 3,500 readers received nutritional information in Dairy Lines and the results of these studies were presented at the National American Dairy Science Association Annual meeting. Ten popular press articles summarizing the results of these studies were released during the year.
c. Source of funding – State Matching and Hatch Act funds
d. Scope of Impact – Multistate Integrated Research and Extension

Ultrasound in the Cattle Feeding Industry

a. This project addresses the needs of the beef cattle industry, the state's most valuable agricultural enterprise. Although significant focus and reputation of this program involves the development of applications of ultrasound technology to improve efficiency and quality in beef production, these research resources are also devoted to addressing many other problems in response to producer questions. For example, recent research has focused on predicting future gains in feedlot cattle, which could be a valuable tool in a sorting procedure that also projects the number of days to attain optimal carcass merit. Recent investigations have monitored carcass gain in feedlot cattle, an especially important effort as the industry turns to carcass basis selling because producers are paid on carcass, rather than live weights.
b. Modeling, using parameters developed from research associated with this project, documents that there is an ideal number of days-to-harvest for each animal that maximizes profitability. These models also show that there is approximately $1 loss in profit from each day the animal is not marketed on the optimal day. Conservative estimates indicate 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. Currently, a Choice carcass is priced at $8 per cwt ($64 / 800 pound carcass) over Select. Premium Choice returns $4 more and Prime is valued at $12 over Choice. If the proportion of Choice among the 5,000,000 cattle marketed annually from Kansas feedlots were increased from the present 55% to 65%, the price per carcass would increase about $6 per head or $30,000,000 per year. A U.S. Patent has been issued covering K-State's ultrasound

technology and it has been licensed to a startup company that is now providing this service to top cattle feeders in Kansas and across the nation.

c. Source of funding – State Matching and Hatch Act
d. Scope of impact – Multistate Integrated Research and Extension

Key Theme – New Uses for Agricultural Products

Utilizing Wheat Protein in Coffee Creamers

a. Food scientists with K-State Research and Extension have found that wheat proteins can be used as an ingredient in coffee creamers. The wheat-based creamers remained stable without feathering (similar to curdling) and had a pleasant taste.
b. Compared to the dairy and soy-based products currently on the market, wheat protein could be used at a much lower cost and would bring added value to the wheat industry.
c. Source of Funding – State Matching
d. Scope of Impact – State Specific

Key Theme – Plant Germplasm and Plant Production Efficiency

Genetic Improvement of Wheat for Western Kansas

a. The long-term goal of the wheat breeding program in western Kansas is the development of wheat cultivars, or germplasm, that will improve Kansas producers' efficiency and the marketability of the wheat they harvest. Production efficiency will be improved by selecting for improved yield potential under dryland western Kansas environments and by incorporating resistance to our major pests into these new cultivars.
b. This year, we identified at least 15 experimental white-seeded lines that demonstrated a level of sprouting tolerance equal to or better than that of Jagger, a red-seeded wheat. This level of sprouting protection could practically eliminate the risk of pre-harvest sprouting in western Kansas and it will also make it possible to move white wheat production further east in the state.
c. Source of Funding – State Matching, Hatch Act funds, and Grants
d. Scope of Impact – Multistate Integrated Research and Extension

Sorghum Breeding

a. Research in the sorghum improvement project is divided between an applied program that produces germplasm usable by the seed industry and a basic program that improves the efficiency of breeding methods and investigates the nature of the genetic control of various traits. The objective of the applied program is to increase the production efficiency and to maximize the economic return to Kansas sorghum producers. The objectives of the basic program are twofold: to investigate those procedures that may improve the efficiency of a breeding program and to identify characters that will be useful in diversifying and improving the production and use of sorghum. An example of such a character would be increased tolerance of temperature extremes of cold and heat. Increased thermo-tolerance will permit extension of the growing season resulting in greater yields under challenging conditions.

b. Our research has shown that adding a few extra days of grain fill increases grain yield. This yield increase comes at no additional cost to the producer. Each additional bushel of grain represents additional net profit. Adding just 1 bushel per acre could mean an additional $4.5 million to the farm economy each year.
c. Source of Funding – State Matching, Grants, State Funding, USDA, and Crop Commissions
d. Scope of Impact – Multistate Research

Aphid Resistance in Grain Crops

a. The overall goal of this research program is to increase the level of resistance to insect pests in sorghum germplasm. This increased resistance in sorghum will help decrease pesticide usage, improve integrated pest management systems, and reduce inputs which in turn increases sorghum production sustainability. There are two major thrusts: (1) using the tools of molecular genetics to identify and study proteins secreted by aphid salivary glands in order to better understand how plants and insects interact at the molecular level; and (2) screening germplasm accessions for increased levels of resistance to the worst sorghum pest in Kansas, the greenbug.
b. More resistant sorghum decreases the need for pesticides and will increase the overall sustainability of sorghum production in Kansas and the Midwest. Some of our best sorghum selections lose only about 19% as much chlorophyll as a susceptible check. The combined efforts of all researchers is estimated to save growers $3 to 30 million per year based on the proportion of greenbug resistant sorghum varieties grown across the state.
c. Source of Funding – State Matching, Hatch Act funds, Grants, and Crop Commissions
d. Scope of Impact – Multistate Integrated Research and Extension

Mutant Rice Project May Help to Strengthen World Food Supply

a. Working with the International Rice Research Institute in the Philippines, K-State Research and Extension has helped develop 30,000 different mutant forms of rice during the last five years. The goal is to develop 40,000 mutants. Scientists from The Ohio State University, University of California-Davis, and Iowa State University also are part of the mutant gene project that received funding through a $500,000 National Science Foundation grant. Different genes serve different purposes, but scientists currently do not know every gene's function.
b. When a gene is eliminated, the rice shows altered plant characteristics. Scientists can then see what that gene used to do for the plant. The "deletion collection" will be a tool to allow researchers to identify genes coding for useful characteristics, especially those that help plants fight off disease. Researchers hope the project will lead to better methods of turning on those genes earlier, or making them more efficient. If some genes do not help battle disease, researchers may find it helpful to disable them. Scientists constantly need to re-engineer plant genotypes to maintain insect and disease resistance at useful levels. Pathogens eventually overcome pathogen-resistant genes so that breeders must continue to make progress to preserve gains in order to protect the world's food supply. Rice is the staple food for two-thirds of the world's population. Rice also is a good model for learning about other cereal grains, like wheat, maize, and barley. Rice has a smaller genome compared to those other

plants, which makes it easier to figure out the order of genes in the rice genome so it can be manipulated for beneficial purposes.

c. Source of Funding – NSF Grant, State Matching, NRI, USDA
d. Scope of Impact – Multistate Research
Collaboration: Scientists at The Ohio State University, University of California-Davis, Iowa State University, and the Philippines.

Key Theme – Plant Production Efficiency

Cropping Systems

a. Research in this theme focuses on soil and crop production technologies for dryland and irrigated agriculture in western Kansas with emphasis on soil fertility and cropping systems. One objective is to determine the feasibility of alternative cropping systems for with regard to profitability, grain production, and preservation of soil and water quality.
b. A long-term tillage study has shown that reduced and no-tillage increases grain yields, particularly for summer crops (more than 50% higher sorghum yields with no-till than conventional tillage).
c. Source of Funding – State Matching and Commissions
d. Scope of Impact – Multistate Integrated Research and Extension

Cropping Systems Design and Management

a. Successful crop production can be measured not only by yields and profitability, but also by their impact on the quality of life of the community. Agricultural systems have historically caused increased levels of sediments, nutrients, and chemicals to runoff with water that flows to streams, rivers, and public water bodies. By using soil conservation techniques, crops can be produced profitably with little adverse impact to those offsite and downstream. Increased adoption of best management practices is the main goal of this project.
b. The impact of this program is measured mainly in changes in long-term cropping practices. The Conservation Technology Information Center's 2002 report shows no-till corn acreage for Kansas to be at 21.6% of total corn acres. In addition, mulch till acreage adds an additional 21.5%. This indicates more than 43% of the 3.4 million acres of corn in the state is produced using best management practices that reduce sediment and non-point sources of pollution. Soybean production is even higher for no-till at 27.4%, and 13.1% for mulch till, with an overall 40.5% of the 2.7 million acres of full-season soybean acres planted in a non-conventional and more protected manner. Even wheat acreage, which has lagged behind the summer crops in no-tillage adoption is up at 8.1% no-till and 11.2% mulch till. Kansas wheat acreage is now below 10 million acres indicating that a greater share of the total acreage is being used for summer crops. These trends continue to show a steady adoption of the best management practices we are promoting within this program
c. Source of funding – Hatch Act funds and Commissions
d. Scope of impact – Integrated Research and Extension

Key Theme – Rangeland Management

The Benefits of Rangeland Management Research

a. Kansas produces about 1.5 million cows and heifers annually, with nearly one-tenth, or 150,000, of those breeding animals in the nine-county area surrounding the Agricultural Research Center at Hays. K-State researchers have evaluated and are promoting the use of perennial cool-season grasses or winter small-grain cereals that provide fast, abundant vegetative growth for grazing purposes from September through April when native warm-season forages are dormant.
b. The economic impact of implementing complementary forage and forage grazing systems could save producers in that area from $3.5 million to $4 million annually on stored feed. Statewide, it could mean a $37 million savings in one month.
c. Source of Funding – State Matching and Hatch Act funds
d. Scope of Impact – Multistate Integrated Research and Extension

Grazing Land Management Program

a. During 2002, 8 meetings, 6 tours, 6 Grazing Management Workshops, 4 Prescribed Burning Workshops, and 6 farm/ranch visits were held along with news releases and radio programs. Total attendance exceeded 2,000.
b. Actual impact ranged from small management changes such as moving mineral feeders to developing comprehensive grazing and livestock watering systems. Improving herbaceous cover through management has been determined to be key to improving water quality.
c. Source of funding – RREA, Hatch Act funds, and State Matching
d. Scope of impact – Multistate Integrated Research and Extension
   • With NE, OK

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. The level of illness reported in Kansas is low, but the reporting system is not an active one, and it is a well-known fact that food borne illnesses are greatly under-reported. Experts believe the risk of food-borne illness is increasing due to multiple factors. One of the goals of Healthy People 2010 is to reduce food borne illness. Key to accomplishing this goal is to increase the proportion of consumers and commercial food handlers following key safety practices.

A Food Science Institute was created to more efficiently draw upon food science expertise. Combining resources in education, research, and extension will improve the coordination, visibility, and capacity of KSU food science programs. The Institute will build on the university's outstanding reputation in food sciences. K-State's meat and poultry programs in the Department of Animal Sciences and Industry were rated third best in the nation by Meat and Poultry magazine. The Food Science Institute also offers a variety of academic programs through various KSU departments and by distance education in 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. A food irradiation education project was funded by a grant from CSREES. 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 ServSafe workshops representing a variety of foodservices including restaurants, schools, hospitals, "quick-type" shops with gas stations, private catering, and others. Because of the importance of food safety issues and the need to reach a rapidly increasing audience, a Meat Safety and Quality program was presented to KSU students, Kansas Department of Commerce and Housing personnel, and Kansas meat processors. Research has been directed to the improvement of the microbiological safety of meat and poultry products, especially on development of slaughter interventions and interventions that may be applied on-farm and during fabrication of sub-primals, irradiation and chemical treatments, and post-process pasteurization. KSU's research on slaughter interventions has been widely implemented by the meat industry. Researchers are testing a foam that was found to kill anthrax spores for use in food and agriculture sectors.
b. Those receiving educational intervention training on food irradiation responded more correctly and also more positively to a post-questionnaire. Twenty-one volunteers were trained in the Master Food Handler program, with each trained 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. Some gain employment as a result of participation. ServSafe-trained people are sought after in food service for managerial positions. 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. 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. ServSafe trained people are sought for managerial positions in food service. 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. 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. It is believed that substantial progress has been made in Kansas toward the reduction of food borne illness, improved food production and management practices, and compliance with HACCP guidelines. Faculty of K-State Research and Extension 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

FY2002	Projected: $2,481,532	Actual: $2,473,130	FTEs: 19.7

Key Theme – Food Safety

Natural Antibiotics Help Aid Swine Health and Food Safety

a. Widespread and sometimes indiscriminate use of antibiotics has resulted in microorganisms that are resistant to these agents. Moreover, infectious diseases such as *E. coli* and *Salmonella* continue to cause significant losses in the swine industry. Alternatives to conventional

antibiotics that will provide effective means of preventing and treating diseases are urgently needed to maintain consumer confidence in a safe food supply.

b. Short-term:
The researchers' goal is to find alternative means of addressing the issue of antibiotic usage in food animals by developing natural antimicrobial peptides. One promising answer may be antimicrobial peptides–small proteins that most animals and humans produce in their bodies. These proteins act as a first-line defense against disease at its entry points (e.g., skin, eyes, tongue, trachea, lungs, and gastrointestinal tract.) With support from USDA's National Research Initiative (NRI), researchers have been studying promising swine natural antibiotics.
Long-term:
Collaborating with researchers at the UCLA College of Medicine, researchers at KSU have discovered a natural antibiotic in the epithelial cells of the pig tongue. Because antimicrobial peptides kill microbes by physically disrupting the invaders (in contrast to a different attack mode used by conventional antibiotics), the likelihood of bacteria acquiring resistance to these natural products is low. Understanding these mechanisms will lead to a better understanding of natural disease resistance at the molecular level that will allow the evaluation of different management strategies for increased disease resistance.
c. Source of Funding – USDA-NRI
d. Scope of Impact – Multistate Research and Extension

Food Safety for Consumers, Food Service, and Retail Stores

a. The focus of this program is research on the economics of food safety–primarily on consumer perceptions of risk from food, their demand for safer food, their preferences for methods of enhancing food safety and factors influencing those preferences.
b. The results of this work provide strong evidence to suggest that consumers are willing to bear the costs of using new technology to enhance food safety, and that a majority of informed consumers have a preference for more effective risk reducing technologies (e.g., 60% of survey respondents preferred food irradiation over carcass pasteurization).
c. Source of Funding – State Matching
d. Scope of Impact – State Specific

Key Theme – Food Quality

Developing a Better Case-Ready Meat Product

a. A study at K-State may soon change the way case-ready meats are packaged and shipped to retail stores. K-State meat scientists have developed a process that packages case-ready meats in an environment that contains no oxygen, low levels of carbon monoxide, and levels of carbon dioxide and nitrogen similar to current systems in use. Case-ready meats now are packaged in a high-oxygen environment that can cause off-odors and flavors.
b. The K-State process is safe and retailers can store meat two to three times longer. Grocery stores are increasing their orders of case-ready meats. Fewer than 10% of retail meat packages were case-ready meats just over a year ago, but that number has tripled and is expected to increase even more.

c. Source of Funding – USDA, Special Grants, State Matching
d. Scope of Impact – Multistate Integrated Research and Extension

Key Theme – Food borne Pathogen Protection

Plums Found to Kill Pathogens in Meat

a. This program focuses on the discovery and development of natural food additives that protect against potentially dangerous pathogens in process and meat products.
b. Raw meats mixed with as little as three percent of plum extract exhibit over 90% reductions in the growth of such major food borne pathogens as *E. coli* O157:H7*, Salmonella, Listeria,* and *Staphlycoccus*. In addition to suppressing pathogens, plum extract also can enhance the moistness of meat and increase its volume. Adding a plum mixture would be most useful where meat products are prepared at central locations and rewarmed at satellite kitchens.
c. Source of Funding – State Matching, Special Grants, Fees
d. Scope of Impact – Multistate Integrated Research and Extension

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. In 2002, 401 telephone and e-mail requests for assistance were handled, 46 nutrition and child nutrition labels developed, and 277 sample evaluations and office/lab consultations were conducted (of these, 227 were sample evaluations). To facilitate HACCP and food safety training, two HACCP workshops and one HACCP verification workshop were held in Kansas. In addition, HACCP, sanitation and GMP, and HACCP verification workshops were coordinated and held in Missouri, Nebraska, and South Dakota through a cooperative USDA project. A Beef Value Cuts Workshop was held at K-State in cooperation with the Kansas Beef Council.
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 $22,500 while enhancing the quality and safety of meat and meat products for Kansas consumers.
c. Source of Funding – State Matching and USDA
d. 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. Tobacco use increases risk for many diseases, including lung cancer and emphysema. Currently, 22% of Kansans smoke, and more youths are using tobacco products. Alcohol and drug abuse are common, especially inappropriate use of medications and over-the-counter drugs by the elderly and binge drinking by youths and young adults. Fourteen percent of adult Kansans engage in binge and heavy drinking. Exposure to environmental hazards (e.g., lead, radon) in their homes can also be a cause of illness and death for Kansans. Other environmental hazards can result in health problems for people with asthma and allergies or in death from carbon monoxide. 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. 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 when given the option. In 2002, the Family Nutrition Program (FNP) provided nutrition education to more than 220,000 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 1,867 Kansas families with 2,724 children in 2002. Nutrition newsletters and audiotapes were distributed to elderly Kansans. Frail, older, homebound adult Kansans were provided with nutrition information targeted to their interest and need. K-State Research and Extension collaborated with other Kansas agencies to increase use of Food Stamps by eligible older adults. Dining with Diabetes provides dietary guidance to people with diabetes and their caregivers. Walk Kansas was a popular exercise motivation program. The PANE (Physical Activity and Nutrition Education) project aims to improve the personal health of Kansans with arthritis. Health-related research programs are examining the influence of different dyes on the UV protection value of cotton

fabric; developing a protein-based therapy that may alleviate the complications of cystic fibrosis; examining the effect of zinc deficiency on the absorption of vitamins A and E; and examining the connection between cigarette smoke, vitamin A, and emphysema.

b. The FNP program resulted in significant intention to change behavior, including 48% intending to eat more servings of grain per day, 58% intending to eat more servings of fruit and vegetables per day, 47% intending to drink more servings of milk per day; 42% intending to eat more than one kind of vegetable or fruit per day more often; 31% intending to eat fried foods less often; 40% intending to mover closer to the Dietary Guidelines recommending that Americans include a greater variety of foods in their diets; and 33% intending to increase their level of physical activity. More than 91% of the EFNEP participants showed improvements in dietary intake after completing the series of EFNEP lessons. EFNEP participants increased frequency of reading food labels (65%), adapted use of a safer method of thawing frozen food (60%), and planning meals ahead of time more often (54%). Older frail Kansans reduced their nutritional risk and practiced more positive nutrition behaviors. As a result of the promotion of Food Stamps by older Kansans, Electronic Benefits Transfers machines were installed in 23 senior dining centers and Center Managers were trained on how to use them. Research programs have shown that red, green, blue, and brown dyes provide better UV protection than black or white and light-colored clothes. Using computer models, peptide synthesis, and laboratory tests, researchers are finding that a specific peptide can restore lost function caused by defective cystic fibrosis cells; zinc deficiency has been shown to markedly reduce the absorption of vitamins A and E; and a connection was found between low vitamin A levels in smokers and the development of emphysema.

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 results of the research projects will likely lead to improved health of the targeted populations.

d. K-State Research and Extension 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. 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

FY2002 Projected: $3,977,094 Actual: $3,963,627 FTEs: 43.2

Key Theme – Human Health

Promoting Physical Fitness through the Walk Kansas Program

a. Physical inactivity is a serious health risk factor. To reduce that risk, an individual needs to complete 30 minutes of moderate physical activity most days of the week, but in Kansas about four out of five people do not meet that requirement, and one in five adults is obese. K-State Research and Extension developed Walk Kansas, a science-based, physical-activity promotion program that helps Kansans initiate and maintain a regular regime of physical activity. The program utilizes county task forces that promote the Walk Kansas program.

Teams of six participate, and the goal of each team is to exercise the equivalent of walking across Kansas. To reach that goal each team member has to do moderate physical activity for 30 minutes a day, five days a week, during the eight-week program.

b. Almost 7,000 adult Kansans participated in 2002. Afterward, participants said they felt more confident about being active and they enjoyed the physical activity. Seventy-five percent of the 7,000 participants responded that this was the first time they had participated in a K-State Research and Extension program.
c. Source of funding – Smith-Lever and USDA
d. Scope of impact – State Specific

EFNEP and FNP Promote Benefits of Breastfeeding

a. The Expanded Food and Nutrition Education Program (EFNEP) and Family Nutrition Program (FNP) in partnership with the Kaw Area (Topeka) Breastfeeding Coalition sponsored a Breastfeeding Celebration. Breast milk is the perfect food for babies. Breastfed babies have fewer cases of ear infections, diarrhea, rashes, and allergies, which means fewer trips to physicians.
b. Breastfeeding saves $321 to $474 in medical expenses during a baby's first year and $1,500 to $3,000 in formula costs. The American Academy of Pediatrics recommends that mothers breastfeed their infants for at least the first year of life.
c. Source of funding – USDA
d. Scope of impact – State Specific
Collaboration: Stormont-Vail Healthcare; St. Francis Hospital and Medical Center; Shawnee County Health Agency; La Leche League; and Parents as Teachers.

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. In phase one, 2001, focus groups, interviews, and written surveys were conducted with older adults, senior center staff and volunteers, senior center board members, community leaders, and grocery store clerks to identify barriers and attitudes affecting food stamp program participation by rural older adults. In phase two, 2002, Electronic Benefits Transfers machines were installed in 23 dining centers and Center Managers trained on how to use them.
b. Food Assistance (Food Stamp Program) participation rates have increased in the intervention region. Project activities and ideas were shared at numerous national and state conferences so that other states may begin or adapt their program outreach to senior adults.
c. Source of funding – USDA Food Stamp Program
d. Scope of impact – State Specific

Improving Nutritional Outcomes in Rural Homebound Older Adults who Receive Home-Delivered Meals

a. The goals of this pilot project were to develop a program that would: (1) investigate the effectiveness of nutrition messages to promote healthy nutritional practices and reduced nutritional risk in a small population of women living alone who receive home-delivered meals, and (2) establish a cost-effective method to integrate delivery of the nutrition information with the delivery of home-delivered meals. This project was completed in collaboration with USDA, the National Policy and Resource Center on Nutrition and Aging, and the Kansas North Central-Flint Hills Area Agency on Aging, Inc.
b. After receiving nutrition education materials last fall, 70% of the women participating indicated they had made specific dietary changes toward recommended practices, intended to start making changes in the next few weeks or months, or were already following healthful nutrition behaviors. This partnership resulted in reduced nutritional risk and encouraged positive change in nutrition practices by providing homebound older adults with nutrition information materials targeted to their interest and need.
c. Source of funding –USDA
d. 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. EFNEP in Shawnee County participated in a cost-benefit study to measure program benefits. The study found that for every $1 spent on EFNEP, $8.82 will be saved on future healthcare costs. In 2001, EFNEP saved Shawnee County $1,300,000.
c. Source of Funding – USDA Federal Grant
d. Scope of Impact – State Specific

Community Health Focuses on Healthy Youth Places

a. As part of the NIH Behavior Change Consortium (BCC), the Office of Community Health (OCH) is collaborating with 15 of the nation's leading behavior-change research sites. These teams meet twice yearly in Washington, D.C., and communicate through conference calls and e-mail. OCH is providing leadership for a BCC work group targeting development of methods to translate research findings into practice. In year three of this four-year grant, eight middle schools that were randomly assigned to receive technical training and assistance, implemented environmental changes designed to promote healthy fruit and vegetable consumption and physical activity to adolescents.
b. Short-term: Change teams developed after-school activities and school lunch products based on the input of adolescents and school staff. In addition, adolescents led the development of promotional videos using video production equipment provided to the schools by the grants. School teams shot, edited, and submitted their public service announcements and received awards from the Office of Community Health.

Long-term: Data collected about fruit and vegetable consumption and physical activity are in the process of being analyzed.

c. Source of Funding – State, National Institute of Child Health and Human Development, National Institute of Nursing Research, National Institute of Allergy and Infectious Diseases, NIH Office of Disease Prevention, and NIH Office of Dietary Supplements

d. 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) has led a number of environmental efforts which have helped K-State Research and Extension's progress towards its five-year plan of work goals.

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.

For years, K-State Research and Extension extolled the virtues of recycling, composting, waste management, and Best Management Practices. To demonstrate these techniques, a Waste Management Learning Center was started north of campus. The demonstration site is two miles north of the K-State campus with access to dairy, swine, and beef manure byproducts. Citizens can visit the Center and see the application of the different methods and weigh the costs and benefits of each. Farmers can build a similar operation with existing equipment without spending a lot of money. The site uses manure from the KSU dairy unit mixed with liquid from the swine unit. It is applied on university gardens and also offered to the public.

Many projects involve efficient use of water or groundwater quality. 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. 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.

Five years of subsurface drip irrigation (SDI) field research was used to create an easy-to-use mathematical model within a Microsoft Excel spreadsheet template to project corn grain yield, irrigation, nitrogen and phosphorus fertilizer requirements, and net returns to land, irrigation equipment, and management. This model can be used to allocate limited water resources to the optimal amount of land at the optimum plant population. The results may appear somewhat surprising to some users in the western Great Plains in that they often indicate higher numbers of planned corn acres and higher plant populations are justified even at fairly low irrigation capacities when using SDI. The model is a planning tool for near-term decisions in the spring.

It's important for producers to make sure their irrigation systems are performing as intended, providing uniform moisture to the areas they are supposed to. To ensure that irrigation systems are working properly and to develop an educational program about effective irrigation and cropping systems in general, K-State Research and Extension faculty developed the Mobile Irrigation Lab. The Mobile Irrigation Lab team includes specialists with expertise in irrigation system design and management, crop water management, agronomic cropping systems, and computer programming and software development. The project coordinator stated: "To our knowledge there are no other educational programs like this." The lab cannot evaluate all irrigation systems in Kansas, so the goal is to develop and field test the technology to make it possible for private companies, consultants, cooperatives, and individuals to do this kind of testing. Information on the Mobile Irrigation Lab is available on the Web at <www.oznet.ksu.edu/mil>.

Fecal bacteria are the most common and severe contaminants of rivers and streams in Kansas. The EPA's National Pollutant Discharge Elimination System (NPDES) permitting program has been extremely successful in reducing point source contributions of fecal bacteria from municipal treatment facilities, concentrated animal feeding operations, and meat processing plants. However, non-point sources such as wildlife, pets, livestock, and failing septic systems continue to cause frequent excursions beyond primary and secondary recreational contact standards in much of the state. One of the greatest challenges in addressing non-point source fecal contamination is being able to determine which sources are responsible for contamination in any given water body. Several K-State laboratories are cooperating in the development of cost effective bacterial source tracing (BST) techniques to differentiate fecal bacteria from various sources. A two-year process of monitoring fecal coliform bacteria in the river has identified a storm drain in Garden City as a major source of bacteria entering the river during moderate runoff events. The greatest concentration of bacteria has been detected in a rural area upstream of the city. While this area has a high density of irrigated cropland on which feedlot manure is applied at high rates, the initial use of BST analysis identified all isolates tested as human. Further investigation has led to the discovery of a "straight pipe" draining into the ditch, but it is not yet clear whether this is related to the high bacterial levels detected in 2002.

Since November 2000, K-State Research and Extension watershed specialists provided watershed management expertise and developed watershed educational programs throughout Kansas. The specialists are assigned to six watersheds: Upper Blue, Lower Arkansas, Lower Kansas, Upper Delaware, Upper Arkansas, and Marais des Cygnes. The watershed specialists work with landowners and farmers within the watersheds to develop action plans based on the concerns within the watersheds. The specialists strive to improve water quality through educational programs, including on-farm demonstrations, workshops, seminars, and other teaching methods.

Several studies have shown that when recommended levels of herbicides are applied up to 5% of the amount applied may be lost. Soil surface condition may be controlled using different tillage practices to reduce runoff losses. K-State has been a national leader in conservation tillage, which leaves some or all of the residue from the previous year's crop on the soil surface. It effectively protects soil against erosion and is one recommendation being made to decrease runoff losses of herbicide. Another recommendation to reduce herbicide runoff is herbicide management.

e. Total expenditures by funding source and FTEs
FY 2002 Projected: $9,232,285 Actual: $9,201,027 FTEs: 66

Key Theme - Riparian Management

Riparian Buffers to Improve Water Quality

a. We have received substantial funding from a variety of sources (including USDA, EPA, and KDHE) to conduct riparian buffer studies and demonstration/education projects. The largest current project is seeking to document the effect of vegetative riparian buffers on water quality, with funding from the KDHE/EPA Section 319 grants. Monitoring sites have been established in Clay and Geary counties, and initial data have been recorded.
The Blue River buffer education project with the University of Nebraska-Lincoln was completed this year. Several research and demonstration sites were established in Washington County, in cooperation with the local NRCS and Conservation District.
b. The direct and indirect benefits are enormous. Improvements in water quality will lead to enhanced recreational opportunities due to cleaner, more aesthetically-pleasing water, and more abundant fish populations. Better quality water will require less expensive treatment before use as municipal supplies. Eventually, the riparian buffers will produce a high-value crop of black walnut, oak and other timber.
c. Source of funding – USDA, Hatch Act funds, EPA, and KDHE
d. Scope of impact – State Specific, Integrated Research and Extension

Quantifying Nitrate Leaching and Improving Current N Recommendations for Sandy Soils Under Irrigated Corn

a. Grain yield results for two growing seasons indicate that 165 lbs N per acre was sufficient to achieve maximum yield. This is about 50 to 70 lbs N per acre less than typically applied by producers; yet, maximum yield ranged between 150 and 220 bu per acre among locations.

b. Reducing N rates by 50 lb N per acre, without a risk of reduced yield, will save Kansas corn producers about $10 per acre in production costs. This translates to $30,000,000 for about 3,000,000 acres of corn planted annually in Kansas. Quantifying this affect for producers will be essential to minimizing the risk (nitrate leaching to groundwater) associated with excess N applications.
c. Scope of funding – Hatch Act funds
d. Scope of impact – State Specific, Integrated Research and Extension

Land Application of Animal Wastes

a. The objectives of this research are to determine the impact of application of swine and beef cattle wastes on soil properties and crop growth; and to evaluate the effectiveness of current BMPs. Effluent water from a swine lagoon and solid manure from a beef cattle feedlot were applied annually since 1999 at rates based on the (1) crop P requirement, (2) crop N requirement, and (3) twice [2x] the crop N requirement. Other treatments were three rates of commercial fertilizer and an untreated control. Soil test P levels in the surface soil (0-6") were increased more by application of cattle manure than swine effluent.
b. This suggests that long term application of cattle manure at rates to meet N requirements of irrigated corn may lead to excessive accumulation of P in the surface soil. However, a benefit from application of cattle manure was an increase in organic C content in the surface soil from 1.21% in the control treatment to 1.64% with cattle manure (at a rate to meet N requirements). Residual soil N content of the soil profile (0 to 8 ft) was similar following cattle manure and swine effluent applications (applied at rates to meet N requirements) as when N fertilizer was applied at recommended rates.
c. Source of funding – EPA, KDHE, Hatch Act funds
d. Scope of impact – State Specific, Integrated Research and Extension

Key Theme - Water Quality

Water Quality

a. The overall goal is the abatement of non-point sources of fecal coliform contamination and improve water quality through adoption of best management practices by farmers, homeowners, and landowners in high priority watersheds.
b. We have built partnerships with such groups as: Kansas Department of Health and Environment, Kansas Department of Agriculture, State Conservation Committee, Natural Resource Conservation Service, Kansas Department of Wildlife and Parks, and Kansas Water Office. We continued to meet with the Agriculture Alliance group which is comprised of several leading commodity organizations. On-farm assessment is one of the indicators of program success. This year 11 farm assessments were made–three in the high priority Horseshoe Creek area.
c. Source of funding – USDA, KDHE, KDA, SCC, NRCS, KDWP,
d. Scope of impact – Multistate Integrated Research and Extension

Key Theme – Yard Waste/Composting

Waste Management

a. The solid waste management program is an ongoing long-term educational program to improve solid waste decision-making capabilities of local officials, business managers, and citizens. Primary emphasis is on beneficial use of organic residuals through organics recycling. Increased emphasis this year was on in-depth training of compost operators and on production of quality products in the composting of yard and livestock waste.
b. At least 84 individuals participated in in-depth training for compost operators. Another 250 participated in programs on composting and compost utilization. A research/demonstration/ educational compost site was constructed and equipped and is in operation. Funding was obtained to complete development of educational materials for the first Kansas Compost Operators' School and for conducting demonstration compost activities across the state.
c. Source of Funding – State Matching
d. Scope of Impact – State Specific

Key Themes – Soil Quality and Air Quality

Investigating the Environmental Benefits of Carbon Sequestration

a. A $15 million federal grant—the largest in K-State history—has been received by K-State Research and Extension to study 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. K-State extension specialists played a key role in formation of the Kansas Carbon Coalition, a constituent organization focused on developing policies and infrastructure necessary for producers to capture economic value created by soil carbon sequestration.
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. Source of Funding – USDA, EPA, KDHE
d. 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. Selected as a Program of Excellence, the E.A.R.T.H. program is a year-long environmental education program that served 1,000 middle school students from three school districts in

2000-01. Each fall, award-winning curriculum, supplies, and training are provided to 12 area middle school teachers. Now in its fourth year, the program serves 25 teachers and 1800 students in three school districts. The curriculum is built around four major themes: land, water, air, and living resources, and it encourages students to increase their capacity for critical thinking, problem solving, and decision making.

In the spring, E.A.R.T.H. participants attend an off-site interactive student workshop sponsored by the E.A.R.T.H. Steering Committee, with sessions taught by local business and community organization representatives. At the workshop, children apply the lessons they have learned in the classroom and use their critical thinking skills to learn more about, or become active participants in, some local environmental issues.

During the two years that E.A.R.T.H. has been in existence, all of the participating students have been from urban or suburban schools located in Sedgwick County. School demographics indicate that 55% of participants are minority students, and 41% are members of families who live at or below the federal poverty-level guidelines.

b. The E.A.R.T.H. program provides resources, opportunities, and support that would otherwise be unavailable to teachers and students who want to learn and apply environmental skills and knowledge. The students have told the coalition that they have learned skills in the classroom that they apply to real-life situations in their community, and that they now feel more qualified to be wise stewards of their environment. The teachers have told the coalition that experiential environmental learning has allowed their students to develop the critical thinking skills needed to succeed in life. Students involved in E.A.R.T.H. also tell us that they enjoy learning more and remember what they have learned longer when they use E.A.R.T.H.'s hands-on lessons. 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. Research has shown that increased academic success and strong attachment to school serve as protective factors for children, making it less likely that they will make risky choices and more likely that they will grow into strong healthy adult members of the community.
c. Source of Funding – State Matching, Smith-Lever, and KDHE
d. Scope of Impact – State Specific

Key Theme – Land Use

A Way to Use Less Water on Crops in Western Kansas

a. The Ogallala Aquifer is the main source of water for irrigated crops in western Kansas. Because the aquifer is declining K-State scientists are looking at ways to decrease water use in that region. One study has focused on growing a crop with irrigation then following it with a dryland crop. Researchers alternated irrigation and dryland practices on the same acreage, and the average yield improvement in the alternating system has been about 10% compared to the overall average for continuous irrigated and dryland crops. The irrigation phase provided more residue to the soil, which aided water storage and protected the soil from wind erosion.

b. Producers and the environment benefit by alternating irrigated and dryland crops to avoid the fallow sequence. That gives the most efficient use of limited irrigation water and limited precipitation.
c. Source of funding – USDA and Special Grant
d. Scope of impact – Multistate Integrated Research and Extension and State Specific

Key Theme – Integrated Pest Management

Controlling Insects in Stored Grain without Pesticides

a. K-State is part of the new Consortium for Integrated Management of Stored Product Insect Pests. Involving two other universities and the USDA, the consortium's goal is to find alternatives to harmful pesticides in controlling insects in stored grain and foods.
b. Producers and consumers benefit from the use of natural controls such as combining heat treatments with insect hormone replacement instead of using insecticides that are potentially harmful to humans and the environment.
c. Source of Funding – USDA-IPM and Commissions
d. Scope of Impact – State Specific

Developing Weed Management Systems for Southwest Kansas

a. Information obtained from studying biological, physiological, ecological and genetic characteristics of the weed-crop complex is being used to develop weed control tactics. Investigations of crop and weed species varying in heritable herbicide tolerance are being conducted with populations developed through collaboration with other plant breeders and in field and greenhouse evaluations. This will lead to better understanding of crop and weed herbicide tolerance.
b. It has been estimated that for every one percent increase in yield of all crops in southwest Kansas over $2 million is pumped into the Kansas economy. Rapid adoption of new weed control techniques could easily increase yields from 1 to 5 percent. Therefore, this program could inject $2 to $10 million dollars into the Kansas economy.
c. Source of funding – State Matching and Hatch Act funds
d. Scope of impact – State Specific

Minimize the Loss of Nutrients and Pesticides to Surface and Ground Water

a. The goal of this program was to (1) develop BMPs for nutrient and pesticide use; and (2) develop and deliver educational programs to assist farmers to adopt BMPs for nutrient and pesticide use. Integrated Agricultural Management Sites (IAMS) were established on farmer fields at four sites in Kansas to develop and demonstrate BMPs for crop production. Farmer and dealer schools and demonstration tours were used to teach BMPs. Extension publications and non-numbered publications were printed explaining pesticide BMPs and water quality concerns. Nutrient management planning has become part of the program.
b. Seventy-five percent of the producers reported BMP adoption during the same period to reduce atrazine runoff leaving their fields. Some of the most common methods/BMPs that farmers adopted included: reduced rates of atrazine; split applications of atrazine; change the

time of atrazine application; use non-atrazine herbicide products, incorporate atrazine, and use postemergence atrazine premix products.

c. Source of funding – EPA, KDHE, and Commissions
d. Scope of impact – State Specific, Integrated Research and Extension

Establishment and Maintenance of Turfgrass Systems with Reduced Water and Pesticide Inputs

a. This project is identifying the minimum levels of irrigation water required to maintain acceptable quality of lawns during Kansas summers, and the best methods for converting cool-season stands of turf to seeded zoysiagrass.
b. By using a drought-resistant turfgrass, such as bermudagrass, water savings of 30% or more could be realized compared to cool-season grasses such as Kentucky bluegrass. Conversion of perennial ryegrass golf course fairways to drought-resistant zoysiagrass using a strip-seeding method under evaluation could save over $1,000 per acre on seed cost alone compared to using a traditional method of broadcast seeding.
c. Source of funding – Hatch Act funds and State Matching
d. Scope of impact – State Specific, Integrated Research and Extension

Key Theme – Drought

Characterizing Functions of Multiple Phospholipase Ds in Arabidopsis

a. Phospholipase D (PLD) refers to an enzyme that hydrolyzes membrane lipids. In the past year, our researchers discovered two novel PLDs that have distinct molecular, biochemical, and biological properties. In addition, genetic manipulation has been achieved for several PLD genes. Characterization of these plants revealed that the PLD activity from the common PLD, PLD alpha, plays a positive role in reducing water loss and increasing drought tolerance. However, high PLD alpha activity is detrimental in plant response to extreme freezing temperatures. Studies are underway to delineate the multi-faceted functions of individual PLDs.
b. Research results indicate that PLDs, a major family of phospholipids-hydrolyzing enzymes in plants, have important and multiple functions in plant response to environmental stresses. Water and temperature are the two most important environmental factors that determine the productivity and distribution of crops. Therefore, this study not only advances the understanding the role of lipid metabolism in plant growth, but also points to new avenues for improving plant stress tolerance.
c. Source of funding – Hatch Act funds and State Matching
d. Scope of impact – State Specific

Key Theme – Natural Resources Management

Soils Management

a. The soils management project employs strategies that enhance production efficiency, stabilize farm income, and reduces water and air pollution potential. The project strives to employ cutting edge management techniques that allow diversity on the family farm in terms of cropping sequence, efficient harvest of soil water, and soil fertility improvement.
b. Monitoring the depth of soil water has proven to be an effective method of determining cropping sequence and permits producers to harvest soil water more efficiently, thus increasing production efficiency.
c. Source of funding – Hatch Act funds, USDA, and KDHE
d. Scope of impact – State Specific

Key Theme – Biological Control

Biological Control of Anthropod Pests

a. The long-term goal of the ivy geranium project is to develop a comprehensive, integrated production/pest protection program for this greenhouse ornamental crop that is economical and practical for growers, and which focuses on the use of two different species of predatory mites as biological control agents of thrips and spider mites. This biological control research is one part of a multi-component, interdisciplinary project that involves three departments: Entomology, Horticulture, Forestry & Recreation Resources, and Agricultural Economics.
b. For ivy geraniums, the predicted impact is three-fold. First, by learning whether horticultural practices shown to produce quality plants affect key pests (spider mites and thrips), and their natural enemies (predatory mites), we will be able to develop an integrated crop management program for greenhouse growers that maximizes efficiency because we can select procedures that have the greatest net benefit with respect to crop production and protection. Second, understanding how production and protection practices affect pests and predators will allow us to optimize the use of biological control in a realistic, practical manner. Third, by testing and developing our crop production/protection methods in consultation with two agricultural economists, we will ensure that any changes in greenhouse crop operations can be validated in economic terms, and ensure maximum profitability for producers. The social acceptance of pest management alternatives also will be addressed by surveys that will be developed and administered to a focus group of actual commercial growers in Kansas. By providing commercial growers with an alternative, we hope to reduce the use of pesticides, thus providing an environmental benefit.
c. Source of funding – USDA-IPM Grant, State Matching, and NRI
d. Scope of impact – Integrated Research and Extension

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

Overview

The complex issues of today require new perspectives and skills. Continuous support by K-State Research and Extension provides the public with help in building strong, healthy communities; improving parenting skills and family relationships; preparing youth through 4-H and other programs to be responsible citizens; balancing demands of work, family, community, and time for self; and developing consumer and financial management skills.

a. As public resources come under pressure with smaller tax revenues, cooperation and partnership between units within and outside of the university is essential. Building upon the successes of the two previous years, K-State Research and Extension is now recognized as the community-based agency of choice to support change and positive outcomes in Kansas communities. Because of its physical presence in each county as well as networks established by local educators, K-State Research and Extension brings knowledge of community dynamics and social interactions that far surpass agencies that are not located in each county. Working with other regulatory agencies, Extension provides prevention education to audiences who might not otherwise participate due to fears of being cited or penalized. In 2001, inroads were made with the Kansas Association of Counties to communicate the potential opportunities available through fullest local engagement with K-State Research and Extension with 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 merged to form K-State Research and Extension, our youth, family, and community development (YFCD) programs have been more interconnected. There are fewer faculty and local community educators who continue to work in complete isolation. After three 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.

   Older youths, especially teens, do have positive and constructive voices in community issues. In 2002, Extension led more than 45 community conversations and 2 statewide conversations about making Kansas a better place for positive youth development. More than 3,000 youths and adults participated in identifying community strengths and prioritizing steps to address the most pressing needs. Through being genuinely listened to and respected by adults, teens develop a connection with their communities, increasing their ability to see themselves as vital, active participants in their community's future. Adults who listen to youth increase the confidence of young people and are more willing to partner with them on community issues while they are still in adolescence.

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. Extension leadership education is helping communities begin from within to identify strengths and existing capacities upon which they can reconstruct a viable future. External consultants do not effectively impact community development over time. Community change occurs from within the existing population when it is tapped and empowered.

c. Structured-out-of-school programs standards directly increase the quality of the learning environment. 4-H youth development included more than 42,405 Kansas youth in long-term, continuously mentored clubs and groups where skills were mastered and recognized. About one third of Kansas' school-aged population (153,545) participated in some type of Extension 4-H youth development educational program in 2002.

   Adult mentors (12,566) were trained and supported during 2002 in creating positive youth development environments for youths to learn in structured out-of-school programs (i.e., 4-H youth development).

   Leadership programs have increased the capacity of individuals within communities for political participation, managing not-for-profits, community service volunteering, and in bringing the voices of youth to discussions about community futures.

   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.

   County Profiles were updated to reflect 2000 census changes to support local government leaders with planning and decision-making.

d. K-State Research and Extension has adopted the Healthy People 2010 goals and is cooperating in the development of Healthy Kansans 2010. Positive social behaviors across the life span are significant part of the 2010 goals. K-State Research and Extension adopted the standards of the National Research Council and Institute of Medicine of the National Science Academies for its youth-development outcomes in youth development. Family relationships, parent education, 4-H youth development, and community leadership education are now better customized within each community context. K-State Research and Extension is perceived as more relevant to a greater number of Kansans than it was in 1995, and measurable indicators are charting progress on outcomes in positive social behaviors, once only anecdotally documented.

e. Total expenditures by funding source and FTEs

FY2002	Projected: $10,918,620	Actual: $10,881,651	FTEs: 148.35

Key Theme – Parenting

Families and Divorce

a. "Family Change: Separation and Divorce" is designed for extension agents to deliver to parents who are going through the divorce process. The goal is to minimize the negative impact of divorce upon the children. The curriculum, consisting of a parent handbook and a teaching guide, was distributed to extension agents in the spring of 2002 in training workshops held in each of the five extension areas.
b. Short-term:
   On the post-test, 88% of trained extension agents from 52 counties agreed or strongly agreed that they now understood appropriate teaching strategies compared to 79% who were unsure or did not understand effective teaching strategies before the training.
   Long-term:
   After participating in a "Parenting During Divorce" workshop, 70% of the parents said they agreed or strongly agreed that they were confident about talking to their children about divorce compared to 20% before the program. In addition, 100% of the parents responded that they understood children's psychological adjustment tasks, compared to 50% before the workshop.
c. Source of Funding – State Matching
d. Scope of Impact – State Specific

Key Theme – Youth Development/4-H

Wyandotte County 4-H Expanded Delivery

a. KIDZONE provides a safe, educational, and fun place where youth can spend after-school time, through the following collaborators: Kansas City, KS, Unified School District 500, Camp Fire USA, Boys and Girls Clubs, Storytellers, 4-H Youth Development, Housing Authority, Unified Government, a local drum group, and a Karate arts expert.

   Opportunities for Prevention Education (OPEN-K) supports the work of Wyandotte County 4-H staff as they provide high quality social competency programming in six schools serving up to 450 children, in grades kindergarten through sixth. They are operating at full capacity.

   Wyandotte County KIDZONE 4-H uses a place-based/ecologically informed approach to developing positive social skills. The project's primary premise is that the social environment of after-school programs will reduce the occurrence of problem behaviors within that setting.

b. Preliminary findings indicate that children exhibit decreased anti-social behaviors in the Wyandotte County sites when opportunities for choice are high, when pro-social/healthy group norms are intentionally addressed, and when the teacher-to-student ratio is high. Wyandotte County Extension's partnership with seven other organizations/agencies through its base KIDZONE 4-H programming has led to expanded efforts to reach Kansas City neighborhoods that are traditionally underserved by Extension.
c. Source of Funding – State Matching Drug Elimination grant, Kansas SRS contract, Kaufman Foundation, CYFAR, 21st Century Community Learning grant
d. Scope of Impact – State Specific

Be a Book Cook

a. Some 377 families and 1139 family members have participated in Be a Book Cook programs that target children ages 3 to 6. This program received national recognition and is a collaboration with Topeka and Shawnee County Library; USD 501 Parents as Teachers and Highland Park High School; Kiwanis; and Success by 6.
b. The Be a Book Cook program helped parents learn to combine reading and cooking to help their children develop early reading and math skills, eye-hand coordination, teamwork, and a sense of accomplishment.
c. Source of Funding – State Matching, Smith-Lever
d. Scope of Impact – State Specific

Key Theme – Leadership Training and Development

Youngsters Learn Leadership Skills

a. Four counties in the Kansas City metropolitan area have consolidated efforts and resources to provide youths in that area with skills in leadership and citizenship. The participating counties are Douglas, Johnson, Leavenworth, and Wyandotte.
b. Adults, businesses, and institutions in the communities become involved with the Kansas River Youth Leadership (KRYL) program, which helps youths to increase communication skills, prepare them for entry-level jobs, foster healthier behaviors, increase their confidence, and encourage them to become more involved in community service. Twenty-one KRYL youth gained great insight to new career opportunities and even greater appreciation for those who dedicate their lives to helping others. Members expressed how they became more compassionate for those who dedicate their lives to public service.
c. Source of Funding – State Matching
d. 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: (1) each county uses the Program Development Committee to determine current priorities; (2) 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 (3) biannual meetings of the State Extension Advisory Council.

The Program Development Committees (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 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 is currently 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 are receiving comments via e-mail, a web site, 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.

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 is drawing to a close at this writing. 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.

D. EVALUATION OF SUCCESS OF MULTI AND JOINT ACTIVITIES

1. Faculty members frequently work in teams within their units and in interdisciplinary teams. In addition to these ad hoc teams, K-State Research and Extension has supported the formation of teams around the 16 issues that identify our organizational priorities during this five-year planning period. The ad hoc teams always work well; they are voluntary, and people gravitate to the team for professional stimulation and comradery. Teams that are formed by the organization are sometimes seen as another layer of meetings and bureaucracy. Nonetheless, we are committed to nurturing teams to achieve the many benefits that good teamwork provides the faculty and our total productivity. Reporting takes place via individual, annual, comprehensive accomplishment documents that go to each unit leader. Teams also have the opportunity to highlight collective efforts through the filing of collaborative impact reports. Consultants have told us that this team culture may take many years to become exhibited as the norm within our organization. Administrative support, incentives, and time will increase our success in this area.

   K-State faculty formed two new integrated research and extension teams in 2002, both of which were approved as Hatch projects by USDA/CSREES. These are the Production Food Animal Safety and Security Team, which focuses on livestock health and management, and

the Precision Agriculture Technologies Team, which addresses the development and implementation of new approaches to precision farming. Another research and extension team project, Food Safety for Consumers, Food Service, and Retail Service, was terminated at the end of 2002. The Food Safety team's activities produced a number of important impacts, including implementation of the Farm*A*Syst program to ensure food safety in direct marketing of farm products to consumers and HACCP training in school foodservice operations. However, the team discovered that it was too large for efficient management, and the members plan to regroup around more tightly focused objectives. Altogether, K-State research and extension faculty are now engaged in eight active team projects that address the following objectives: food animal health and management; precision agriculture; postharvest food safety; water conservation and irrigation management; environmental air quality; efficient coordinated swine production systems; livestock marketing; plant biotechnology. These teams represent the efforts of more than 125 research and extension faculty. The concept of integrated research and extension teams has been very positive for the smooth transfer of the 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.

During 2002, KSU continued to be actively engaged in multistate research activities, easily meeting the required levels of Hatch fund spending in this important area. Activity continued on 45 projects carried over from previous years, with a total investment of approximately $700,000. These projects were predominantly conducted between K-State and other Land Grant Universities in the North Central region, but they included one or more projects from each of the other regions (Northeast, Southern, and Western). Two research projects on human nutrition (NC167 and NC219) decided to add an extension component to maximize the impact of the knowledge generated, and K-State contributed the efforts of a human nutrition extension specialist to each of them. Another ongoing project, NC503, continued to develop a rapid response to the challenge posed by Karnal Bunt (KB) Disease of Wheat, which threatens to close wheat export markets worth $3 billion to US wheat farmers. During 2002, K-State facilitated growth in NC503 participation, which now includes researchers, producers, and other stakeholders from 18 different states. NC503 succeeded in obtaining a congressional appropriation of $250,000 for KB research and extension activities in FY03 and organized an advisory committee composed of wheat farmers and other stakeholders from the wheat industry to guide the allocation of these funds to specific projects. The greatest anticipated short-term impact will be to identify and eliminate from production those wheat varieties that are most susceptible to KB disease. KSU initiated participation in five new multistate projects in 2002, including investigations of the role of flies in the ecology of food borne and animal pathogens, improved thermotolerance in grain sorghum, improved grazing systems for cattle, genetic characterization of soybean stem borer populations, and integration of biophysical functions of riparian systems with management practices and policies. Spending on these new projects totaled an additional $70,000.

A number of grant-supported programs also have strong multistate and joint components. A prime example is the $15 million carbon sequestration program mentioned above, in which K-State serves as the lead institution for research and extension activities spread across 10 states.

Biotechnology - Strategies for Durable Deployment of Bt Resistance. The corn entomology group continues to evaluate the efficacy of insect host-plant resistant transgenic events for efficacy against corn earworm, European and southwestern corn borers. A variety of research investigations and extension outreach activities and products are used to develop and assess the effectiveness of Bt-linked pest management strategies. The overall goal is to prolong the interval that Bt products and crops can provide value to agriculture as pest control tools. Laboratory studies validate the need for ongoing investments in proactive resistance management strategies useful in minimizing the chances of losing this technology. Many counties in south central and southwest Kansas are planting Bt corn at rates that exceeded 50%. Modelers at the University of Illinois surveyed research and extension personnel in Kansas, Texas, Oklahoma, and Colorado and employed our data to create a two-species corn borer model suitable for predicting the onset of resistance in high insecticide use areas where both ECB and SWCB occur. There is concern that the use of insecticides in non-Bt corn refuge areas could complicate the current insect resistant management program. The model suggests that Bt corn resistance should last 30 years or longer if the 20% non-Bt corn refuge recommendation was widely implemented by corn growers. A variety of educational venues are being employed to educate the agricultural and non-agricultural public about Bt, transgenic crops, and related biotechnology subjects.

Distance Diagnostics (DD). Our Internet-based Distance Diagnosis system remains important in our efforts to speed the identification of plant and insect samples through the seamless sharing of digital images between county offices and diagnostic laboratories of entomology, plant pathology, the horticulture rapid-response center, and the herbarium. This electronic shuttle service is designed to reduce the frustration of the person making the inquiry and should decrease the time available for loss in pest management-related situations. Several hundred electronic submissions (inquiries, images, and reports) have passed to/from remote and on-campus sites via DD during the last three years. Submitting sites can track their requests and have the ability to print professionally appearing reports once the work has been completed. Diagnosticians can access and import sections of Internet-based publications, make referrals, and prepare preliminary or final reports while still linked to the software. Submitted images, modifications thereof, and prepared reports are being archived for later reference and the ability to modify the identifying title has been added to the system. Much of the current effort is directed toward refining the image archiving and retrieval process so that on- and off-campus educational uses are optimized. We want to expand the system capabilities so that images and reports can be employed to train new employees, provide continuing education for existing personnel, and serve as new, practical resources for classroom teachers. In addition, royalty-free still- and video-image

resources acquired in part through this system will be distributed electronically as early warning or real-time pest alerts.

Great Plains Diagnostic Network. The software developed for the Great Plains Diagnostic Network is being modified so it can be adopted by many states as the diagnostics software of choice. Some of this work is being supported by funding associated with improving homeland security. K-State Research and Extension plans to continue developing, testing, and piloting the system as a component of our biosecurity communications and response network.

Advancement of Youth through Involvement in Livestock Programs. It is important to recognize that many students enrolling in agricultural postsecondary education programs have not been previously exposed to production agriculture. Linking livestock education with youth activities, such as 4-H and FFA, builds on knowledge that can lead to satisfying agricultural careers. This project helps youth from production and urban backgrounds acquire livestock education though informative, hands-on, and stimulating discussions. Success is predicated on the knowledge that the process of preparing youth for careers in production agriculture or other agriculturally based careers can start at a young age. A three-state event (Junior Swine Producer Day) attracted over 150 youth from Kansas, Oklahoma, and Nebraska. The program included the following sessions: (1) selecting and caring for their new swine project; (2) nutrition for your pig: (3) preparing your animal for the show; (4) the Pork Quality Assurance Program [PQA]; (5) proper biosecurity measures before and after transporting your swine project; and (6) sportsmanship and ethics when exhibiting junior livestock projects. In addition, an educational Skill-A-Thon competition was conducted that offered challenges in swine knowledge, meat cut identification, live pig analysis, and other areas that would increase the general knowledge of the participants.

2. Examples of K-State Research and Extension programs that address the needs of under-served audiences follow:

Family Nutrition Program. Families with low incomes are challenged to find ways to keep themselves fed and healthy. Limited resources enforce smaller food budgets that can result in poor diets. Poor diets can have such effects as increased illness, increased absence from school and work, decreased learning, and decreased income. The Family Nutrition Program (FNP) works in collaboration with local agencies, both governmental and non-governmental, to provide free programming on diet and nutrition, food safety, and stretching the food dollar to low-income audiences across the lifespan. The Spanish-speaking population is also very prominent in some parts of Kansas, necessitating Spanish-language programming efforts. We have found it important to consider the culture of well-established and newly-arriving Hispanic populations in Kansas when designing information and selecting delivery methods. A bilingual (English and Spanish) Kids a Cookin' program encourages parents to cook with their children. SRS collaborations are used to better reach the food stamp-eligible population.

Master Food Volunteers. The Master Food Volunteer Program provides a foundation of science-based knowledge to volunteers in the subject areas of food safety, food preparation, food science, and food preservation. The work of agents is multiplied many times through a cadre of trained volunteers who meet criteria for certifying and training others so that even more clientele are reached. Extension agents in three pilot counties recruited volunteers, assisted with the 40 hours of training, and managed and directed the master volunteers when they offer approved community-level activities and events. Twenty-one volunteers completed the program and, as of December 15, 2002, sixteen have "paid back" at least 40 community volunteer hours to the local extension program. At $15/hour these volunteers have already provided ca. $20,000 or approximately .64 FTE in non-appropriated value. This program should expand to approximately 15 counties in Kansas during 2003. Follow-up focus group evaluations will be conducted with trained volunteers to continue shaping and improving the final product. A Web site will be created specifically to support the volunteers.

Improving Nutritional Outcomes in Rural Homebound Older Adults who Receive Home-Delivered Meals. Building on one of K-State Research and Extension's core areas, nutrition education materials were designed to help homebound older adults improve their food intake and nutritional well-being, which are necessary to maintain health. The goals of this pilot project to reach frail older Kansans were to develop a program that would: (1) investigate the effectiveness of nutrition messages to promote healthy nutritional practices and reduced nutritional risk in a small population of women living alone who receive home-delivered meals, and (2) establish a cost-effective method to integrate delivery of the nutrition information with the delivery of home-delivered meals. This project was completed in collaboration with USDA, the National Policy and Resource Center on Nutrition and Aging, and the Kansas North Central-Flint Hills Area Agency on Aging, Inc. Most of this population had not received any nutrition education in recent years. After receiving nutrition education materials last fall, 70% of the women participating indicated they had made specific dietary changes toward recommended practices, intended to start making changes in the next few weeks or months, or were already following healthful nutrition behaviors.

Gardening for Healthy Aging. This project examines the impact of an innovative, multi-level social cognitive theory-based gardening program compared to a standard walking program on improving and maintaining the physical activity, physical health, and psychological health over time of senior adults with osteoarthritis. Given that light- to moderate- intensity physical activity is prescribed for preventive or restorative purposes in combating declines in health and functional capacity, and that gardening is a preferred leisure-time physical activity of older adults, this research may result in an effective way to manage the negative health impacts of arthritis and help older adults maintain lifelong physical activity. The process involves the development, offering, and testing of an educational gardening program for older adults, while monitoring fruit and vegetable intake, and subjective health (funded by the Family Nutrition Program).

The K-State Nutrition PAGE (Practical Advice for Good Eating). A cooking program/recipe series that includes English and Spanish materials was developed. It includes main dishes, hot and cold side dishes, and healthy sweet foods, including 25 audience-tested nutritious and affordable recipes, with accompanying nutrition facts, lesson plans and complementary educational written materials to use as participant handouts, and evaluation questions. FNP educators will teach people of all ages how to choose and prepare foods for good taste, good health and a good buy, with emphasis on choosing more of the best (e.g., grains, fruits and vegetables) and less of the rest (e.g., saturated fats, sugars, and salt).

Nutrition and Dietetics Students Working in Communities to Promote Healthful Eating. This project connected county Extension educators involved in the Family Nutrition Program (FNP) with advanced-level undergraduate dietetics or nutrition students to promote community-based nutrition education among those with limited resources.

Expanded Opportunities for 4-H Youth Development - Prepare Youth to be Responsible Citizens. The 4-H Youth Development Action Team continued to prepare and support K-State Research and Extension professionals as they expanded their programmatic reach to more traditionally underserved audiences. The 4-H Afterschool Initiative is a cohesive national effort, which brings under one umbrella the multitude of diverse activities of the 4-H movement in the after school time frame to increase visibility and effectiveness in furthering the development of social, emotional, physical, and academic skills among our nation's youth.

USDA 4-H / Army Youth Development Project.
There are two army installations in Kansas – Fort Riley in Geary County and Fort Leavenworth in Leavenworth County. The army is now requiring that each installation establish and maintain a minimum of five 4-H clubs. The rationale for requiring these five clubs is to aid in predictability of services for Army youth as they transition from installation to installation.

Youth Development: OPEN-K and Healthy Places for 4-H Youth Development. Haskell Indian Nations University is an OPEN-K (Opportunities for Prevention Education and Networking in Kansas) partner collaborating with native Kansas communities. Haskell Youth Extension focuses its OPEN-K work on helping youth workers develop skills and on increasing cultural competence for non-native partners. Haskell Youth Extension is developing an adult volunteer base within native communities that will be capable of establishing a viable mentoring project for at-risk native youth.

The Kansas Center for Sustainable Agriculture and Alternative Crops was created to facilitate agricultural systems-based research and outreach. The center acts as a resource center for producers, researchers, and educators seeking information on sustainable agriculture topics. The center has increased communication between agencies and

organizations that advise and support agricultural producers. Multi-disciplinary research and outreach grants have been submitted as a result of center facilitation. Existing outreach programs are being revised to include more systems-based or holistic training on the food system–from production to the table. The Center:

- Developed and distributed a Kansas Family Farmer and Rancher Resources and Services Guide that includes entries from over 80 agencies and organizations with sources of technical and financial help on topics such as conservation, direct marketing, business development, financing, production, and value added enterprises.
- Developed the Kansas Locally Raised Food Directory with the goal of connecting local producers with consumers.
- Responded to 198 requests for assistance, primarily on topics of producing and marketing for alternative enterprises (e.g., buckwheat, herbs, vegetables, cheese, goats); direct marketing of meat, vegetables, fruits, and herbs to consumers, restaurants, and at Farmers Markets; livestock/grazing systems; and grant sources and grant writing resources.

EFNEP. In Kansas, EFNEP (Expanded Food and Nutrition Education Program) helps families and youth with limited resources in three counties Sedgwick, Shawnee, and Crawford. In 2002, 1,867 families with 2,724 children enrolled in EFNEP in the state, with 8,181 additional youth contacts. EFNEP reaches a diverse audience in Kansas, with 57% of EFNEP adult participants identifying themselves as non-Caucasian. EFNEP positively affects the health of future Kansans as well – 650 EFNEP participants were pregnant, and learned about positive nutrition and health practices for themselves and their babies. EFNEP graduates showed real improvement in desirable practices that help keep themselves and their families well-nourished with a safe food supply – 29% of 2002 graduates exhibited improved food resource management practices, 25% improved nutrition practices, and 27% showed an increase in food safety practices. Kansas EFNEP continues to make efficient, effective use of its limited funds as it ranked 1st in 2002 among similarly-funded EFNEP state programs in positive changes made in the diets of their participants, and 2nd in improvement among those ten states in improvement of participants' acceptable food-related practices.

3. Planning commenced in 2002 for the 5-year period beginning in 2004. 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.

4. The 1998-2003 planning cycle has provided some important organizational learning. We have moved forward with the development of electronic data-gathering software (RETORIC) to support planning and reporting needs for both research and extension. We have learned the importance of having an outcome-based orientation rather than an issue-based orientation. We anticipate that clear outcome goals will give us much better evaluation of results.

We have 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 which make it more user-friendly to researchers. When we develop our next five-year plan, we will put the greatest emphasis on the short- and medium-term outcomes and the long-term impacts that we anticipate will occur 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 challenging. While the club/group delivery method is clearly substantiated in science to have the most positive potential in promoting positive youth development, 4-H is 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 to 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 funded 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.