

MINUTES OF THE HOUSE COMMITTEE ON AGRICULTURE.

The meeting was called to order by Chairman Dan Johnson at 3:30 p.m. on February 12, 2003, in Room 423-S of the Capitol.

All members were present except:

Committee staff present: Raney Gilliland, Legislative Research Department
 Amy VanHouse, Legislative Research Department
 Gordon Self, Revisor of Statutes Office
 Kay Scarlett, Committee Secretary

Conferees appearing before the committee:

Dr. Marc Johnson, Director of K-State Research and Extension and Dean, College of Agriculture, Kansas State University
Dr. Charles Rice, Soil Microbiologist, Department of Agronomy, Kansas State University
Dennis Metz, member, Kansas Dairy Marketing Advisory Board

Others attending: See attached list

Minutes of the February 5 meeting were distributed. Members were asked to notify the committee secretary of any corrections or additions prior to 5:00 p.m. February 14, or the minutes will be considered approved as presented.

Discussion and action on HCR 5009 - Concurrent Resolution urging the President and Congress to remove trade, financial and travel restrictions to Cuba.

Representative Thimesch moved to amend HCR 5009 on page 1, lines 40 and 41, by inserting after the word "restrictions" the phrase "with the exception of arms sales," and after the word "Cuba" the language "while continuing to encourage Cuba to fully recognize the fundamental rights of its citizens." (Attachment 1) The motion was seconded by Representative Freeborn. There was discussion concerning human rights and fundamental rights. Representative Thimesch reported that of the eleven states working on resolutions, there is no mention of human rights or fundamental rights. After further discussion, the motion carried.

Representative Faber moved to amend HCR 5009 as proposed by Representative Mario Goico to include language addressing the human rights situation in Cuba. (Attachment 2) The motion was seconded by Representative Craft. After much discussion, the motion failed. Representatives Dahl and Faber asked to be recorded as voting yes on this amendment.

Representative Thimesch moved to recommend HCR 5009, as amended, favorable for adoption. Seconded by Representative Feuerborn, the motion carried.

Dr. Marc Johnson, Director of K-State Research and Extension and Dean, College of Agriculture, Kansas State University, presented their annual report to the House Agriculture Committee focusing on some of the newer initiatives of K-State Research and Extension. He discussed the impact of K-State Research and Extension in the categories of bio-security, economic development, drought assistance, agricultural management, environmental management, and community health. A copy of the *Kansas Center for Sustainable Agriculture and Alternative Crops 2002 Accomplishments* was included with his testimony. (Attachment 3)

Dr. Charles Rice, Soil Microbiologist, Department of Agronomy, Kansas State University, discussed carbon sequestration through management of Kansas' natural resources. Research is being done to test the effect of tillage, various crop rotations, soil conservation practices, and several grazing land management practices on soil carbon levels. Kansas State University and nine other universities recently formed the Consortium for Agricultural Soils Mitigation of Greenhouse Gasses (CASMGs) to provide the science and technology necessary to help our nation realize the benefit of carbon sequestration. (Attachment 4)

CONTINUATION SHEET

MINUTES OF THE HOUSE COMMITTEE ON AGRICULTURE at 3:30 p.m. on February 12, 2003, in Room 423-S of the Capitol.

Dennis Metz, member, Kansas Dairy Marketing Advisory Board, presented their annual report to the House Agriculture Committee. He discussed the many changes in the dairy industry in Kansas, Regional Dairy Compacts, and milk prices. The Kansas Dairy Marketing Advisory Board asks that the Kansas Legislature continue to monitor the impact of volatile prices on the Kansas dairy industry. (Attachment 5)

A memorandum from Greg Foley, Acting Secretary, Kansas Department of Agriculture, was distributed in response to questions raised at the February 5 meeting concerning the meat and poultry inspection program. (Attachment 6)

The meeting adjourned at 5:02 p.m. The next meeting is scheduled for February 17, 2003.

HOUSE AGRICULTURE COMMITTEE GUEST LIST

DATE: February 12, 2003

NAME	REPRESENTING
Jodd Johnson	KLA
John Robinson	Lt. Governor's Ofc.
Steven Graham	1c-state Reserch + Extension
Rebecca Reed	KS Dept. of Agriculture
Marc Johnson	KSV
Chuck Rice	KSL
Ben Hopper	KS Dairy Assoc.
DENNIS METZ	KS DAIRY COMMISSION
Rae Anne Davis	Dept. of Commerce
Paul Johnson	PACK
Mark Leonard	Kansas, Inc.
DENNIS ENSLINGER	CITY OF LAWRENCE
TRACY STREETER	CONSERVATION Comm.
Diane Coe	Kansas Water Office
Kent Lamb	KWA
MARIO GOICO	Representative Dist. 100
Janet McPherson	Ks. Farm Bureau
Justin Adels	Propane Marketers of KS
Mary Jane Sattelman	KGA/KARA

HOUSE AGRICULTURE COMMITTEE GUEST LIST

DATE: February 12, 2003

NAME	REPRESENTING
<i>Chris Wilson</i>	<i>KS Dairy Ass'n</i>

House Concurrent Resolution No. 5009

By Committee on Agriculture

2-5

A CONCURRENT RESOLUTION urging the President and Congress of the United States to consider the removal of trade, financial and travel restrictions to Cuba.

WHEREAS, The relationship between the United States and Cuba has long been marked by tension and confrontation; and

WHEREAS, Further heightening this hostility is the 40-year-old United States trade embargo against the island nation, which remains the longest-standing embargo in modern history; and

WHEREAS, Cuba imports nearly a billion dollars' worth of food every year, including wheat, corn, flour and meat products; and

WHEREAS, Import amounts are expected to grow significantly in coming years as Cuba slowly recovers from the severe economic recession it has endured following the withdrawal of subsidies from the former Soviet Union in the last decade; and

WHEREAS, Kansas ranks number one in flour and wheat production, and this state is a leader in the overall value of agricultural exports at more than \$2.5 billion annually; and

WHEREAS, Agricultural production in Kansas is valued at more than \$6 billion annually; and

WHEREAS, Kansas is ideally positioned to benefit from the market opportunities that free trade with Cuba would provide; and

WHEREAS, Rather than depriving Cuba of agricultural products, the United States embargo succeeds only in driving sales to competitors in other countries that have no such restrictions; and

WHEREAS, Trade, financial and travel restrictions imposed by the United States against Cuba hinder the export of agricultural and food products from Kansas, and the right of Kansans to travel freely: Now, therefore,

Be it resolved by the House of Representatives of the State of Kansas, the Senate concurring therein: That we urge the President and Congress of the United States to remove trade, financial and travel restrictions relating to Cuba; and with the exception of arms sales,

Be it further resolved: That the Secretary of State be directed to send enrolled copies of this resolution to the President of the United States, while continuing to encourage Cuba to fully recognize the fundamental rights of its citizens.

House Agriculture Committee
February 12, 2003
Attachment 1

1-2

1 the Speaker of the United States House of Representatives and the Ma-
2 jority Leader of the United States Senate and to each member of the
3 Kansas Congressional Delegation.
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House Concurrent Resolution No. 5009

By Committee on Agriculture

2-5

Proposed Amendments

House Agriculture Committee
February 12, 2003
Attachment 2

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12
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37 therefore,

38 *Be it resolved by the House of Representatives of the State of Kansas,*
39 *the Senate concurring therein:* That we urge the President and Congress
40 of the United States to remove trade, financial and travel restrictions
41 relating to Cuba; and

42 *Be it further resolved:* That the Secretary of State be directed to send
43 enrolled copies of this resolution to the President of the United States,

if, and only if, the Republic of Cuba agrees without limitation to allow the Organization of American States (OAS), Inter-American Commission on Human Rights, the United Nations High Commission for Human Rights, the European Union and other human rights organizations throughout the world to visit Cuba for the purposes of reviewing and reporting, without interference, to the international community on the human rights situation in Cuba and the immediate release of all Cuban political prisoners being currently jailed in Cuba

See insert 1

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- 1 the Speaker of the United States House of Representatives and the Ma-
- 2 jority Leader of the United States Senate and to each member of the
- 3 Kansas Congressional Delegation.

2-2

INSERT 1

WHEREAS, The democracies of the Western Hemisphere have approved an Inter-American Democratic Charter that sets a regional standard regarding respect for human rights and fundamental freedoms; and

WHEREAS, The government of the Republic of Cuba approved and is bound to respect the Charter of the Organization of American States (OAS) and the American Declaration of the Rights and Duties of Man; and

WHEREAS, In 2001, 2000, 1999, 1998 and previous years, the government of the Republic of Cuba declined to reply to the OAS Inter-American Commission on Human Rights when it sought the government's views on human rights violations in the Republic of Cuba; and

WHEREAS, All countries have an obligation to promote and protect human rights and fundamental freedoms as stated in the Charter of the United Nations and the Universal Declaration of Human Rights; and

WHEREAS, The United Nations Commission on Human Rights considered and passed a resolution in 2002 regarding the situation of human rights in the Republic of Cuba and called for the United Nations High Commission for Human Rights to send a person representative to the Republic of Cuba; and

WHEREAS, The United States and other countries remain concerned about violations of human rights and fundamental freedoms in the Republic of Cuba, including the freedoms of expression, association and assembly, and the rights associated with the administration of justice; and

WHEREAS, According to the Department of State, Cuban authorities use exile as a means of repression and continue to harass, threaten arbitrarily arrest, detain, imprison and defame human rights advocates and members of independent professional associations, including journalists, economists, doctors and lawyers with the goal of coercing them into leaving the country; and

WHEREAS, Cuban citizens are routinely
cited solely because their views do not
coincide with those of the government; and

WHEREAS, Amnesty International in its 2002
report noted an increase in human rights
violations in the Republic of Cuba, including
short-term arbitrary arrests, threats,
summonses, evictions, interrogations, losses of
employment, restrictions on travel, house
arrests and other forms of harassment directed
by the government against political dissidents,
independent journalists and other activists in
an effort to limit their ability to exercise
fundamental freedoms; and

WHEREAS, Amnesty International also noted
with concern the beginning of a trend toward
the increased use of violence by Cuban
authorities in order to repress dissent; and

Testimony Before the Kansas House Agriculture Committee
February 12, 2003
Dr. Marc A. Johnson
Dean, College of Agriculture
Director, K-State Research and Extension
Kansas State University

Thank you for the invitation to address your committee. My name is Dr. Marc A. Johnson, Dean of the College of Agriculture and Director of K-State Research and Extension at Kansas State University. I have been asked to focus on some of the newer initiatives of K-State Research and Extension. I'll begin with an overview of our organization.

Our full name is the Kansas State University Agricultural Experiment Station and Cooperative Extension Service. In the Regents University budget we are referred to as Extension Systems and Agricultural Research Programs (ESARP). This university subagency represents the activities which distinguish a "land grant" university from others. The "land grant" university system was established by the Morrill Act of 1862 with the offer of a grant of land to any state which would establish a college of practical arts open to common people; agriculture and the mechanical arts were the cornerstones. The Hatch Act of 1887 established "Agricultural Experiment Stations" at land grant universities to perform agricultural research and the Smith-Lever Act of 1914 established "Cooperative Extension Services" at land grant universities to extend the knowledge of the university to the public. Through K-State Research and Extension, Kansas State University is truly engaged with people and communities in every section of Kansas. Research is conducted on campus and at branch experiment stations and research fields across the state and Extension is conducted at state and regionals levels and in county extension offices in every county of the state. Our strength is in our presence in local communities.

Senator Pat Roberts has addressed the Kansas Legislature to say that if the State Legislature provides the facilities and the people in universities, the Congress will supply opportunities to compete for program funds. K-State Research and Extension faculty compete and earn grant funds nearly equal to the amount of State General Fund dollars provided by Kansas government, and this is without access to student tuition dollars. Part of our success relates to the fact that we maintain a set of excellent professional expertise and facilities at various locations around the state and opportunities present themselves because "we are there."

Following are examples of the impact of K-State Research and Extension in Kansas in the categories of biosecurity, economic development, drought assistance, agricultural management, environmental management, and community health.

Biosecurity

When the nation was shocked by the tragedy of September 11, 2001, a sense of fear gripped the nation. Our people sought security from terrorism. One element is biosecurity, or the protection of our food supply. K-State Research and Extension had finished development of a distance diagnosis system for insect and disease pests of crop plants, whereby a county extension agent

takes a picture of a condition with a digital camera, relays the image by internet to our diagnosticians in Manhattan, and gets an immediate diagnosis and control recommendation back to a producer or homeowner in a matter of minutes. In 2002, Secretary of Agriculture Anne Veneman flew to Wichita to announce a \$900,000 grant to our Department of Plant Pathology to establish an early warning system for intentional infections of crop plants with diseases. K-State became one of five regional centers for this activity. During the year, K-State quickly organized the early-warning system for the northern Plains states and the organization and data base management system was adopted by two of the other four regions. Now, 28 states are following Kansas's lead. This system developed quickly because of the presence of appropriately educated professionals located in county extension offices in nearly every county of the nation, and the infrastructure of plant diagnosis laboratories in nearly every land grant university. These resources put in place for peace-time protection of food crops are equally useful for biosecurity.

Similarly, the network of veterinary colleges and animal science departments located at land grant universities has made similar early warning diagnosis systems for food animal diseases possible. Kansas State University has been recognized as a national leader, along with Texas A&M and Purdue Universities, in research and education related to security of the nation's food supply. We have been able to respond quickly to these external threats because Kansas had previously invested in the capacity of personnel and facilities across the state to protect our agricultural industries from naturally occurring crop and livestock pests.

Economic Development

K-State Research and Extension contributes to economic development. We have performed many studies over the years to improve productivity and competitiveness of Kansas agriculture. For example, wheat varieties developed at K-State are grown on 80 percent of the wheat acres harvested in Kansas. We develop and teach production methods for the major commodities grown in the state. We also assist producers in building businesses based upon the processing and distribution of commodities.

K-State Research and Extension is leading a new initiative in global cereal comparative genomics to map the genetic code of cereal grains. This initiative involves genetic scientists from around the nation along with the cereal germplasm collections at the International Agricultural Research Centers. The purpose is to thoroughly understand the genetic codes for cereals to improve and speed crop breeding practices to build higher value characteristics and stronger environmental and pest resistance in food crops. This effort is being coordinated by K-State scientists and funded by the U. S. Agency for International Development.

Our newest approach to food animal nutrition and physiology is to learn how to control the development of meat quality as muscle is being formed. In both beef and pork nutrition programs, scientists are discovering ways to enhance the omega 3 fatty acid content of meat, which contributes to healthy hearts in consumers. We are working to make basic beef and pork into a higher value functional food product.

In the last session of the Legislature, an appropriation was made to build a bioprocessing and value added facility. Designs are complete and contracts have been signed to begin construction. This

facility will permit Kansas entrepreneurs with a food or nonfood product idea to interact with our scientists within this facility to develop the process, make a test market quantity, and spin off businesses onto the Kansas landscape which will convert agricultural commodities into higher value products. Potential products include breakfast cereals, industrial chemicals, plastics, pharmaceuticals, adhesives, and fuels. We are working now to build a Director of Business Services into this center to help businesses based on new products get started successfully. County extension agents are being trained to represent these technical and business services in their counties to lead those interested in new products to resources at the university where they can get business development assistance.

Another resource is the new Agricultural Marketing Resource Center (AgMRC), a USDA grant project with Iowa State University and the University of California–Davis. The mission of the AgMRC is to do research and outreach to improve the profitability of marketing activities for beef and wheat producers.

The Kansas Cooperative Development Center, on campus, works with groups of producers to find business opportunities, such as, The All Natural Beef Cooperative, the Nicodemus Flour Cooperative, Earth Pals composting operation, VB Farms (a certified organic operation), the KS/NE Meat Goat Growers Cooperative, and the Great Plains Herb Growers Association. Our Food Science Pilot Lab performs new product food testing and nutritional labelling; a \$50,000 grant from the Agricultural Product Development Center provided enough resources to provide services to Kansas food producers which would have cost \$440,000 in private labs. Our Meat Science Pilot Lab turned a similar grant of \$10,000 into \$36,000 worth of technical services for small meat cutting plants.

Drought Assistance

Drought requires special approaches to management of agricultural operations. Numerous conferences, workshops, tours, and field days have demonstrated management practices with low moisture, e.g., baling immature grain crops for hay, resisting overstocking of pastures, policy changes allowing haying on CRP acres, avoiding livestock poisoning with stressed hay crops, water management, etc. Many of these topics have been disseminated through news releases at the state and county levels and on the Agriculture Today radio program. The Oznet drought website (www.oznet.ksu.edu/drought) has been established for 24-hour access to drought management and weather information. County extension agents provide one-on-one consultations in the field.

Agricultural Management

When the new, complex farm bill was passed, producers found optimal participation decisions difficult. K-State extension economists developed computer spreadsheets to guide producers through the decisions. More than 200 producer meetings were held with the USDA Farm Service Agency to discuss decision options, involving more than 25,000 participants. More than 4,250 individual producers have met with county extension agents and economists to work through the spreadsheet. Dale Ladd, agent in McPherson County, noted that in his county alone he has worked with 150 farmers on the farm bill, 100 of those with the spreadsheet averaging 5 to 6 farms per producer, and that some of these individuals were not regular users of extension

services.

K-State maintains a farm analyst program with several producers who have received special financial training to respond to requests by other producers to provide financial analysis and recommendations individually. This program is credited with saving many family farms on the verge of bankruptcy.

The Kansas Farm Management Associations maintain one-on-one financial record analysis for 2,500 farms in Kansas. By agreement, the university stores production and financial data to be aggregated for analysis. This data is used for individual and group farm management education and for policy analysis showing the impacts of policy proposals on the financial conditions of the farm population. The Kansas Farm Management Associations are the only university connected programs left in the nation and economists and policy makers from several states use Kansas farm data for analyses.

A new farm management education program has just been established to provide depth of education, Management Analysis and Strategic Thinking (MAST). This is a four-month class program whereby producers come together in a class setting briefly, go home and study seven management modules on CD-ROM, interact in computer chat rooms, take tests, and graduate. This has been an answer to producer requests for more in-depth knowledge of management related to career farmers.

The Kansas Center for Sustainable Agriculture and Alternative Crops (KCSAAC) has been serving as a broker between sustainable agricultural adherents and scientists at K-State. This group has held organic farming schools, established a computer-based local foods directory to connect local producers with local consumers, facilitated \$780,000 in producer grants, and organized the sustainable agriculture roundup annually. We have passed out the KCSAAC annual report to you today.

Environmental Management

Extension specialists are active in testing and demonstrating "best management practices" for farm and ranch production with minimal environmental impact. Kansas is under court order to cleanup its waterways to specific Total Management Daily Loads (TMDLs) of specific nutrients. K-State Extension has organized a TMDL Working Group of Kansas agricultural associations to discuss ways to gain access to members to deliver the message of water quality protection practices. Six watershed specialists were hired to provide concentrated education and training to producers on severely polluted watersheds. Many people applied for these positions, but when the groups of producer groups and regulatory agency personnel interviewed the candidates, all of those selected were experienced county extension agents because of their clear abilities to organize and communicate with producers. After being active for three years, these extension watershed specialists are very popular for what they can do with people actually on the land. The 2003 Kansas Water Plan lists the strategy for approaching the TMDL issues in all 12 basins as turning to K-State Research and Extension for watershed education.

K-State Research and Extension has established a water quality research and demonstration site

on campus near our livestock nutrition facilities. This site includes work in manure composting, wetland systems for cleansing wastewater, and use of manure and wastewater for soil fertility.

The Ogallala aquifer decline is a public issue. K-State Research and Extension has for many years provided research and education for irrigators on ways to minimize water use for profitability. K-State has a mobile irrigation educational laboratory which can be taken to field days or individual farms to demonstrate the integrity of the irrigation system, precision application of irrigation water for each stage of growth of the crop plants, and economic and irrigation scheduling information. Extension also maintains a number of weather stations across the state to provide farmers the necessary climate data to manage irrigation scheduling.

Community Health

About eight years ago the Kansas Health Foundation created the Distinguished Chair in Community Health in Extension at K-State. Their purpose was to gain access to the local information delivery system of the county agent network. The Office of Community Health was created around this position and numerous programs related to nutrition and exercise, public health, healthy behaviors for youth, and immunizations have been implemented.

K-State was awarded, for the first time in 2002, a USDA AgrAbility grant, in cooperation with Southeast Kansas Independent Living and Assistive Technologies for Kansans, both of Parsons. Since the project began in May, 2002, more than 40 clients have been served, whose disabilities range from arthritis to spinal cord injury. The project provides information on farmstead modifications, assistive technology, farm task restructuring, and farm safety and brings individuals into contact with disability service providers.

The Kansas Department of Social and Rehabilitation Services contracts with K-State Research and Extension, through the Family Nutrition Program (FNP) to provide nutrition education for low income families on food stamp, surplus commodity, and WIC programs. This program operates in more than 80 counties.

The Kansas Department of Health and Environment works with K-State Research and Extension to deliver ServSafe, a food safety education program for school food service workers, restaurant workers, and other food handlers. K-State offers this program in rural county offices to make it more available since the state offers the program only in larger cities.

Last year the Walk Kansas program engaged more than 7,000 individuals in an exercise program to change physical activity habits of Kansans. This program is one element of an obesity control program. Teams of six people agree to collectively walk 423 miles, the breadth of Kansas, over an eight-week period in spring. In 2003 teams are forming and the goal is to double the number of participants. These teams are organized through county Extension offices.

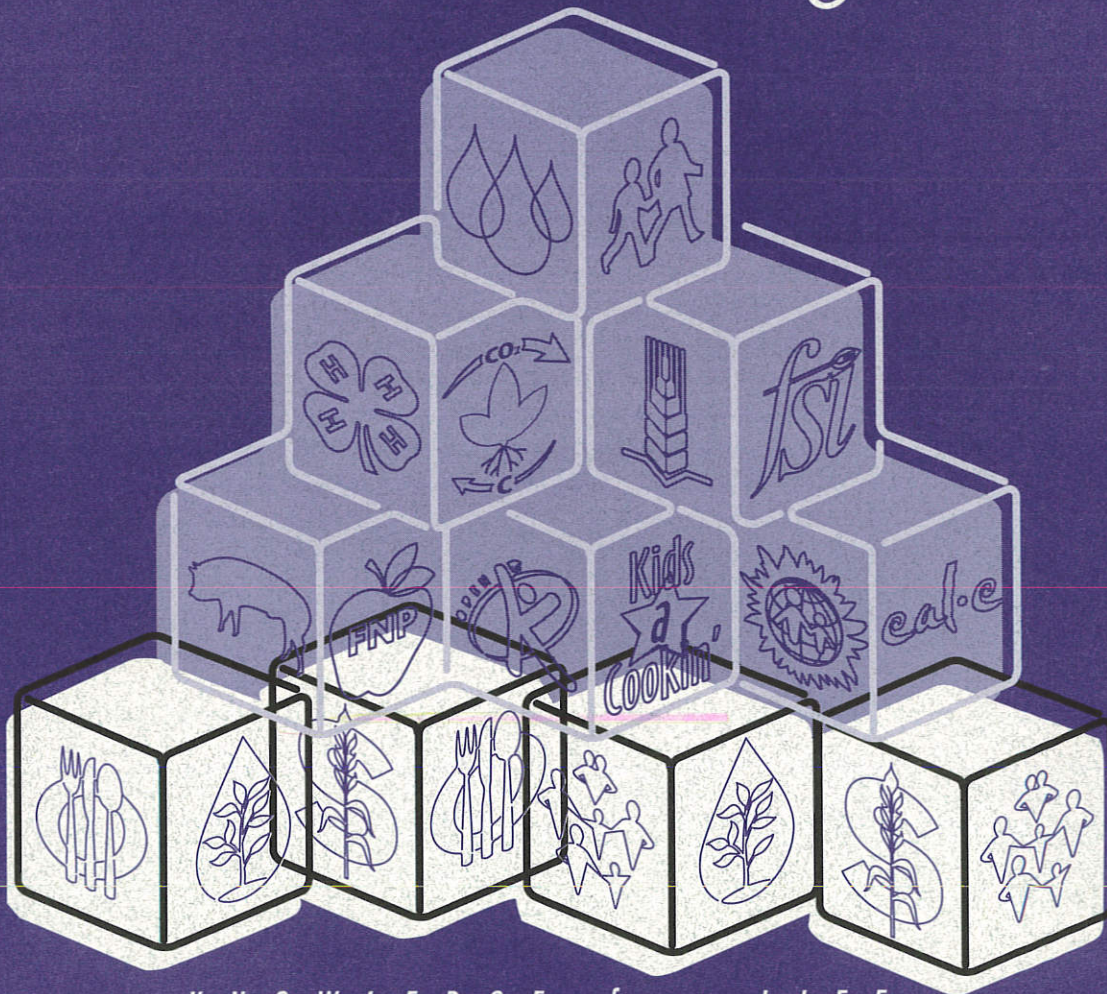
The 4-H Youth Development program has been in Kansas for 100 years. Young people ages 7-18 are engaged in experiential learning activities to enhance leadership, problem solving, and career awareness. Employers of K-State graduates mention that they specifically look for involvement in 4-H during interviews for employees.

One of the newest discoveries has come from a collaboration between animal science and veterinary scientists. Stem cell technology has been found to be promising in therapy for diseases and injuries of the nervous system, e.g., Parkinson's disease. Earlier, the ethical controversy occurred because stem cells were found primarily in human embryos. K-State scientists have found active stem cells in the umbilical cords of food animals and humans. These cells exhibit telomerase activity, a key indicator of stem cells and they have been induced to form nerve cells. These stem cells are produced in tissues which are normally thrown away after the birth of a healthy baby. This may be the discovery which takes stem cell treatments out of the realm of severe ethical controversy.

Conclusion

K-State Research and Extension is a silent partner with the people of Kansas. Our motto is "Knowledge for Life." We provide access to knowledge where people can use it: on a website, on a farm, at a residence, or in a community. The knowledge delivery network has had the same purpose for decades, but the topics of interest and the means of communication have changed over time. K-State Research and Extension is the way the land grant university remains engaged with potentially every Kansas citizen, potentially throughout their lives.

K-State Research and Extension
**An Informal Report
to the Kansas Legislature**



KNOWLEDGE for LIFE

January 2003

*Kansas State University Agricultural Experiment Station
and Cooperative Extension Service*

Director's 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 are about to begin the planning procedures for 2004-2008. Our guiding principle is summarized by our motto: "Knowledge for Life."

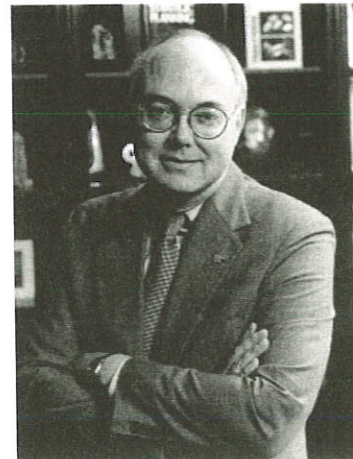
Our core programs remain strong. Despite the setbacks, we will strive to meet the expectations of Kansans.

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.

Sincerely,



Marc A. Johnson
Dean and Director



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Four Core Mission Themes

As part of its Five-Year Work Plan (1999-2003), K-State Research and Extension developed Four Core Mission Themes. Those Four Core Mission Themes are



Agricultural Industry Competitiveness



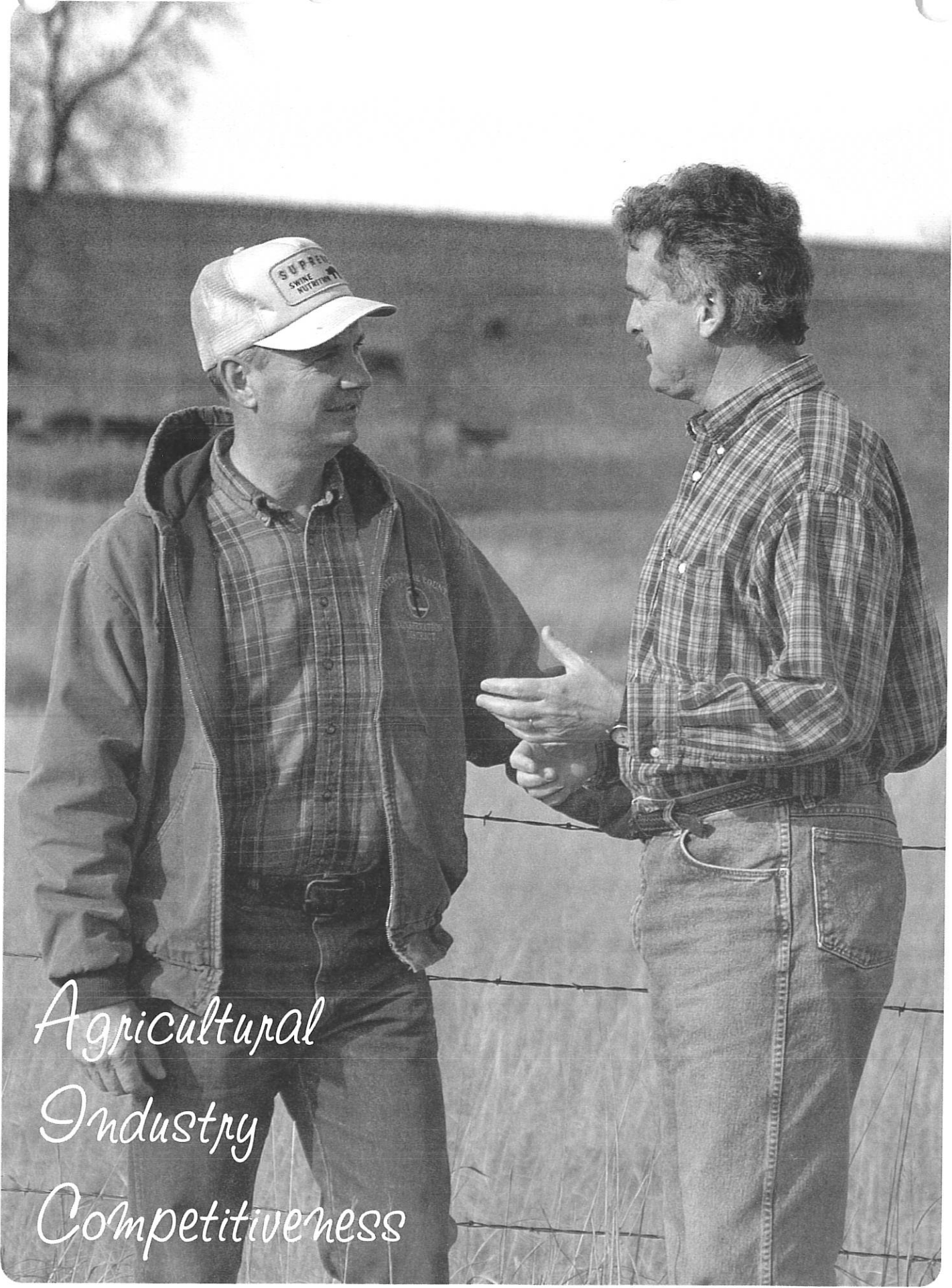
Natural Resources and Environmental Management



Food, Nutrition, Health, and Safety



Youth, Family, and Community Development



*Agricultural
Industry
Competitiveness*

Agricultural Industry Competitiveness



In this area, 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; and develop agricultural technologies and information systems.

EXTRA VALUE MEANS EXTRA INCOME

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 to add value to soybeans involved developing industrial adhesives and resins from that commodity.

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.

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

What follows are examples of work at K-State:

Ways K-State Research and Extension Helped with the Drought

For more than 100 years, K-State has provided knowledge that helps solve or alleviate problems. For example, here are six ways that K-State responded to the drought of 2002:

1. Presented weekly and biweekly crop and forage teleconferences among agents and specialists who discussed current drought conditions and issues. As a result, information was gathered and developed that was used in radio broadcasts, newsletters, 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 meetings in Kansas counties initiated by K-State brought livestock producers together to discuss and share planning and decisions.

2. Identified the need for pasture and hay exchange among ranchers; 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 either one.
3. Provided current and historical weather data from the Weather Data Library of K-State Research and Extension to state and federal agencies needing that kind of information.
4. Developed a drought Web site with information on current drought situations, decisions, and planning for crops and livestock.
5. Held numerous conferences, workshops, tours, and field days around the state on the extremely dry conditions and options and consequences of farm-level decisions. Also planned a series of winter meetings focusing on spring planting decisions.
6. Agents and specialists consulted one-on-one with producers on the impact of the drought on farming operations. They also provided drought-related information to their local areas through newspaper columns, radio programs, and K-State Research and Extension publications.



Investigating New Ways to Add Value to Soybeans

K-State Research and Extension scientists are studying ways to create industrial adhesives and resins from the soybean. This research initiative could result in nearly quadrupling Kansas soybean production while also creating higher demand and increased commodity prices. Another impact of this research could be to reduce the 20 billion pounds of petroleum-based adhesives used annually. The soy protein adhesives used in particle board and plywood could potentially cut the current use of formaldehyde-based adhesives in half. The project includes research on the structure of adhesives based on soy protein and gene mapping of soy protein and oil. It also will identify better soybean varieties for soy protein and oil-based adhesive applications.

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Utilizing Wheat Protein in Coffee Creamers

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. 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. The research could open opportunities to study and utilize other wheat-based liquid products.

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Whole-Wheat Products Found to Fight Cancer

K-State Research and Extension scientists are investigating a component in wheat bran that can kill cancer cells. A chemical component found in wheat bran—called an orthophenol—acts as an antioxidant to kill cancer cells. The component is most common in whole-wheat products and less so in highly processed wheat products such as white bread. The researchers have found that mice fed whole-wheat diets were able to reduce tumor size and number of tumors by about 60 percent. The researchers also are studying the health benefits of this for diabetics.

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Developing a Better Case-Ready Meat Product

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. Additional advantages of the K-State process are that it 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 percent 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.

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Reducing Phosphorus and Nitrogen in the Diets of Swine

Phosphorus and nitrogen are the major nutrients of concern for swine farms. K-State swine nutritionists continue to test and implement technology to reduce phosphorus and nitrogen excretion. K-State researchers conducted a series of experiments to reduce phosphorus levels in swine diets. The focus of those experiments was to determine the optimal phosphorus level for finishing pigs and the optimal level of phytase (an enzyme that reduces phosphorus excretion) to add to swine diets. As a result of the experiments, it is estimated that phosphorus excretion in swine will decrease by 30 percent as Kansas pork producers utilize these new swine diet formulations. In the area of nitrogen excretion, K-State swine researchers continue to test the use of higher levels of free amino acids to lower the crude protein and total nitrogen level in the diet. As a result, nitrogen excretion can be lowered by 25 percent to 40 percent depending on the phase of production. Initial results of the series of research trials hold great promise, though fine-tuning of the process is needed before full implementation on Kansas swine farms.

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Multiple Benefits Derive from Feeding Flaxseed to Cattle

Current studies show that adding flaxseed to cattle diets dramatically improves carcass value, strengthens the natural immunities of calves, and may enhance the fatty acid profile of beef. Flaxseed can be added to cattle diets either ground or as a processed oil. In addition to finding that flaxseed strengthens the immune systems of calves, which may require fewer antibiotics, the scientists found that it also improves marbling in beef products and increases carcass value, which is likely to mean more money for the cattle producer. In another study, when flaxseed was fed to finishing cattle, it increased omega-3 fats in their muscle tissues. Omega-3 fats are “the good fats”—they’ve been found to lower the risk of cardiovascular disease and stroke in humans.

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Beef Genetic Evaluation

The Kansas Bull Test program provides an avenue for bull producers to evaluate their cattle's genetics and to provide customers an opportunity to acquire those genetics. The role of K-State in the Kansas Bull Test has evolved for more than 30 years, and K-State continues to provide unbiased genetic and performance information to cattle producers and buyers. The Kansas Bull Test board of directors is made up of representatives from several Kansas beef breed organizations and past KBT customers. K-State Research and Extension personnel assist the board to carry out the rules and regulations of the test as well as collect and disseminate all information concerning the bulls. Bull calves are developed following Beef Improvement Federation guidelines at a commercial feeding facility near Tipton, Kan. Once the 112-day testing period is completed, bulls are ranked on growth potential to qualify for the annual spring sale. Only the top 70 percent of the bulls can qualify to make the sale, and they must pass a complete Breeding Soundness Examination before entering the sale ring at the annual bull sale held the first Wednesday of April at the Mitchell County Fairgrounds, Beloit. Normally, the bull sale will gross about \$250,000 and send bulls to herds in Kansas and surrounding states. The Kansas Bull Test provides an opportunity for bull producers to evaluate and sell their bull-produced genetics regardless of the size of their ranch or facilities.

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Responding Rapidly to Diagnose Plant Problems

K-State is one of the first universities in the nation to offer Rapid Response Centers for plant, insect, and food problems. Specialists are available 40 hours a week to give rapid responses to county extension agents who receive questions on home and industry horticulture, food preparation, and food safety. A distance diagnostics system is in place for county agents to send digital pictures of a plant or insect by Internet to a specialist on campus to get a quick diagnosis of the problem and a recommended remedy. K-State is one of the first universities in the nation to offer such a service. The diagnostic labs on the K-State campus in entomology, horticulture, plant pathology, and the herbarium are providing the expertise for the program. They also are linked with experts across the nation and globe for their opinions on problems particularly puzzling. Distance diagnosis won't replace what K-State Research and Extension has been doing for years. Agents and other faculty continue to scout problems in fields and landscapes and talk to Kansans personally. When a quick response is needed, the distance diagnosis system can provide it quickly, which can often mean the difference between saving a plant or a crop or losing it.

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Homeland Security Grant of \$900,000 Aids K-State Rapid Response Centers

K-State received \$900,000 as part of the federal government's program to improve surveillance, early detection, and rapid response for plant pests and diseases. K-State already established Rapid Response Centers for quick diagnoses of potential problems in farm crops and horticultural plants. Kansas Livestock Commissioner George Teagarden said, "It's good for Kansas. It gives us some opportunities to do a number of things that we'd like to do to be better prepared." The money will be used to purchase equipment, hire personnel, and support research, including developing molecular techniques and cutting-edge diagnostic tools for use across laboratories. In addition to enhancing K-State's rapid diagnosis capabilities, K-State Research and Extension will be able to develop broader spectrum and more durable resistance in farm crops. Even if there are no terrorist attacks, these new capabilities will benefit society by helping to develop broader spectrum and more durable resistance in farm and horticultural crops.

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Mutant Rice Project May Help World Food Supply

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 in 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 from a \$500,000 National Science Foundation grant. Different genes serve different purposes, but scientists don't know what each gene does. When a gene is eliminated, the rice mutates. Scientists can then see what that gene used to do for the plant. The "deletion collection" will be a tool to allow researchers to find genes they want to work with, 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 don't help battle disease, researchers may find it helpful to turn them off. Scientists constantly need to engineer new plants that resist insects and disease. Each time a new pathogen-resistant gene is utilized, the pathogen eventually overcomes it, so a new one is needed. At stake is 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.

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Collaboration: Scientists at The Ohio State University, University of California-Davis, Iowa State University, and the Philippines.



How One Farm Couple Learned to Manage Risk Better

When Kent and Rebecca Ott wanted to learn about how to manage price risk and to effectively use markets in their farming operation, they turned to the Sedgwick County Research and Extension agents. The Otts took advantage of classes offered by agents to learn all they could about how markets work. They own a diversified grain production operation, including corn, grain sorghum, soybeans, and wheat. What they learned has enabled them to weather a long stretch of low commodity prices and keep their operation profitable. They found options and futures contracts could be very scary. Their conclusion: They found expert advice in that area to be very helpful. Others in the Wichita area who have a business problem can learn more about help available from the K-State Research and Extension Office's Web site at www.oznet.ksu.edu/sedgwick.

Contact: Steven Westfahl, Sedgwick County Research and Extension Office, Telephone: 316-722-7721, FAX: 316-722-7727, E-mail: swestfah@oznet.ksu.edu

K-State Wheat Varieties Preferred by Kansas Wheat Farmers

Wheat varieties developed by K-State Research and Extension totaled more than 80 percent of the planted acres in Kansas. For the 2002 crop, Jagger was the leading variety of wheat seeded in Kansas, accounting for 42.8 percent of the state's wheat acreage. The KSU variety 2137 ranked second. Karl improved to third. Wheat research is partially supported by funding from Kansas wheat producers through the Kansas Wheat Commission and certified seed producers through the Kansas Crop Improvement Association.

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Still Important—Research and Extension Field Days

It has been a tradition for K-State Research and Extension to hold field days across the state where anyone interested can learn about the latest advances in agriculture. For example, the 2002 Agronomy Farm Field Day in Manhattan (now called an Expo) provided demonstrations and talks on such topics as precision agriculture, soil profiles, wheat breeding, corn/grain sorghum comparison, soil compaction, and manure management. In addition to the Manhattan location, seven other experiment fields and two satellite locations are spread around the state. Crop variety and herbicide performance tests are conducted at all of those places. The fields also are important sites for nurseries to support plant-breeding programs in sorghum, wheat, alfalfa, soybeans, and canola. At most locations, studies are done on long-term cropping systems and the effects of crop rotation, tillage, fertilizations, and other management practices. Irrigation management and water-use efficiency work is conducted at three of the locations. The fields also play a key role in technology transfer.

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Plums Found to Kill Pathogens in Meat

K-State researchers have found that raw meats mixed with as little as three percent of plum extract are over 90 percent effective in suppressing the growth of such major food-borne pathogens as *E. coli O157:H7*, *salmonella*, *listeria*, and *staphylococcus*. 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. Future research will focus on determining if plum extracts can extend the shelf life of meats.

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Soybean-Sorghum Rotation Boosts Sorghum Yields

Two studies by K-State have documented specific yield benefits gained by planting soybeans as part of a sorghum-soybean rotation rather than keeping a field in continuous sorghum. A five-year study in northeast Kansas found a 17-bushel advantage per acre for sorghum after soybeans compared to continuous sorghum. An 18-year study in north central Kansas found a 23-bushel per acre advantage for sorghum in the soybean-sorghum rotation.

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Risk Management Workshops on Prices and Yields

Growers identify prices and yields as major risks in their operations. K-State Research and Extension ag economists have been presenting workshops around the state designed to help growers price a crop before harvest using forward contracts, futures, options, and other pricing tools. Utilizing such information and combining it with crop insurance can reduce financial risks. Information on risk management also is available on a Web site, the KSU Risk Management Home Page at www.agecon.ksu.edu/risk/. This site receives more than 2,600 visitors each month. Also, Successful Farming's Web site is posting information from the KSU Web page, giving that information even wider exposure.

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The Horticultural Food Crop Production Project

This project involves a number of horticultural investigations at the K-State Research and Extension centers in Olathe and Wichita. One example of the work involves developing a system of growing tomatoes that produces high yields of good quality tomatoes. Another example focuses on assessing the adaptation of different medicinal plants. The project recommends superior varieties or practices for commercial horticultural food crop producers or homeowners.

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Historical Research Publications Available on CD

Sixty years of research from the Kansas Agricultural Experiment Station—from 1888 to 1945—is available now on a set of four compact discs. The Harvest of Knowledge CD-ROM library contains the full text and illustrations of nearly all of the publications published by the Kansas Agricultural Experiment Station from pioneer days through the Depression and two world wars. It includes more than 24,000 pages of publications on crops, pasture, gardening, foods, weeds, insects, diseases, livestock, machinery, buildings, soils, natural resources, farm economics, and farm life.

The CD set costs \$36.50 and can be ordered by e-mail at orderpub@lists.oznet.ksu.edu or from Kansas State University, Production Services, 24 Umberger Hall, Manhattan, KS 66506-3402.

Delivering High-Level Farm Management Information to Those Who Need It

Few producers can take several months, much less several years, to head to a university town and take classes amid planting and harvesting and everything in between. A new K-State program makes it easier for producers to learn new ways of managing their businesses—mostly in the comfort of their own homes and on their own schedules. The Management, Analysis, and Strategic Thinking (MAST) Program combines face-to-face workshops with state-of-the-art distance education techniques to deliver high-level farm management information to farmers and ranchers. After a two-day orientation session on the K-State campus, participants then learn through distance education methods from their personal computers at home, which is accomplished through learning modules that focus on farm management tools and their applications. Producers can work on lessons when time is available. Time also is built into the process for students to have online discussions with other participants and the instructors. After the modules are completed, MAST participants return to the K-State campus for a final program that emphasizes applying what they learned to their own operations. More information is available on the Web at www.agecon.ksu.edu/mast/

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Gene Research Leads to Greenbug Resistant Wheat

KSU scientists have located and characterized a gene from bread wheat that expresses resistance to greenbug. Wheat genotypes containing the gene were linked to molecular markers on the short arm of wheat chromosomes 7D and 7A. These results can increase wheat-breeding efficiency by approximately 30 percent by allowing the use of molecular markers to track greenbug resistance genes in wheat-breeding populations.

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Whole Farm Planning

K-State Research and Extension is reaching out to Kansas farmers by providing information on Whole Farm Planning, a process that takes into consideration the economic, social, and environmental factors involved in farming. According to some estimates, only about 30 percent of farmers have a clear idea of their break-even costs for their major market commodities and only five percent have done a recent calculation. Short-term profits will increase as farmers utilize Whole Farm Planning to determine how to decrease input expenses and increase returns through alternative and value-added marketing options. Long-term financial benefits will accrue to farmers who utilize the knowledge and techniques available to preserve water quality and improve soil quality. Social benefits can be realized by those who engage in Whole Farm Planning. Spouses begin to communicate about farm goals, life goals, and other shared values. Children and parents also are brought into the planning process. As Whole Farm Planning reaches more people, it can create awareness that the land is more than just an investment to hedge against inflation but also a living resource needed to sustain the future productivity of the heartland.

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Finding a Natural Alternative to Pesticides in Stored Grain

K-State researchers are teaming with Dow Agro Sciences and the USDA Grain Marketing and Production Research Center to test the efficacy of Spinosad as a stored-grain protectant. Spinosad is a reduced-risk commercial pesticide that is naturally derived. Safer and effective alternatives to pesticides are needed because of insecticide resistance in stored-grain insects and because the 1996 Food Quality Protection Act has placed existing organophosphate grain protectants at risk of being eliminated. Three Kansas wheat producers are helping the researchers by providing farm bins for field efficacy trails. The ongoing research at K-State and the Grain Marketing Center is producing positive results for the control and management of stored-wheat insects by Spinosad.

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Collaboration: Kansas Wheat Commission, Dow AgroSciences, and Kansas farmers. For photos of the Spinosad experiments you can visit www.oznet.ksu.edu/grsc_subi under the "What's new" link.

The Kansas Locally Raised Food Directory

A new directory from the Kansas Center for Sustainable Agriculture and Alternative Crops will help farmers advertise their products to consumers. The online Kansas Locally Raised Foods Directory lists information about Kansas food producers and their products. Participants can register at no charge, and the directory is not limited to fruits and vegetables but also includes meat, poultry, dairy, grains, and baked products.

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The Benefits of Rangeland Management Research

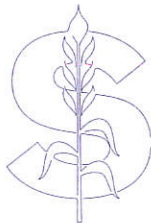
Kansas produces about 1.5 million cows and heifers annually, with nearly one-tenth, or 150,000, of those breeding animals in the nine-county area surrounding the Agricultural Research Center—Hays. The economic impact of implementing complementary forage and forage grazing systems could save producers 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. K-State researchers are focusing on utilizing 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.

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New Product Developed at K-State Could Help Spur Demand for Lamb

Scientists with K-State Research and Extension have developed a precooked lamb product in curry sauce that can be stored in the refrigerator for up to 150 days and can be cooked in seven minutes in a microwave oven. Lamb is not popular with consumers, but this product could change that. A taste panel trial showed that the taste was “just fine.” Few in the panel could tell the difference between lamb and beef they were served. The product is cut from the lamb shoulder, which is a part of the carcass that has been hard to market in the past. By using that cut, producers will get more money for lamb meat. Also, the lamb shoulder may be less expensive for consumers in addition to being tender, flavorful, and juicy.

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Experimenting with Plants in Outer Space

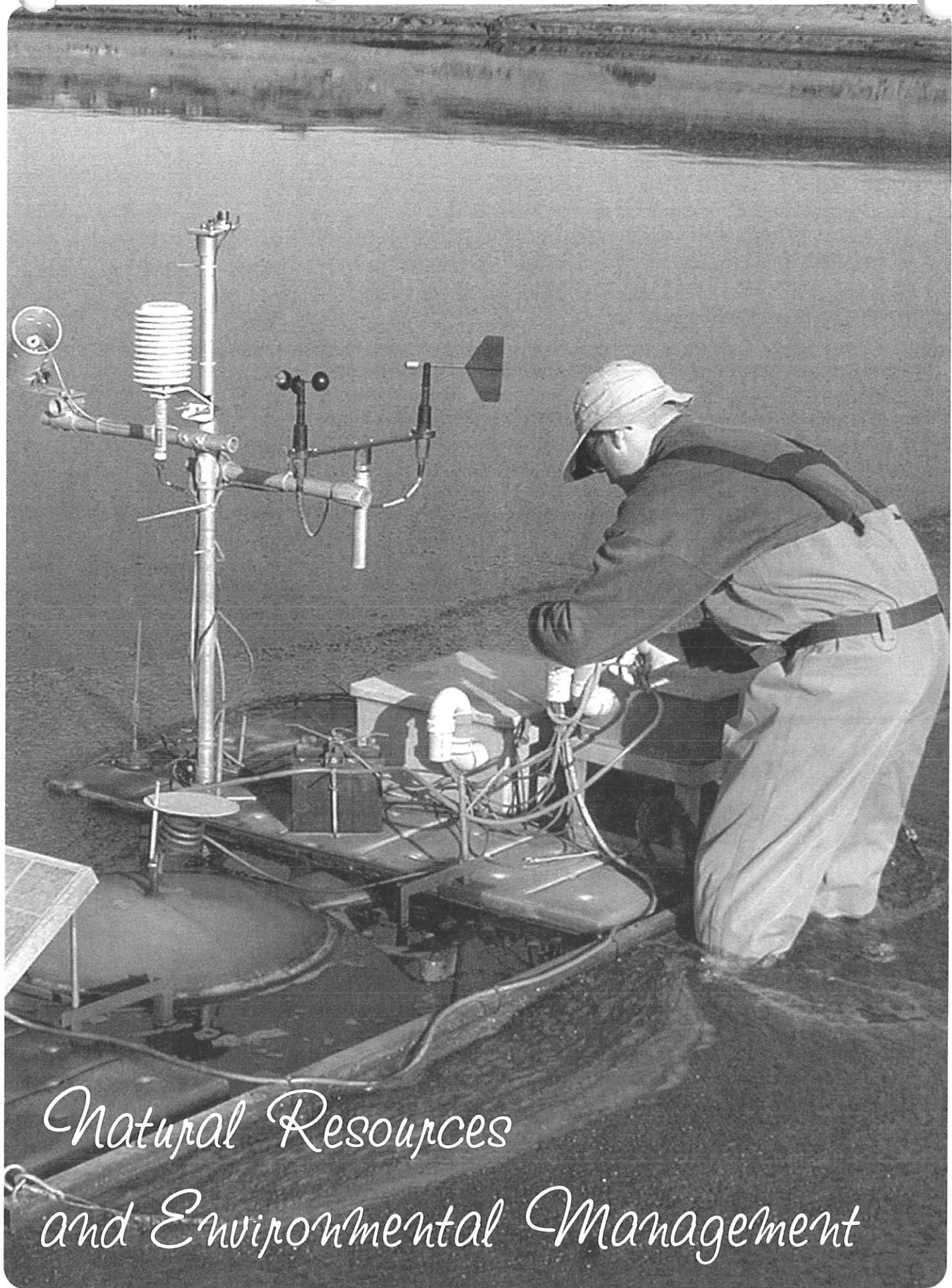
K-State researchers received a \$600,000 grant from the National Aeronautics and Space Administration to study growing plants in space. The K-Staters are one of five research teams in the nation studying the potential to grow plants in environments without gravity. The work at K-State focuses on the behavior of water and air in soil under zero gravity or microgravity. The ultimate goal is to develop enough knowledge to do plant testing under a variety of conditions.

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Kansas Crop Variety Testing

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 and electronically on the Web: www.ksu.edu/kscpt/. Farmers utilize the information because it can add value to their enterprises. For example, if wheat 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 percent of those acres to that variety would produce an additional \$1.8 million in gross farm income for western Kansas.

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*Natural Resources
and Environmental Management*

Natural Resources and Environmental Management



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; generate systems for improved soil and air quality; and maintain plant diversity.

Water Quality Initiative Continues to Make Progress

In the mid-1990s, Kansas Gov. Bill Graves enlisted the help of K-State Research and Extension and groups from agriculture, industry, city governments, federal and state agencies, and the private sector to help improve the water in the state. The initiative united efforts of the private sector, agriculture, industry, state, and federal and local governments to protect and improve water quality. These groups worked together to fund research and implement activities, educate their constituencies through workshops and other efforts, and support effective change for water-quality improvements. Accomplishments have included:

Technical and financial assistance—Property owners received technical and financial assistance to address various environmental management practices. Local-level, incentive-based efforts, delivered through USDA-NRCS and the State Conservation Commission and local conservation districts, helped residents implement such water-quality protection practices as conservation tillage, nutrient management, pest management, terraces, and grade-stabilization structures. The Buffer Initiative offered an incentive to landowners to plant trees and restore riparian areas. Livestock waste management systems were improved in several locations, and practices were promoted to reduce cropland nonpoint source pollution.

Monitoring—K-State Research and Extension sampled water quality at specific locations in targeted watersheds during runoff events. This sampling provided a baseline for measuring improvement.

Research—K-State scientists focused on optimizing Best Management Practices to protect water quality through cropping practices and livestock waste management. Research directed at urban water quality included information on predicting water quality changes as development occurs and methods to reduce the impact.

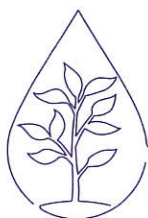
Education and Information—K-State Research and Extension watershed specialists visited one-on-one with farmers about Best Management Practices.

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An Example of How K-State Stays on Top of Current Issues

Shortly after the Kansas and Missouri rivers were designated as two of the four most endangered rivers in the nation because of pollution, K-State Research and Extension held a meeting for the news media to provide information on water quality and other conservation projects and issues at the university. The meeting coincided with Earth Day 2002. Topics ranged from Management Practices to Protect Water Quality to Livestock Waste Management and from Fecal Bacteria Contamination in Streams to Assisting Local Governments in Protecting Drinking Water. The news media toured K-State's Waste Management Center to learn how rural and urban areas can benefit from new university research, including composting for communities.

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Investigating the Environmental Benefits of Carbon Sequestration

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. It has been estimated that 20 percent 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.

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Immobilizing Soil Contaminants with Horseradish

A research project at K-State is focusing on using horseradish to clean up petroleum-based contaminants in soil. An enzyme from horseradish has been discovered that attacks phenols—acidic compounds found in pesticides, petroleum, and plastics. Adding the enzyme to soil speeds up the natural process of turning animal and plant residue into organic matter by causing toxic chemicals to bind to the soil and preventing them from seeping into groundwater.

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Walking the Talk on Waste Management

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. Livestock waste compost has advantages over other compost materials because it has a lower water content and is more stable, and its nutrients are released slowly. It's also environmentally friendly. The demonstration site is two miles north of the K-State campus with access to dairy, swine, and beef manure by-products. 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 and 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.

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Wetlands Offer Wastewater Cleanup Alternative

Engineers with K-State Research and Extension are testing the suitability of wastewater treatment wetlands in Kansas, a technology already used extensively in states with warmer climates such as Tennessee, Kentucky, and Arkansas. The wetlands are fairly low-cost to build and maintain, and they can be retrofitted to such existing treatment systems as small wastewater municipal plants, rural residential septic systems, industrial wastewater systems, and small dairy or livestock operations. Eight experimental wetlands are being tested in east and southeast Kansas, four at residential sites and four at small dairies. The process involves sending water from a septic tank or anaerobic lagoon into treatment wetlands designed so that the water moves slowly through the system, giving plants time to process organic matter and nutrients and filter the water. The water plants detain any pathogenic microorganisms that then either die, are eaten by other organisms, or are irradiated by ultraviolet rays near the water surface. Any metals adhere to particles in the water and settle out.

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A Way to Use Less Water on Crops in Western Kansas

Because the Ogallala Aquifer is diminishing—it's the main source of water for irrigated crops in western Kansas—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 percent compared to the overall average for continuous irrigated and dryland crops. The irrigation phase provided more residue to the soil, which aided in water storage and protected the soil from wind erosion. The conclusion: Producers and the environment would benefit by alternating irrigated and dryland crops to avoid the fallow sequence. That will give the most efficient use of limited irrigation water and limited precipitation.

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Watershed Specialists Provide Local Assistance

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.

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The Blue River Compact

The Kansas-Nebraska partnership, of which K-State Research and Extension is a part, effectively monitors water quality and promotes practices to prevent runoff of pesticides into the Big Blue River. The work is being conducted under the auspices of the two states' Big Blue River Compact. Water samples regularly are collected at 22 locations through the basin and analyzed for pesticide, nutrient, and bacterial levels. New sites are being added in Nebraska and Kansas in the upper tributaries (Upper Horseshoe Creek, Lower Horseshoe Creek, Big Indian Creek, and Turkey Creek). The monitoring will help narrow the search for the highest levels of loading. 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.

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K-State Study Allays Fears About Leaking Lagoons

When a debate arose in south central Kansas in the late 1990s involving lagoons in the Equus Beds groundwater basin, county commissioners decided they needed more facts before making far-reaching decisions. They turned to K-State Research and Extension.

"I am 100 percent for water protection," said Gene Wendling, a livestock producer and Harvey County Commissioner. "When the issue arose, we wanted to have the argument fueled by facts, not emotion. That's when K-State got involved."

K-State scientists completed a four-year study in 2001 that provided information on the environmental impact of earthen waste lagoons that are commonly used to collect livestock or municipal waste. The study found that seepage rates were much lower than the previous state standard of one-fourth inch per day.

"The results of the study helped to educate people that lagoons were not leaking as much as originally thought," said Carolyn McGinn, Sedgwick County commissioner. "Some people without all of the information thought the pollutants leaked straight to the groundwater when that is not the case at all."

Kenny Meier, Harvey County commissioner, said he agreed with the results of the study. "The bottom line of the research helped to base regulations to a site-specific process rather than blanketing the entire state with the same qualifications," he noted.

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Saving Precious Water— and Money—Is Goal of Mobile Irrigation Lab

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.

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Sustainable Ag Center Helps Farmers and Is Good for the Environment

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 production and direct marketing. The 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.

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Dairy Ecological Pollution Control Demonstrations

This project involves gathering on-site information on the nutrient removal rates of an ecological system in several dairy operations in Kansas. The project utilizes wetland cells and vegetative filters. The nutrients removed by the plants are harvested as forages for feed. The goal of the study is to provide understanding of developing livestock pollution control practices with controlled release rates, which will help producers to install control practices that do not require investments in irrigation equipment for periodic pumping of lagoons.

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Collaboration: Kansas Department of Health and Environment, Kansas State Conservation Commission, USDA, Natural Resource and Conservation Service, Kansas Forest Service, Kansas Department of Agriculture, Kansas Department of Wildlife and Parks, and U.S. Fish and Game.

The Importance of Subsurface Drip Irrigation

K-State has been a pioneer in the use of Subsurface Drip Irrigation (SDI), which is a method of delivering water to crop roots at small emission points from a series of plastic lines spaced between crop rows. It allows producers to use wastewater in their irrigation systems without the odor or risk of human contact or drift because it is applied under the soil. The value of annual water savings associated with widespread adoption of SDI on irrigated areas in western Kansas has been estimated to range between \$175 million to \$350 million. The SDI Web site www.oznet.ksu.edu/sdi has had more than 13,000 page views by more than 4,000 visitors from 44 different countries.

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Management of Konza Prairie Biological Station

Research at the Konza Prairie, the premier site for prairie research in North America, continues to provide a strong base of scientific information to guide regional range management and agricultural and land-use decisions that enhance the conservation, productivity, and sustainability of rangeland ecosystems. For example, survey and satellite mapping were completed and field experiments were conducted to assess effects of grassland management practices and control methods on the population dynamics of exotic plant species. Another project involved conducting on-site K-12 education and teacher training programs in grassland ecology, management, and conservation. Nearly 3,800 persons participated. This community education project enhances science education in Kansas schools and public understanding and appreciation of agricultural and natural resources.

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The National Atmosphere Deposition Program

This program entails weekly collection and chemical analyses of wet deposition at the Konza Prairie and more than 200 other sites nationwide as part of the National Trends Network. Atmospheric inputs of nutrients can negatively impact productivity and structure of grassland ecosystems. Monitoring these inputs is critical for the management of grassland ecosystems because they provide a strong economic base in the livestock industry in Kansas. A long-term record of rainfall and its effect is valuable in identifying changes in nutrient inputs. This program has been in place on the Konza Prairie for 18 years.

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Using Different Tillage Practices to Reduce Herbicide Runoff Losses

Several studies have shown that when recommended levels of herbicides are applied up to 5 percent 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.

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Reducing Water and Pesticide Use in Turfgrass

This research involves evaluating methods of converting the cool-season turfgrass perennial rye to seeded zoysia at golf courses and to reduce fungicide use on creeping bent grass putting greens. Warm-season grasses such as zoysia require up to 40 percent less water and less than one-half the pesticide inputs compared to cool-season grasses. The effectiveness of several methods is being tested to convert cool-season turf to seeded zoysia. One effective method involved glyphosate application. It eliminated rye grass and provided over 75 percent zoysia coverage by the end of the first year and complete coverage by the end of June of the second year. In a separate test, dollar spot disease in creeping bent grass golf greens was reduced by 40 percent using a nonfungicidal plant defense activator.

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Monitoring Surface Water to Understand Contamination in a River Basin

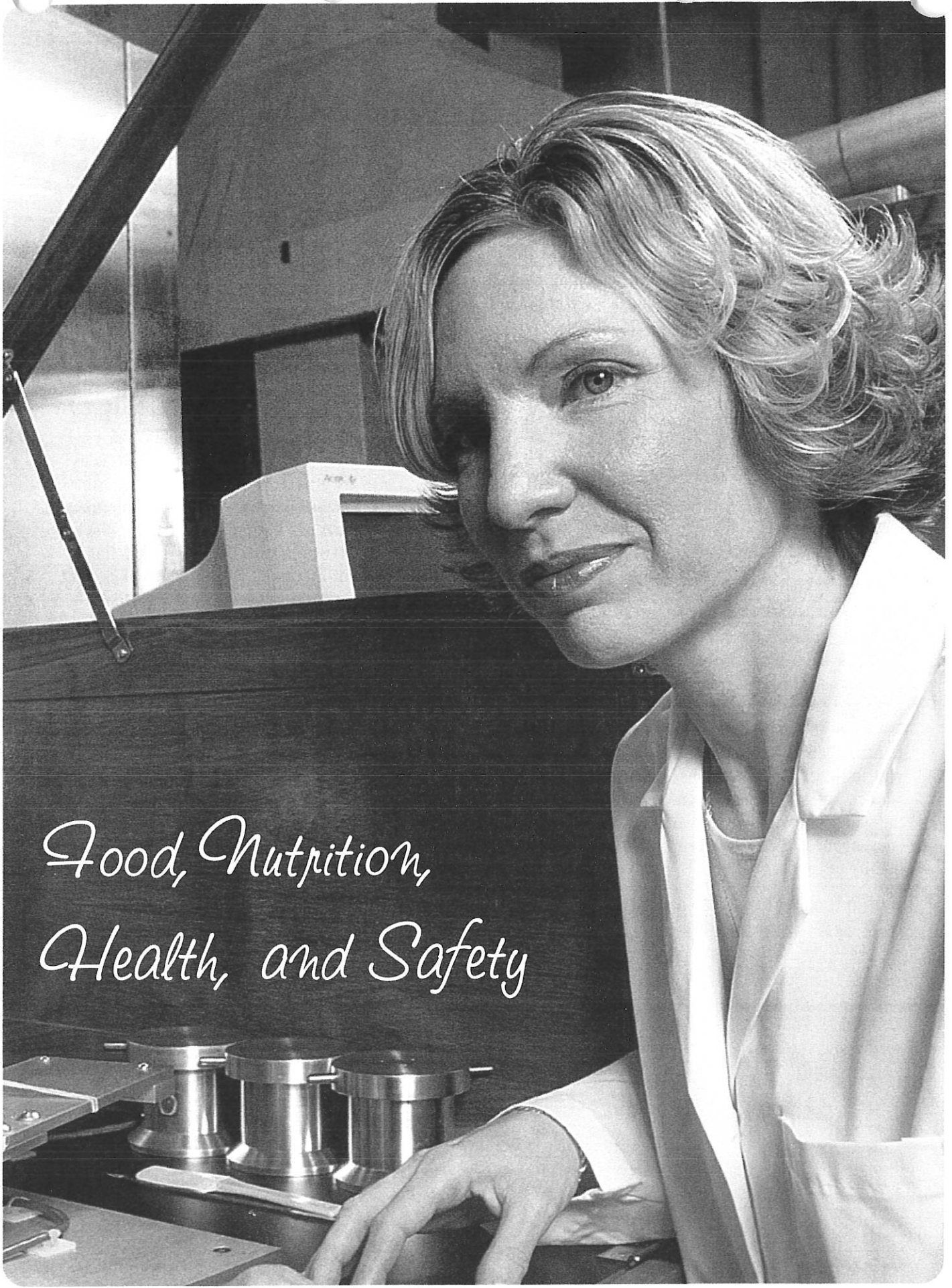
To better understand sources and levels of contamination of surface water in the Kansas Lower Republication River Basin, a surface water-monitoring program has been conducted. Water samples are collected from the point of entry of surface water at the Nebraska border to the point of exit at the Missouri border. Local, state, and federal agencies have been very interested in this project. The results will show 1. Which watersheds contribute heavier contaminate loads to surface water; 2. Seasonal patterns of contaminate loss; and 3. How serious the water problems are in surface water. The results of this project will show agencies, private groups, and K-State where to focus their future water-quality efforts.

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A Program that Helps Kansans with Wildlife Problems

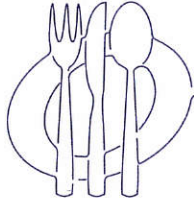
K-State Research and Extension has had a wildlife damage control program for many years. The effort helps Kansans with wildlife problems learn effective ways to resolve them. The director of the program provides publications and newsletters; teaching clinics and workshops; a free-access Web site; and advice to county extension agents on how to help local citizens. The job requires only that he offer practical, research-based information. He neither makes nor enforces any laws. He doesn't compete with pest-control firms or state agencies. He tries to support both Kansans and Kansas wildlife.

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*Food, Nutrition,
Health, and Safety*

Food, Nutrition, Health, And Safety



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; promoting healthier and safer lives; and developing new and appealing food products.

Food Science Institute Established

A Food Science Institute has been created to bring together all of the current food science expertise at K-State. 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.

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New K-State Project to Help Disabled Farmers

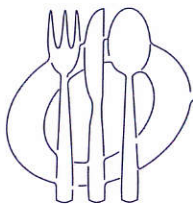
Agriculture is the most hazardous industry in Kansas, with an average of almost 28,000 nonfatal farm injuries each year sustained by farm workers 16 and over. Nearly 9,000 farmers with disabilities are working on Kansas farms. About 23 youth are injured on Kansas farms every day. K-State received a \$590,982 USDA grant to initiate the Kansas AgrAbility program to help farmers, their families, and farm workers with disabilities. The program provides information, resources, and a variety of services to Kansans who have become disabled while engaged in production agriculture. It speeds up assistance to the disabled by coordinating services and involves people already working in agriculture who understand the needs of farmers. Farmers can request assistance even without a medically diagnosed disability. The Kansas AgrAbility project is available to all farmers through the Assistive Technology for Kansans toll-free number 1-800-KAN DO IT (1-800-526-3648). Telephone calls are routed to one of five regional sites in Kansas.

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New Drink Combines the Best of Juice and Milk

NutriJoy and K-State have developed a new drink that combines milk and fruit juice with extra calcium. Trademarked as Cal-C, the beverage is sold in a 20-ounce bottle with the flavors orange-tangerine, strawberry-kiwi, peach-mango, and cranberry-raspberry. The drink combines the flavor and vitamins of juice with the nutrients of milk. NutriJoy is a company started by Mid-American Commercialization Corp. in Manhattan. Two years ago Procter & Gamble donated patented nutritional beverage technologies to the Mid-American Commercialization Corp. Procter & Gamble's process allows milk and juice to remain in a stable form for a long time. Though NutriJoy is a separate company from K-State, the futures of both are intertwined. Through its Research Foundation, K-State is a shareholder in the company and will profit financially if Cal-C succeeds.

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New Test Quickly Diagnoses Rotavirus

K-State veterinary medicine researchers have developed a fast, accurate, easy-to-use test to diagnose rotavirus, a sometimes-deadly cause of diarrhea in children and newborn babies. Rotavirus is the world's most common cause of diarrhea in young children. The test also can be used on calves affected by rotavirus. The K-State test is done on a disposable instrument about half the size of a credit card. After a drop of diarrhea is dropped on it, a line will appear on the device if the sample has the virus. No other instruments are needed.

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Finding an Improved Method of Diagnosis for Disease from Ticks

A K-State molecular biologist is researching an improved method to detect ehrlichiosis, a disease that can be transmitted by ticks to both humans and dogs. Currently, the five pathogens that cause ehrlichiosis must be tested individually to diagnose ehrlichiosis infections. The K-State project is focusing on a molecular test that identifies all five pathogens, resulting in faster and more accurate diagnosis and reduced costs.

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Bringing Dentists and Hygienists to Children Who Need Them

Dentists and hygienists utilizing the Colgate Bright Smiles, Bright Futures van provided free dental screenings to 1,682 youth at six elementary schools in Topeka. This was a collaborative effort of community partners, volunteers, Stormont Vail Foundation, and K-State Research and Extension in Shawnee County. They found that 41 percent of the students had fair to poor oral hygiene. Twenty-one percent of them had at least mild dental problems that included a recommendation of visiting a dentist within a month. Nearly 130 students had severe or emergency dental needs, including large cavities the size of a small green pea, gingivitis, chronic abscesses, acute oral infection, insufficient number of teeth for mastication, injuries, or painful conditions.

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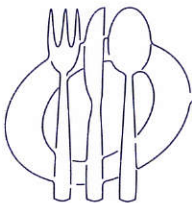
Collaboration: Hill's Pet Nutrition;
Stormont Vail Foundation; volunteer
dentists and dental hygienists; the
Preventive Health Action Team
organized contact with schools,
parents, and follow-up
efforts.

Nutrition Program Helps Families Stretch Food Dollars

The K-State Research and Extension Family Nutrition Program teaches low-income persons—from youth to older adults—how to choose and prepare nutritious meals on a limited budget, how to handle food safely, and how to balance healthy eating practices with physical activity. The program brings nutrition information to people in 84 Kansas counties through a network of county agents who work with Head Start; the WIC (Women, Infants, Children) program; shelters; and other agencies that focus on those struggling financially. When families eat better, they are healthier and have fewer illnesses. Children from those families perform better in school and are better prepared to live productive adult lives.

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Collaboration: USDA and the Kansas Department of Social and Rehabilitation Services (SRS)



Serving Safe Food Program (SERVSAFE)

SERVSAFE is a component of the overall statewide K-State Research and Extension interdisciplinary farm-to-table food safety effort. It helps restaurant and foodservice managers to become certified in safe food handling and sanitation. A collaborative program with the Kansas Department of Health and Environment, it is required by many national food operations such as McDonald's Restaurants. Participants learn the principles and practices of food safety in foodservice establishments, including food safety hazards; how to serve food safely; the safe food handler; Hazard Analysis and Critical Control Point or HACCP; keeping food safe from the time it is purchased and through preparation and service; and maintaining sanitary facilities and equipment.

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Testing a Foam that Kills Foodborne Pathogens

K-State Research and Extension scientists are testing a new anthrax-killing foam product developed by Sandia National Laboratories in Albuquerque, N.M., for application in the food and agriculture sectors. The tests focus on killing such foodborne pathogens as *E. coli O157:H7*, *salmonella*, *listeria*, *staphylococcus*, and *pseudomonas* (a spoilage organism) that may persist on food-processing equipment. Sandia Labs developed the foam to decontaminate military equipment that might be exposed to various biological warfare agents.

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Kids a Cookin'

The K-State Department of Communications has been working with the Family Nutrition Program to develop, produce, and market Kids a Cookin', a series of weekly cooking programs for youth to be shown on Kansas television stations. Each program is geared toward teaching basic cooking skills, basic nutrition, and healthy food choices to children and parents of limited-income families. A special feature of the project is the inclusion of Spanish language translations in the videos.

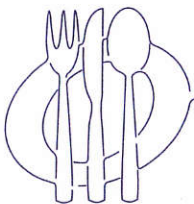
Contact: Ron Frank, Communications-TV
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Improving Nutritional Outcomes in Rural Homebound Older Adults

A recent grant provided the opportunity to expand K-State Research and Extension's outreach to frail older Kansans. In collaboration with the Kansas North Central-Flint Hills Area Agency on Aging, K-State Research and Extension provided in-home nutrition information to older adults who reside in rural areas and receive home-delivered meals. Most of this population currently does not receive any nutrition education. Nutrition education materials were designed to help homebound older adults improve their food intake and nutritional well-being necessary to maintain health. In a 2000 survey, older adults ranked the cost of food and maintenance of a healthy diet as their third and fourth most significant concerns. Eighty-eight percent of older adults who receive home-delivered meals reported in another survey that the meals helped maintain their independence, security, and dignity. 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 reduce 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. After receiving nutrition education materials last fall, 70 percent 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. Responses included: "I started drinking more juice." "I started keeping two water bottles next to my chair, and I plan to keep doing that." "Now I store fruits and vegetables where I can see them." "I have started to stay away from pastries." and "I would like to hear more about what good things foods do for the body." 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.

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Collaboration: USDA, National Policy and Resource Center on Nutrition and Aging, Kansas North Central-Flint Hills Area Agency on Aging.



Be a Book Cook

This program has 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. Some 377 families and 1139 family members have participated in Be a Book Cook programs that target children ages 3 to 6. This program has received national recognition.

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Collaboration: Topeka and Shawnee County Library; USD 501 Parents as Teachers and Highland Park High School; Kiwanis; Success by 6.

Finding a Safer Way to Package Meats

K-State Research and Extension has been working with Stork RMS Protecon Corp. of Gainesville, Ga., and Steris Corp. of Menton, Ohio, to develop a steam pasteurization unit that can eliminate any recontamination that has occurred during packaging. The Stork unit is a new condensing steam pasteurization technology developed in conjunction with a Steris and KSU designed clean-room environment.

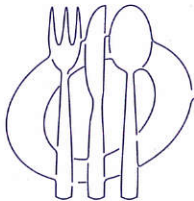
Contact: Randall Phebus, Animal Sciences and Industry,
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Expanded Food and Nutrition Education Program

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. 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 health-care costs. In 2001, EFNEP saved Shawnee County \$1,300,000. A personal story: an inmate at the Topeka Correctional Facility reported because of participation in EFNEP nutrition lessons she is drinking more water, milk, and juice and has stopped drinking three to four cans of pop each day. She also has sent recipes and nutrition information home to family members.

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Collaboration: USDA, WIC (Women, Infants, and Children) agencies, Head Start programs, and numerous other agencies in Kansas.



EFNEP and FNP Promotes Benefits of Breastfeeding

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. 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. A personal story: A mother of a two-week old who won a breast pump at the Breastfeeding Celebration said she plans to breastfeed her child for at least a year. With her other children, she stopped breastfeeding when she returned to work because she did not know of other options. She visited with her boss, and he supported her decision, allowing her time to pump at work.

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Collaboration: Stormont-Vail Healthcare; St. Francis Hospital and Medical Center; Shawnee County Health Agency; La Leche League; and Parents as Teachers.

Part of the War on Terror— Protecting the Nation's Food Supply

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. U.S. Sen. Pat Roberts, who pushed for the grant, said "Kansas State has the resources, the personnel, and the experience to lead the critical national effort and deter acts of agroterrorism." 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 the country.

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Three Studies Focus on Fighting Obesity in Youth

With the help of grants totaling \$227,000 from the Sunflower Foundation: Health Care for Kansans, K-State Research and Extension is developing, testing, and measuring the success of three programs designed to prevent obesity in children and adolescents.

1. The first grant involves developing a tool to evaluate the effectiveness of obesity prevention projects. It features a 16-item checklist targeted toward young adults. Project leaders will assess 1,000 youngsters with different ranges of eating behaviors in order to determine those with healthy behaviors and those without.

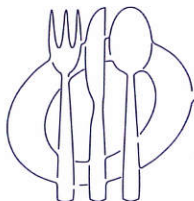
Contact: Barbara Lohse Knous, Human Nutrition, Telephone: 785-532-0154, FAX: 785-532-1674,
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2. The second program supports the Kansas Nutrition Network and its efforts to provide basic nutrition information to low-income families. Parents who have a better knowledge of basic nutrition tend to have children who fit normal weight patterns. An example of this effort is to send K-State Research and Extension personnel into communities to work with Head Start and WIC (Women, Infants, Children) to educate parents and child-care providers on good nutrition

Contact: Karen Fitzgerald, Kansas Nutrition Network, Telephone: 316-262-7636, FAX: 316-264-9965,
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3. The third grant targets adolescent obesity by looking at environmental factors. It isn't enough to look at individual behavior only. The problem of childhood obesity has been growing since the 1980s and can be traced to outside factors such as super-sized food servings, for example, or communities without sufficient facilities to support physical activities. This is a community-based pilot project that identifies families with adolescents in several community groups in Wichita. Mentors from the health community work with the groups to focus on fruit and vegetable consumption and moderate physical activity and to determine what can be changed in the participants' environments to help them to be healthier.

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Making Homes Safer and Healthier Places to Live

Home*A*Syst is a K-State Research and Extension program that helps people assess how home management can add to or subtract from the health and safety of their family. As part of a national effort, it involves engineers and safety specialists who cover everything from indoor air quality to storm water drainage. For example, Home*A*Syst helps to identify and promote awareness of hazardous household products. Close to 90 percent of the approximately 2.1 million toxic exposures reported each year happen in or around a home.

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Study Focuses on Foodservice at Retirement Homes

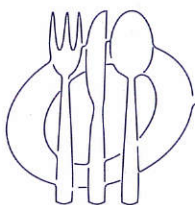
A study being done by K-State Research and Extension is focusing on how to make food more appealing to retirement community residents. Food is important to the quality of life of residents. If they aren't getting proper nutrients, they could lose weight, and those with chronic conditions could get worse. Eating also is an event, a way for residents to socialize. The researchers are identifying the residents' preferences for food and service quality, then sharing those preferences with foodservice directors and administrators of retirement communities. For example, do they want something different for breakfast, or lunch, or dinner? Do they want a buffet or wait staff? That kind of information has not been available in the research literature, so this study is breaking new ground.

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Promoting Physical Fitness through the Walk Kansas Program

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 are 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. 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.

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Collaborative Project Leads to New Food Safety System

Farmland National Beef, a leading food safety innovator, teamed with K-State Research and Extension to develop the BioLogic Food Safety System. This system organizes beef processing facilities into five zones with specially developed protocols for managing food safety in those zones and preventing microbial contamination. Regularly conducted tests and evaluations of the BioLogic Food Safety System take place in each zone and involve employees and their clothing, processing equipment, and air. Any area with an elevated reading is immediately isolated and treated with a scientifically engineered BioLogic protocol. Farmland National Beef Packing Company of Kansas City, Mo., is the only major beef packing company fully owned by producers. Its owners are members of U.S. Premium Beef, a producer-owned, beef-marketing cooperative, and Farmland Industries, the largest farmer-owned cooperative in North America. Farmland National Beef has operations in Liberal and Dodge City. The company markets fresh beef, boxed beef, and beef by-products for domestic and international markets.

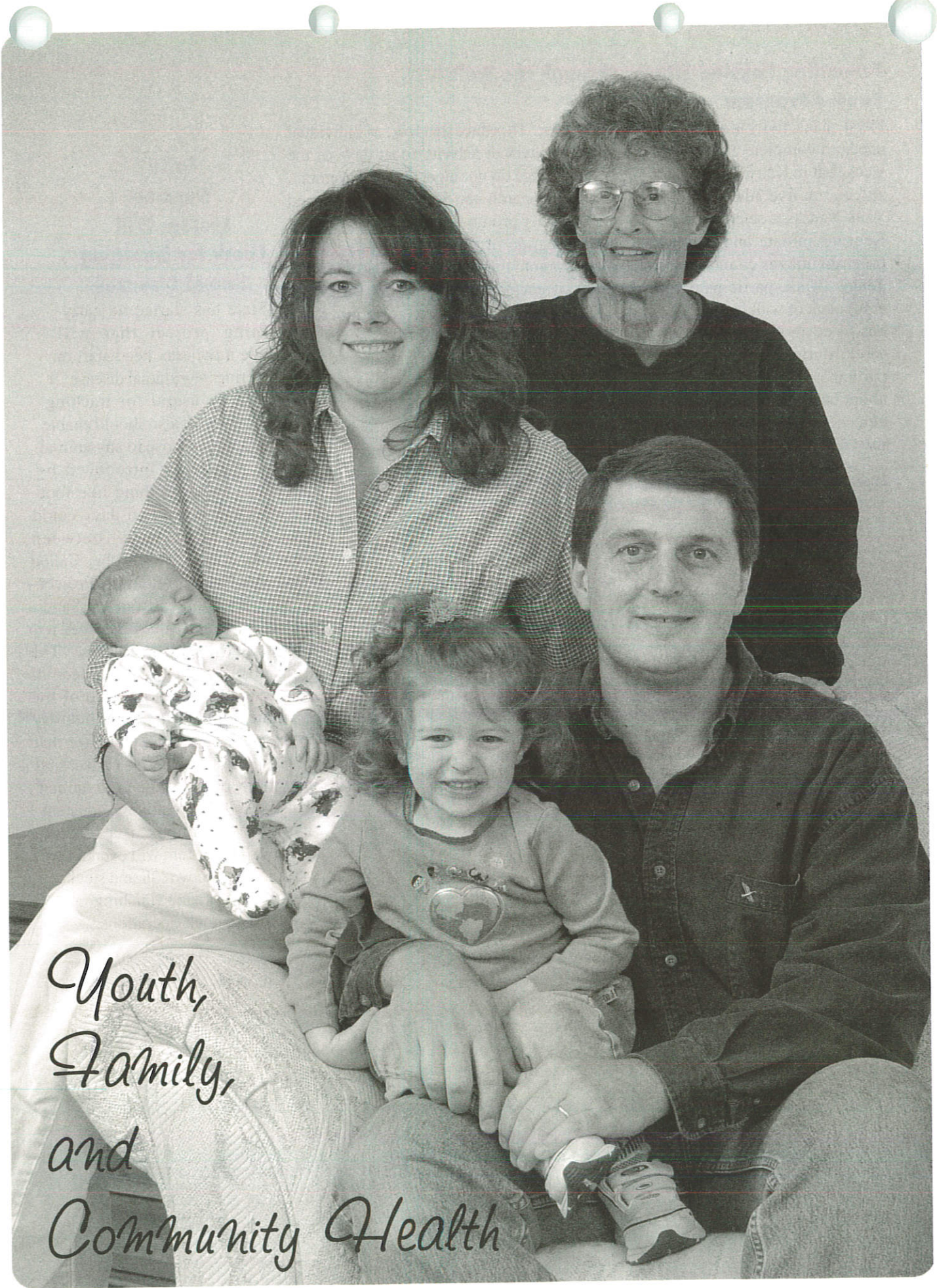
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Collaboration: Farmland National Beef Packing Company

Early Warning System Will Check for Emerging Animal Diseases

K-State has started an early warning project that will provide a two-day head start on discovering new animal disease. It also will be useful for tracking disease trends. It also should enable a more rapid response to any animal disease purposely introduced by terrorists. For something like foot-and-mouth disease, two days could mean the difference between containing it and catastrophe. Called Rapid Syndrome Validation Project-Animals, it's adopted from the Sandia National Laboratory that originated it to track human health problems. The initial efforts will focus on feedlot operations in Kansas because of the economic importance of that industry to the state. In addition, data for that industry will be easier to collect and interpret because of the high animal density and the relatively constant numbers of animals in a feedlot setting. The system will eventually be adapted to cow-calf and stocker operations, swine finishing, and other livestock operations.

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*Youth,
Family,
and
Community Health*

Youth, Family, and Community Development



Helping to Make Marriages the Best They Can Be

Couples contemplating marriage in two Kansas counties—Clay and Pottawatomie—were offered opportunities to participate in free four-week premarital enrichment groups. Sponsored by the Kansas Marital Preservation Project of K-State Research and Extension, the group sessions were conducted by marriage and family therapy interns from the K-State Family Center. They emphasized ways to help couples plan for a healthy marriage before they say “I do.” The long-term goal of the project is to activate and organize networks of community resources to promote marital stability and quality. Increased participation in such programs is expected to contribute to the well being of couples and families.

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Monitoring Retail Activity in Kansas

Trade Pull Factors produced by K-State Research and Extension estimate the relative strength of the retail community in every county and in many cities across Kansas. Pull Factors are used by big businesses such as the McDonald’s Corporation and by chambers of commerce in small cities like Columbus. Businesses use the data to determine the relative strength of the retail community in markets across Kansas. Community groups monitor the data to gauge the performance and overall health of the local business environment. The Trade Pull Factor reports are sent to all county K-State Research and Extension offices, small business development centers, certified development companies, and field staff of the Department of Commerce and Housing.

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Collaboration: U.S. Department of Commerce and Kansas Department of Commerce and Housing.

Web Site Aids Communities in Economic Development

Current information for community leaders and others interested in building and maintaining a healthy economy is available on the World Wide Web at www.agecon.ksu.edu/ddarling. The site includes Community Development Study Reports as well as newsletters, programs, bulletins, and other resources available through K-State Research and Extension.

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The complex issues of today require new perspectives and skills. K-State Research and Extension provides them by helping to build strong, healthy communities; improve parenting skills and family relationships; prepare youth through 4-H and other programs to be responsible citizens; balance demands of work, family, community, and time for self; and develop consumer and financial management skills.

Family Financial Programming Impacts

Money management programming is available in many Kansas counties for men and women of all ages, including high school students, senior citizens, and those with limited incomes. One example of K-State Research and Extension family resource management in Sedgwick County involved designing and implementing a Master Money Managers program to help families determine the status of their finances, set goals for the future, manage risk, and find professional financial help. Another program in Douglas County helped families with financial decision-making. Parents learned about basic budgeting, needs versus wants, and use and abuse of credit. Families in the program also used a computer program to pay down debts and save money on loan interest.

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Extension InfoLine

Want to know about activities for youths, making meat safer, or making your home more energy efficient? In an example of bi-state cooperation, K-State Research and Extension is working with Lincoln University of Missouri Outreach and Extension to provide an audio text system called Extension InfoLine to the residents of the Kansas City metropolitan area. Topics include gardening and horticulture; family and parenting issues; food preparation and preservation; youth activities; agriculture; community development, and many others. Faxed copies of the messages also are available. The service provides pre-recorded information to the public through telephone access. It is formatted in one- to two-minute messages on a variety of topics available 24 hours and free of charge. The counties participating in this collaborative effort are Clay, Jackson, and Platte in Missouri and Johnson, Leavenworth, and Wyandotte in Kansas. The Extension InfoLine number is 913-393-1913.

Contact: Johnson County Research and Extension Office, Telephone: 913-764-6300, FAX: 913-764-6305

Leadership Program Focuses on Global Agricultural Issues

Agricultural leaders and community leaders in Kansas face many challenges as well as opportunities as a result of emerging global trade agreements. The Kansas Agricultural and Rural Leadership program (KARL) has been helping them to understand and work with the international issues affecting Kansas agriculture and consumers. Since 1990, KARL has helped hundreds of Kansans study the agriculture of other countries. The program involves classroom training and a two-week study tour in another country. Participants compare agricultural practices and learn about different customs and cultures that affect Kansas agriculture in the global marketplace.

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New Fiscal Conditions and Trends Reports for Counties

The Office of Local Government in K-State Research and Extension has released its third annual county Fiscal Conditions and Trends reports. They contain detailed revenue and expenditure data extracted from budget documents in each Kansas county. The reports are designed to aid county commissioners in the budget planning process but may be of interest to anyone concerned with county government finance. Copies of the report have been distributed to K-State Research and Extension offices in the counties. Additional print copies are available in limited quantities. Reports also are available in pdf format upon request.

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Bringing Youth into the KidZone

KidZone, an after-school program in Wyandotte County (mainly Kansas City), provides out-of-school care in neighborhoods where at-risk youth and their families live. Featuring safe, educational, and fun places for youth to be before and after school, the focus is on providing skill-building, making connections with others, and self-determination, attributes that can increase healthy behaviors and decrease antisocial ones. KidZone is a project of a larger K-State Research and Extension program called OPEN-K (Opportunities for Prevention Education and Networking in Kansas). The impetus for KidZone and other such programs resulted when the collaborating partners evaluated resources available to them in Kansas City, Kan., communities and when they reviewed local crime statistics. They saw a need for safe and healthy places where youth could learn 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. 4-H Youth Development is currently part of after-school programming in six of the 12 schools in the area. K-State Research and Extension staff members recruit, train, monitor, and provide supplies and ongoing support for the part-time program staff. This effort is reaching Kansas City neighborhoods that have been traditionally underserved by K-State Research and Extension.

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Collaboration: USD 500, Camp Fire USA, Boys and Girls Clubs, Storytellers, Housing Authority, Unified Government, a local drum group, and a Karate arts expert.



Greeley County 4-H Ranch

Greeley County in far western Kansas has only 1,500 residents. As more and more rural families leave farmsteads for small-town living, the youth in those towns lose access to the resources needed to do livestock projects. In cooperation with K-State Research and Extension, ranchers, business owners, and others built the Greeley County 4-H Ranch. Youth there have the opportunity to develop hands-on skills by participating in a 4-H or FFA project at the ranch. Handling finances, managing time, and dealing with an animal's illness or death are among the "real world" skills that they develop. They also gain social skills related to teamwork, leadership, respect for others, and public speaking and public relations. Youth can participate even with little or no family involvement because of the strong volunteer base. The number of youth participating has doubled since the Ranch's start up in 1999. This initiative has allowed 4-H and K-State Research and Extension to reach a new audience of future community leaders.

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Opportunities for Youth to Develop Leadership Skills

Four counties in the Kansas City metropolitan area have consolidated efforts and resources to provide youth in that area with skills in leadership and citizenship. Kansas youth are vulnerable to increased pressures and situations in our fast-paced society. They need guidance and direction to help them become productive and successful citizens. Kansas River Youth Leadership is a youth development program of K-State Research and Extension. Adults, businesses, and institutions in the communities become involved with the program. The goals are to help youth 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. The participating counties are Douglas, Johnson, Leavenworth, and Wyandotte.

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Osage County Interagency Initiative

In cooperation with parents and several agencies, organizations, and service providers, K-State Research and Extension formed the Osage County Interagency Initiative, a program to assess risks related to children and youth in the county and to establish prevention efforts aimed at those risks. Funding for the project came from grants from the State Incentive Cooperative Agreement: Communities that Care. Although mid-term and long-term outcomes are not expected to be evident yet, preliminary data show progress, including 1. an increase in the number of families with clear rules about youth substance abuse; 2. a larger percentage of students reporting that they would get caught by their parents if they consumed alcohol, skipped school, or carried a handgun without permission; 3. improvements in community laws and norms; and 4. a drop in the perceived availability of cigarettes, alcohol, and marijuana.

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Collaboration: Regional Prevention Center of the Flint Hills, Farm Bureau, Three Lakes Educational Cooperative, Big Brothers/Big Sisters, the Santa Fe Trail School District, and parents.



Pratt County Web Site Project for 4-H Clubs

4-H is renowned for teaching life skills. Now it is adding a new dimension—teaching about technology, particularly computer and Internet skills. It began with a Web Page Contest for 4-H club members in Pratt County. Awards were presented for the selected Web site pages during the county fair, and the pages were posted on the Pratt Chamber of Commerce Web site. First National Bank of Pratt provided funding for the project, including enough money to later buy a domain name and space for a permanent site. The project has continued to expand, with the 4-H'ers learning to create and post videos, maintain and update the site, and make the site a place for club members to meet. The Web site pages can be seen at www.prattcountyextension.com

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Collaboration: First National Bank of Pratt and Pratt Tele-Community Center

Facts about 4-H Youth Development in Kansas

Kansas 4-H club and group memberships have increased 46 percent since 1991, with 165,579 Kansas school-aged youth participating (20 percent). It involves more than 18,000 volunteers throughout the state. The many different 4-H projects can boast 300,000 enrollments per year, and the top four are 1. Foods and Nutrition, 2. Physical Activity, 3. Leadership, and 4. Arts and Crafts. Fifty-one percent of Kansas 4-H'ers are female, 49 percent male. These statistics and many more are available in a 4-H brochure #4H839.

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4-H CARES—Helping Youth Stay Away from Drugs

An acronym for Chemical Abuse Resistance Education Series, 4-H CARES is a youth program designed to improve self-esteem and family interaction, promote life skills, and teach about chemical abuse. Many youth organizations have included 4-H CARES in their educational campaigns. Nearly all the other states and a number of school systems and provinces in Canada have requested the 4-H CARES educational material. It has been named one of 20 exemplary prevention programs in the nation by the National Association of State Alcohol and Drug Abuse Directors and the National Prevention Network.

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OPEN-K Helps Native American Youth

K-State has teamed with Haskell Indian Nations University in Lawrence to develop an OPEN-K program that focuses on activities and education that can empower American Indian youth to grow and develop self-respect, dignity, self-sufficiency, and self-determination. OPEN-K stands for Opportunities for Prevention Education and Networking in Kansas. The program serves as a hub to connect nine targeted American Indian communities on tribal land and in Kansas cities so that they can benefit from each other's youth development experience and knowledge. Efforts are being made to identify people in the Native American communities to interact with Native American youth and mentor them.

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Establishing a Community Health Institute

The Office of Community Health has been working to establish a Community Health Institute at K-State. The goal of the Institute is to promote individual, family and community health by improving the nutrition, physical activities, and social behavior practices of individuals, families, and communities in Kansas. To reach that goal, the Institute is planning to develop innovative partnerships with national, state, county, and community agencies. It also will facilitate interdisciplinary research on prevention and intervention of community health problems, and it will facilitate outcomes-based educational programs to solve those problems. The Institute will work with many other departments and colleges at K-State, drawing on the expertise of faculty in many disciplines.

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Targeting Education and Early Intervention to Reduce Juvenile Crime

The OPEN-K program of K-State Research and Extension focuses on education and early intervention to reduce crimes by juveniles in Kansas. The acronym stands for Opportunities for Prevention Education and Networking in Kansas. This federally funded effort aims to reduce juvenile crime by improving the quality of life for youth and communities through after-school projects, mentoring, and parent education. Professional development programs for extension personnel involved in this area are another part of OPEN-K.

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Back-to-School Program Prepares Students to Start School

Called Success by 6, this program began in Shawnee County to prepare children for school. Organized around six action teams, the project focuses on early childhood education, home visitation, safety, preventative health, diversity, and nutrition. More than 80 partners contribute to Success by 6, including hospitals, insurance companies, government offices, child-care programs, and more. United Way spearheads the program, which has expanded to such surrounding communities as Clay Center, Abilene, Junction City, and Salina. Success by 6 helps prevent problems before they happen by giving families the tools they need to prepare their children for success in school and in life. One of the projects involves a Back-to-School Fair. It attracts more than 2,000 participants. More than 1,200 backpacks full of school supplies are distributed through the program, including common items such as pencils and paper but also extras such as personal hygiene products. Families qualifying for free or reduced school lunches can sign up at the fair.

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School District Leaders Look to Extension for Assistance

When teachers and administrators from the Auburn-Washburn school district began to develop their application for a 21st Century Community Learning Center grant, one of the community partners they looked to was K-State Research and Extension. Alice Frost, coordinator with the LEADERS for the school district project, said, "We wanted 4-H to be a part of our project because its goals to teach youth life skills, build self-confidence, learn responsibility, and set and achieve goals match our goals for the grant." Two Topeka schools—Pauline South and Pauline Central—already received a 21st Century Community Learning Center grant, and they, too, turned to K-State Research and Extension to help them with after-school and summer learning opportunities to address the needs of students, parents, and the community. K-State Research and Extension was one of the first partners to offer enrichment activities for the after-school program. Other programs K-State offered were Be a Book Cook; Basic Parenting; and Responsive Discipline.

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785-532-2202, foodsci@k-state.edu

Foundation Seed

Conditioning Center—Vernon Schaffer
2200 Kimball Ave.
785-532-6115, vas@ksu.edu

Galichia Center on Aging—Lyn Norris-Baker
203 Fairchild
785-532-5949, lyn@ksu.edu

Grain Industry Alliance—Ronald Madl
107D Waters Hall
785-532-7022, rmadl@ksu.edu

Horticulture Response Center

Ward Upham
3027 Throckmorton Hall
785-532-1438, wupham@oznet.ksu.edu

International Grains Program

John Howard
53 Waters Hall
785-532-4071, IGP@ksu.edu

International Meat

and Livestock Program—Janice Swanson
134C Weber Hall
785-532-1241, jswanson@oznet.ksu.edu

Kansas Artificial

Breeding Service Unit—Tom Taul
1402 College Ave.
785-539-3554, ttaul@oznet.ksu.edu

Kansas Cooperative Development Center

David Coltrain David G. Barton
303 Waters Hall 305C Waters Hall
785-532-1523 785-532-1508
coltrain@agecon.ksu.edu barton@ksu.edu

K-MAR-105 Association

Michael Langemeier
1720 Hayes Drive, Manhattan, KS 66502
785-539-0373, webmaster@kmar105.com

Kansas Agricultural

Mediation Service—Forrest Buhler
2A Edwards Hall
785-532-6958, fbuhler@oznet.ksu.edu
Toll-Free Number 1-800-321-3276

Kansas Center for Sustainable

Agriculture and Alternative Crops—
Jana Beckman
3602 Throckmorton Hall
785-532-1440, beckman@oznet.ksu.edu

Kansas Crop Improvement

Association Seed Laboratory—
Eric Fabrizio
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785-532-6118, efkcia@kansas.net

Kansas Farm

Management Association—Martin L. Albright
39 Waters Hall
785-532-1513, albright@agecon.ksu.edu

Marriage and Family

Therapy Clinic—Mark B. White
Galichia Institute
785-532-1487, mwhite@humec.ksu.edu

Meat Product Development and Technical

Assistance Laboratory—Elizabeth A.E. Boyle
251 Weber Hall
785-532-1247, lboyle@oznet.ksu.edu

Office of Local Government

John Leatherman
331F Waters Hall
785-532-4492, jleather@agecon.ksu.edu

Plant Disease Diagnostic

Laboratory—Judy O'Mara
4032 Throckmorton Hall
785-532-1383, clinic@plantpath.ksu.edu

Plant Biotechnology Center

—Robert Zeigler
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785-532-6176, rzeigler@plantpath.ksu.edu

Rapid Response Center

—Karen Blakeslee
222 Call Hall
785-532-1673, kblakesl@oznet.ksu.edu

Scanning Electron

Microscope Laboratory—Kent E. Hampton
28 Waters Hall
785-532-4724, khampton@oznet.ksu.edu

Soil Testing Laboratory

—Ray E. Lamond
2308 Throckmorton Hall
785-532-7897, rlamond@oznet.ksu.edu

Thermal Processing/Wet Processing

Laboratory—Do Sup Chung
138B Seaton Hall
785-532-2905, dschung@bae.ksu.edu

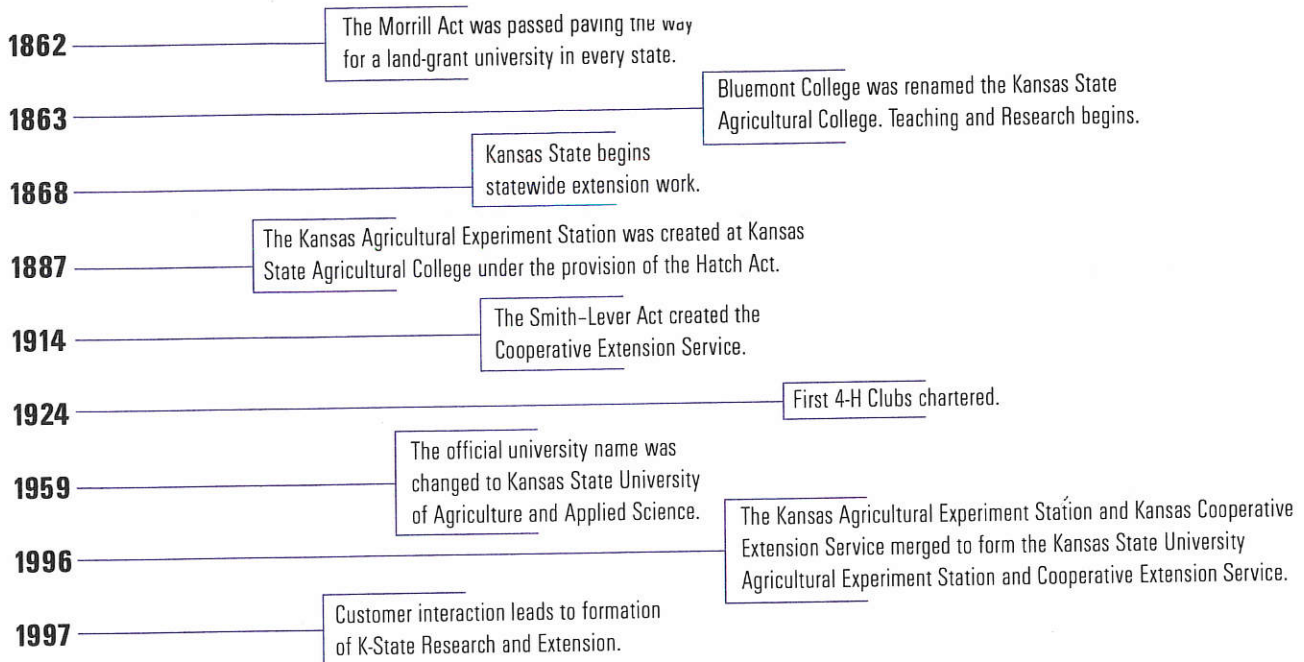
Weather Data Library

—Mary Knapp
23 Umberger Hall,
785-532-6247, mknapp@oznet.ksu.edu

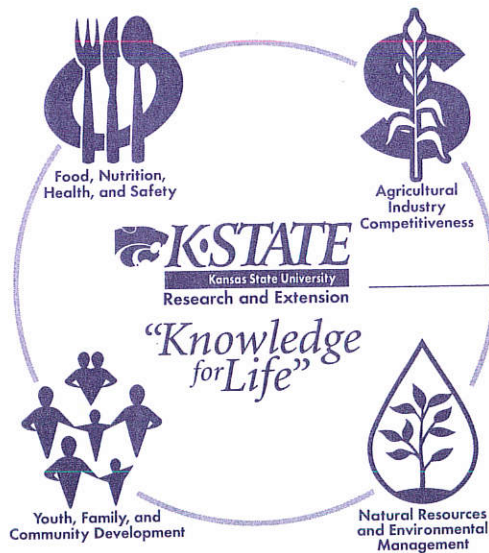
Wheat Genetics

Resource Center—Bikram Gill
4304/4308 Throckmorton Hall,
785-532-1108 / 532-1353, wgrc@ksu.edu

Brief History of K-State Research and Extension



Today, K-State Research and Extension employs more than 300 research scientists, approximately 180 faculty specialists and program leaders, nearly 270 county and area specialists, and more than 400 support staff in 23 departments in five different colleges. In addition to main campus, K-State Research and Extension personnel are located in 105 county offices, eight experiment fields, five area offices, three research centers, and three research-extension centers.



Our Mission Statement:

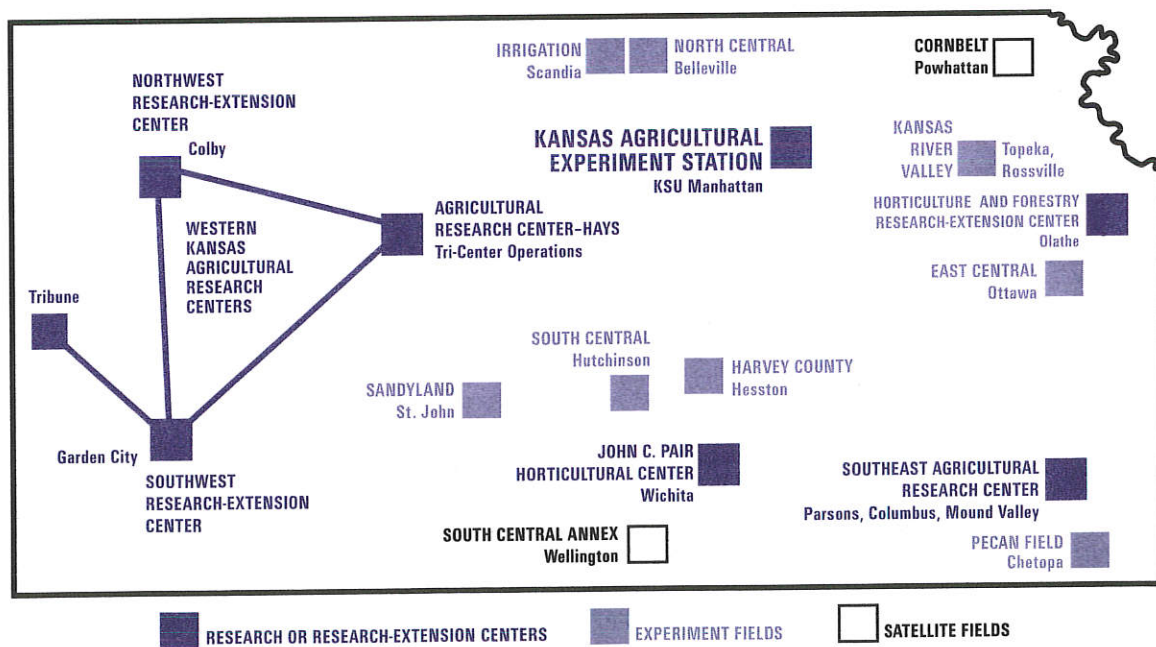
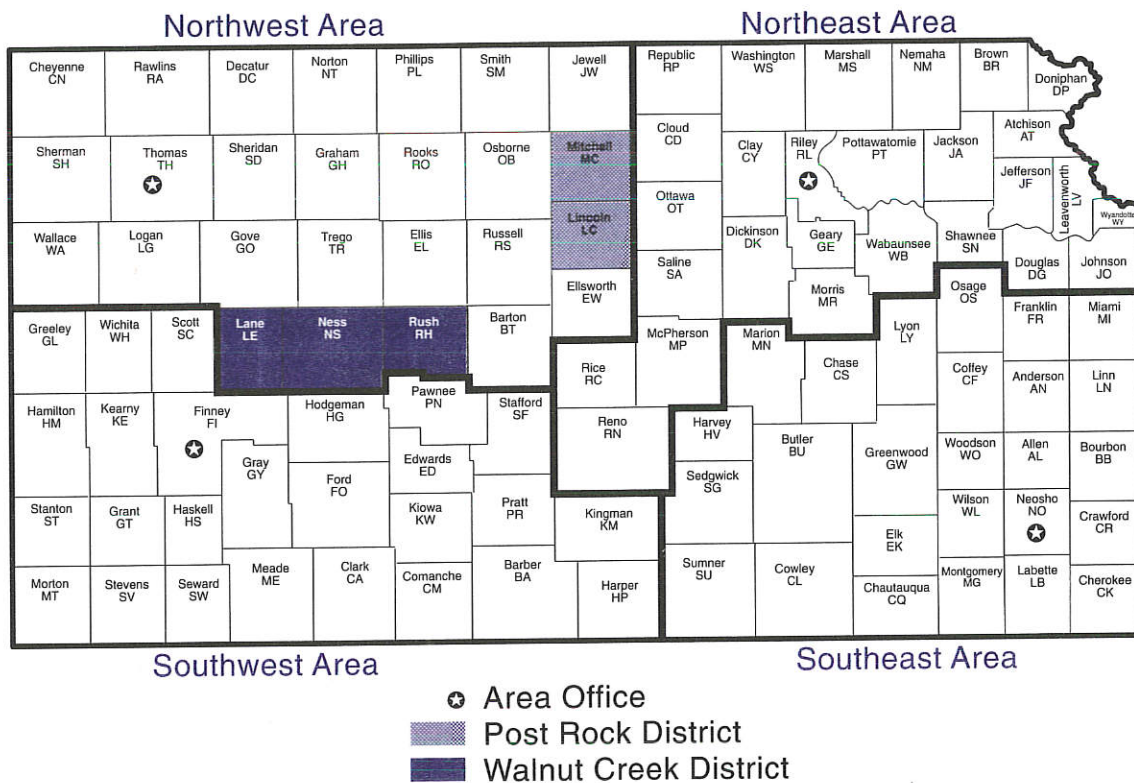
We are "dedicated to a safe, sustainable, competitive food and fiber system and to strong, healthy communities, families and youth through integrated research, analysis, and education."

K-State Research & Extension

Fiscal Year 2003 Annual Budget

		Governor's Reductions in September
Physical Plant State Funds	\$778,791	\$771,975
Agricultural Experiment Station State Funds	\$33,015,228	\$32,755,970
Cooperative Extension Service State Funds	\$22,957,828	\$22,797,008
Research Grants, Contracts, Other Funds Use	\$25,137,094	\$25,137,094
Extension Grants, Contracts, Other Funds Use	\$18,083,226	\$18,083,226
Total FY 2003 Budget	\$99,972,167	\$99,545,273
State and Federal Base Funding		
Physical Plant State Funds	\$778,791	\$771,975
Agricultural Experiment Station State Funds	\$29,621,450	\$29,362,192
Federal Research Funds	\$3,393,778	\$3,393,778
Cooperative Extension Service State Funds	\$18,376,345	\$18,215,525
Federal Extension Funds	\$4,581,483	\$4,581,483
Total FY 2003 State Funding Support	\$56,751,847	\$56,324,953
Budget Classifications		
Faculty & Administrative Salaries	\$39,187,744	\$39,187,744
Classified & Student Salaries	\$9,301,733	\$9,301,733
Operating Expenditures	\$8,262,370	\$7,835,476
Fiscal Year 2003 Annual Budget	\$56,751,847	\$56,324,953

K-State Research and Extension Statewide Operations





2002 Accomplishments

1. Supported the distribution of the Kansas Family Farmer and Rancher Resources and Services Guide that includes entries from over 80 agencies and organizations with helpful information on topics such as conservation; direct marketing, value added, and business development; financing; and production. A total of 3,500 guides have been distributed.

2. Created the Kansas Locally Raised Food Directory in cooperation with the Kansas Rural Center. The free web based directory currently has 75 Kansas producers enrolled. Additional producers will be encouraged to enroll through the winter months. When the directory is populated, an outreach effort directed towards consumers will be launched. The ultimate goal of the directory is to connect producers and consumers. The directory is located at:
<http://www.oznet.ksu.edu/kcsaac/fooddirectory.asp>

3. Participated in organizing and hosting conferences and meetings on sustainable agriculture topics.

- 2002 and 2003 Organic Producers School. Approximately 35 attended the 2002 school
- 2002 and 2003 Annual Sustainable Agriculture Roundup. Approximately 200 attended the 2002 Sustainable Agriculture Roundup
- 2003 Family Nutrition Program/Expanded Food and Nutrition Education Program Conference

4. Created awareness of sustainable agriculture and alternative crops through press releases, the KCSAAC newsletter and by participating in various meetings, field days and conferences, including meetings with NRCS personnel, 2002 Great Plains Vegetable Conference, State Outreach Council, and the National Small Farm Conference. A complete listing of press releases and newsletters initiated by KCSAAC may be found at: <http://www.oznet.ksu.edu/kcsaac/agnews.htm>

5. Responded to 198 requests for assistance in 2002. The total number of requests in 2001 was 102.

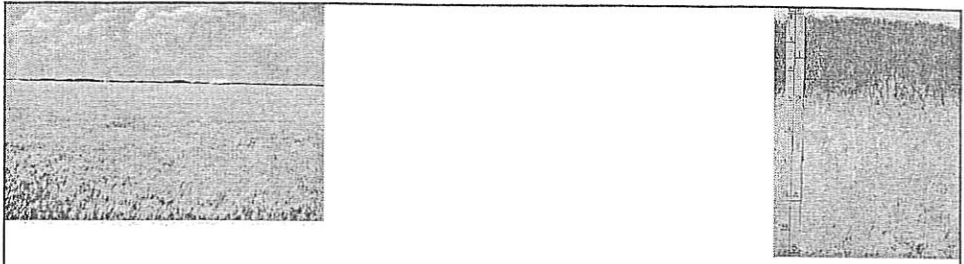
- 41% of the calls are from extension, agency, nonprofit organizations and educators
- 40% of the calls are from producers
- At least one request has been received from each county in Kansas
- The most common requests involve:
 - marketing and production of alternative enterprises
for example, buckwheat, cover crops, herbs, brambles, vegetables, cheese, goats
 - grant sources and grant writing resources,
 - direct marketing
for example, meat, vegetables, fruit and herbs to consumers, restaurants and at Farmers' Markets
 - livestock/grazing systems
for example, water systems, fencing, season- long grazing

6. Reorganized the KCSAAC website to increase usability of the site and to comply with American with Disabilities Act requirements. The number of visits to the site in 2002 was 13,877. The number of visits in 2001 was 5,198.

7. Facilitated the submission of \$3,596,265 of grant requests. Eight projects totaling \$827,505 were funded and three projects totaling \$417,656 are pending. Funded projects include:

- Prairie Hay Market Research
- Kansas Agrability Program
- Kansas Sustainable Agriculture Research and Education Professional Development Program
- Guided Exploration of Value Added Enterprises
- Antibiotic Detection and Resistance in Feedlot Management
- Post Harvest Handling and Production Facilities for Horticultural Crops
- "Orchard of the Future, A Kansas Fruit Growers Project"
- Agrarian Landscape in Transition: A Cross-Scale Approach
- Konza Prairie LTER V: Long-Term Research on Grassland Dynamics and Global Change





Carbon Sequestration Through Management of Kansas Natural Resources

Charles W. Rice
Director, CASMGS
Department of Agronomy

K-State Research and Extension

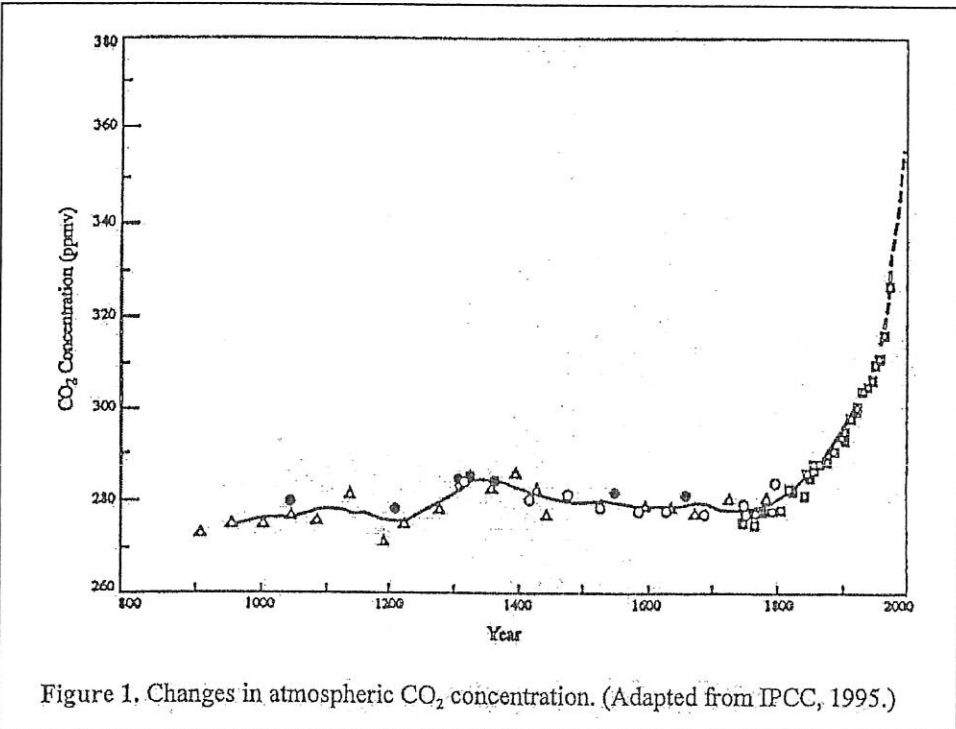

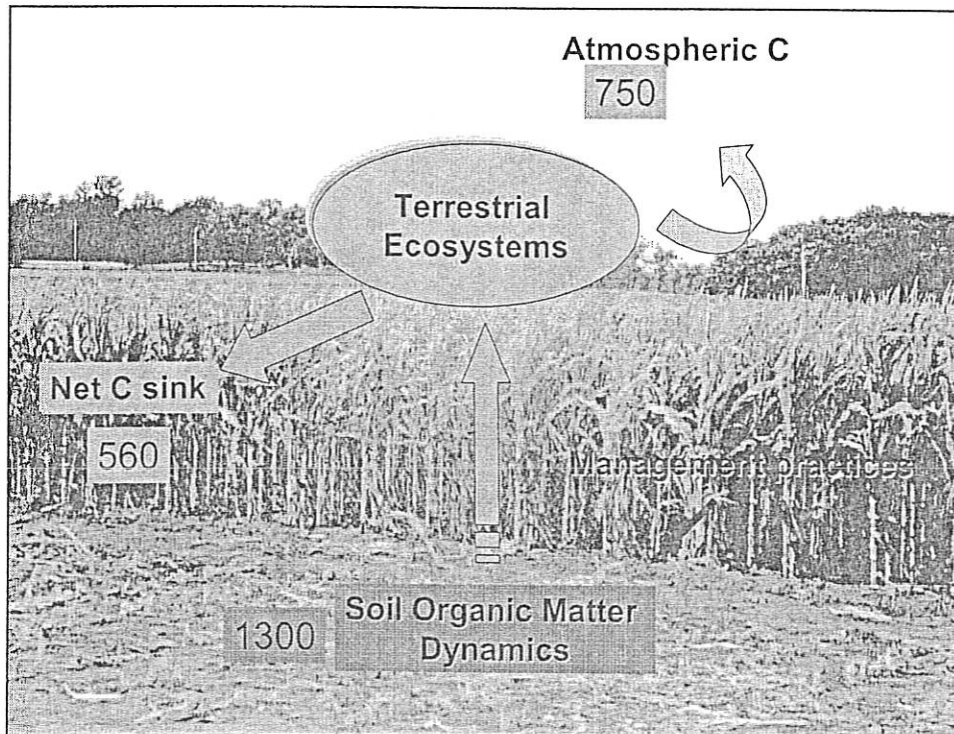
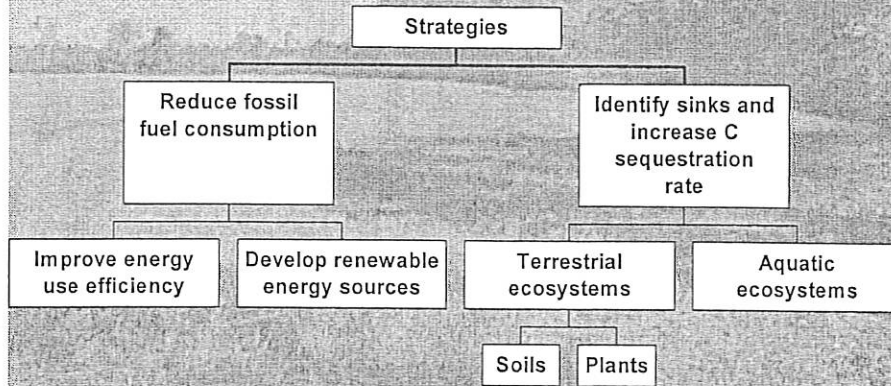
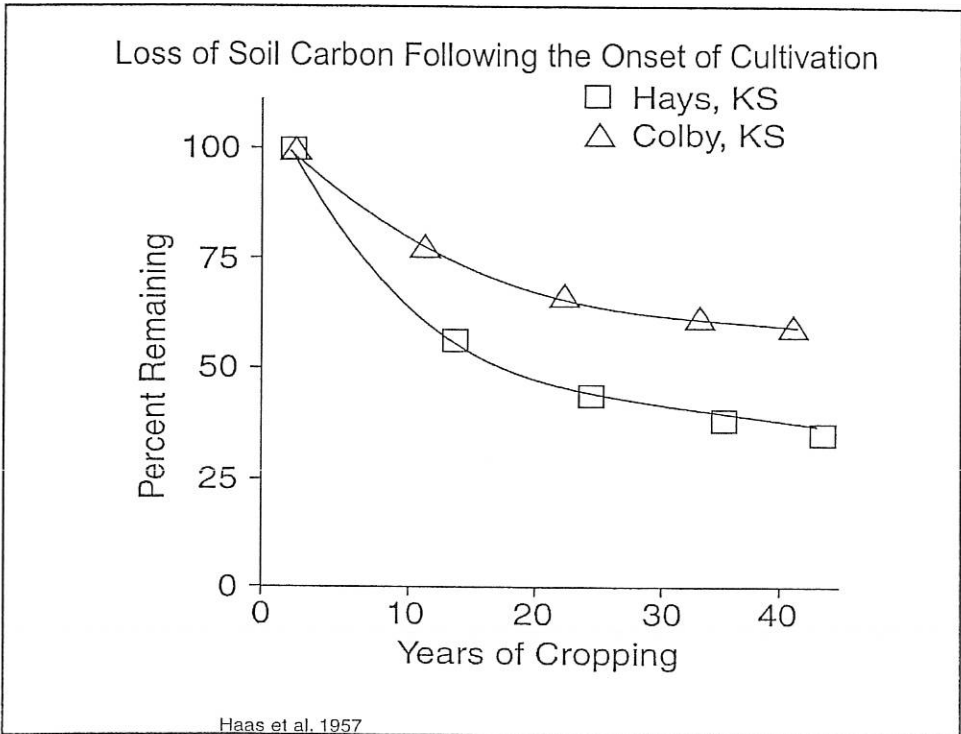
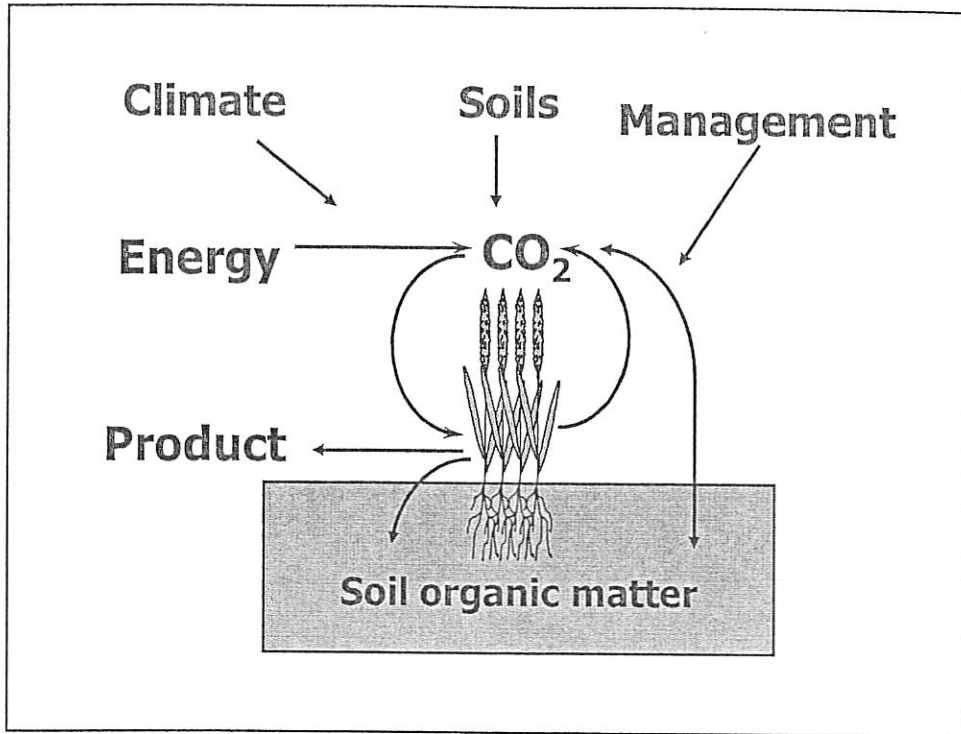


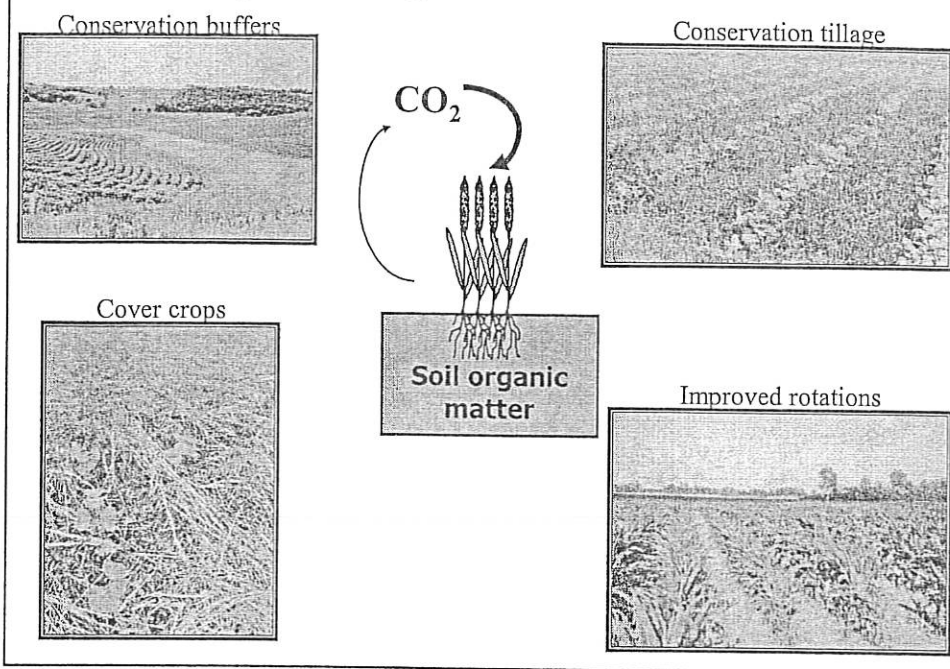
Figure 1. Changes in atmospheric CO₂ concentration. (Adapted from IPCC, 1995.)

Strategies to Reduce Risks of Global CO₂





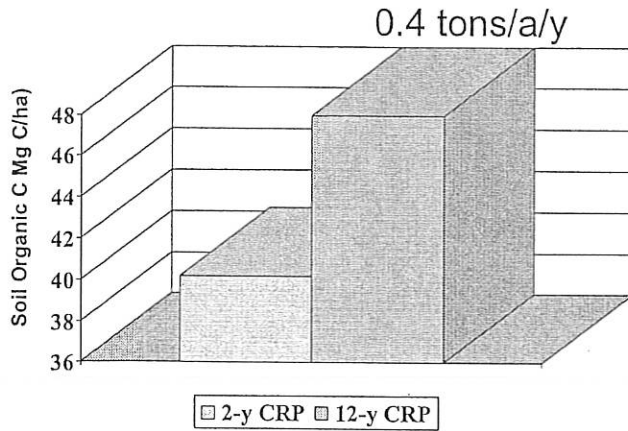
Improved Agricultural Practices



Land Use for C Sequestration Management Strategies

Land Use	Soil Management	Crop Management
• Cultivation	• Tillage	• Varieties
• Rangeland	• Residue Management	• Crop Rotations
• Forestry	• Fertility	• Cover Crops
	• Water	• CRP
	• Erosion Control	

Soil organic C after 2 and 12 y of CRP in Nebraska (Baer, Kitchen, Blair, and Rice)



Crop rotations in south central KS

	CT-SS	NT-SS	CT-S, NT-W	NT-S, NT-W
Net C gain T/a/y	0.07	0.34	0.32	0.60

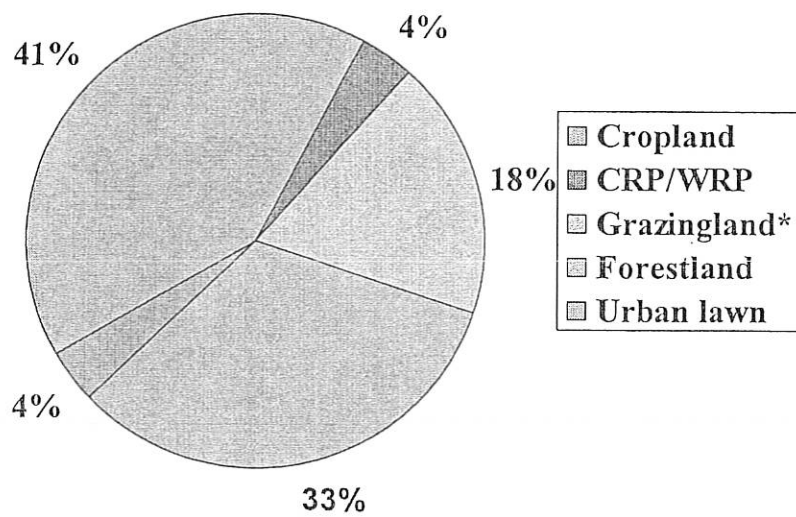
Aller, Williams, Nelson, Claassen, and Rice

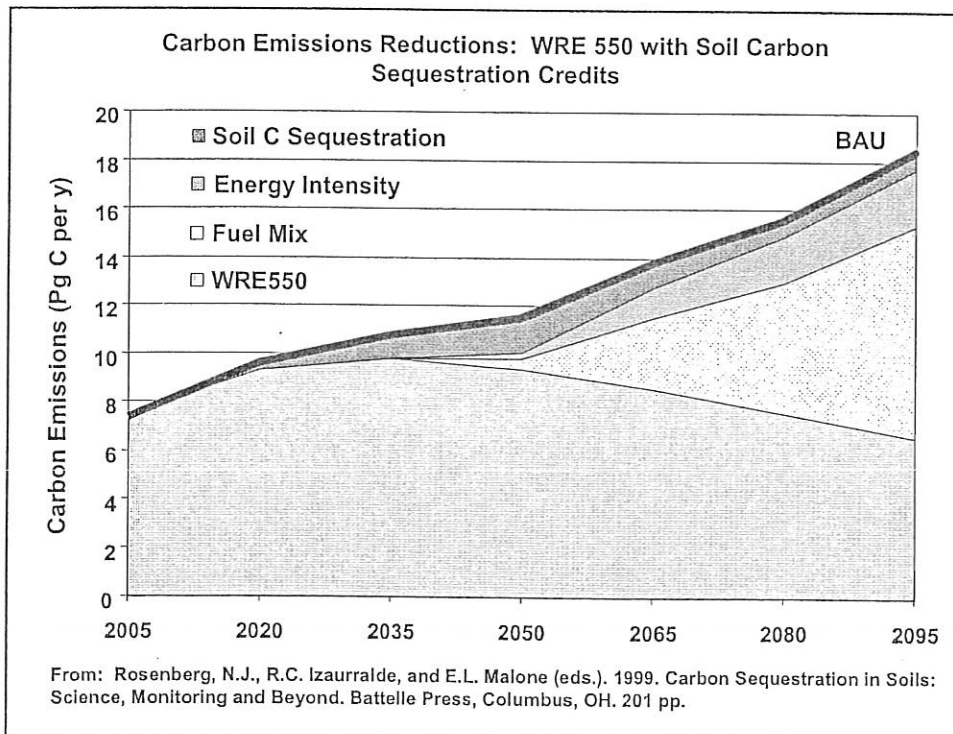
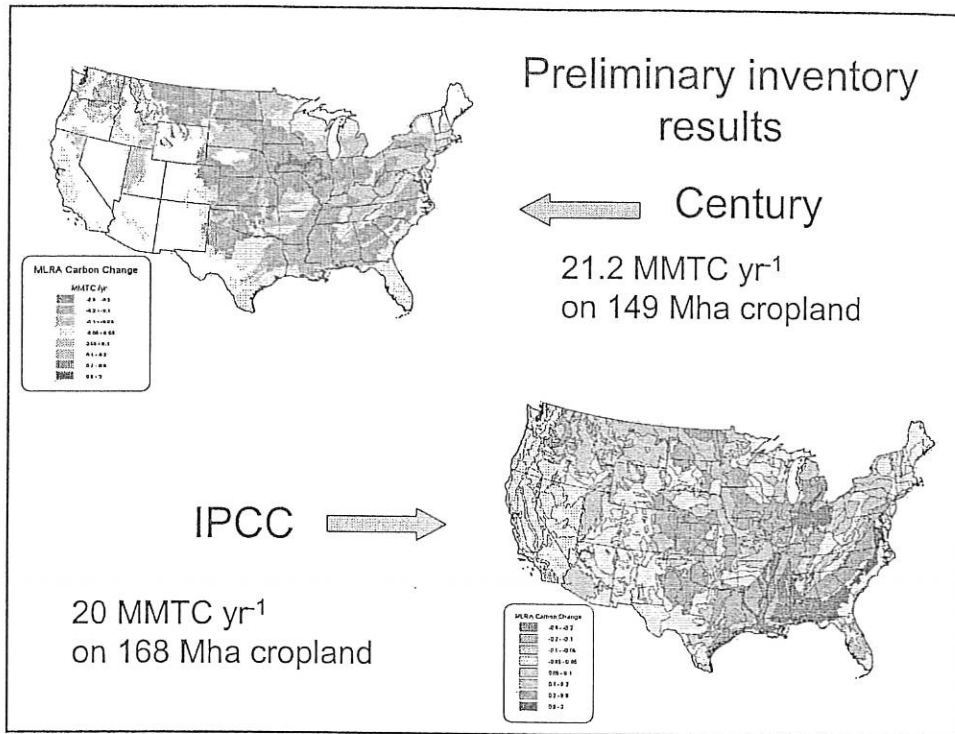
Estimates of C sequestration potential through improved management of U.S. cropland (tons C/a/y)

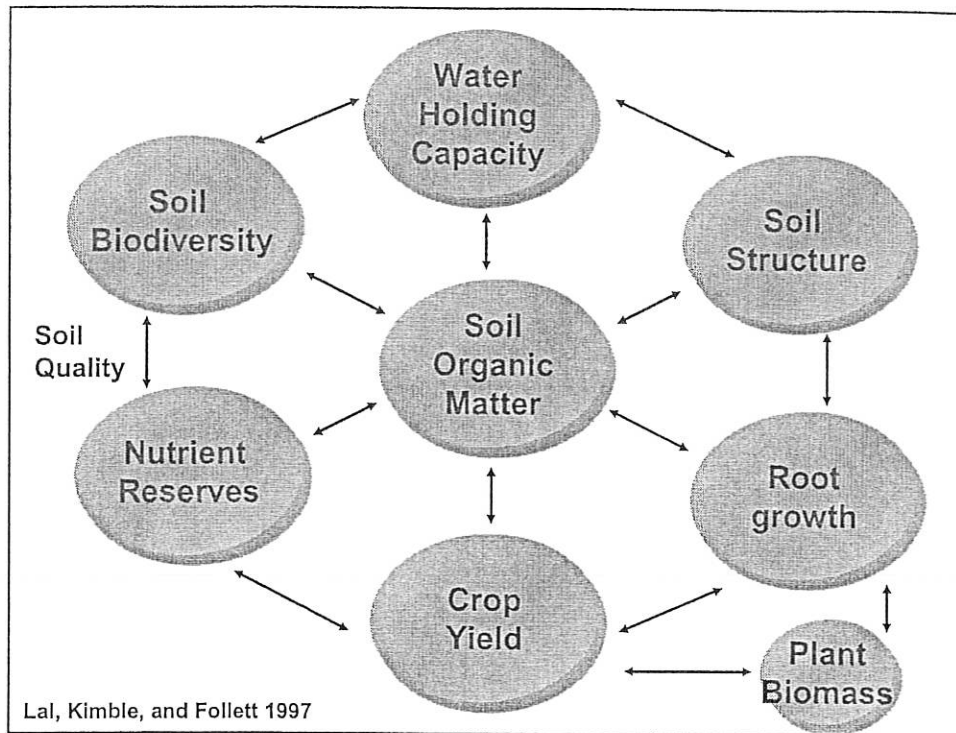
CRP	0.15-0.30
Conservation tillage	0.10-0.20
Fertilizer management	0.02-0.07
Rotation with winter cover crops	0.05-0.15
Summer fallow elimination	0.05-0.15

Lal et al., 1999

Soil C sequestration potential of different US land Categories (% of 322 MMT C/yr) **







Value of Soil Organic Carbon

- Value of N, P, K, and H₂O in Kg of humus about = \$0.20.
- Does not seem like much but converts to about \$1900.00 per acre when you have 1% carbon in your soil! So if you increase by 0.1% would be \$190.00/A.

No-till soils Central Illinois

- 1980 OM 2.1 % 1995 OM 3.4%
- Nitrogen use is now 50-60 % of recommended based on yield goal. Or about 85 lbs.. less per acre than would be applied to conventionally tilled field.

Consortium for Agricultural Soil Mitigation of Greenhouse Gases

- *To provide the tools and information to successfully implement soil carbon sequestration so that*
 - *the accumulation of greenhouse gases is lowered in the atmosphere,*
 - *while providing income and incentives to farmers and improving the soil.*

Kansas State University
Iowa State University
Montana State University
Ohio State University
Texas A&M University

Colorado State University
Michigan State University
University of Nebraska
Purdue University
Pacific Northwest National Labs

CASMGS Objectives

- Improve the understanding of processes and mechanisms controlling soil C sequestration.
- Evaluate rates of carbon sequestration of different agricultural practices.
- Provide measurement and modeling tools to quantify and verify soil carbon sequestration.
- Provide assessment of economic and policy strategies for carbon sequestration.
- Identify other benefits of practices that sequester carbon.
- Outreach.

Kansas Coalition for Carbon Management

- **Mission**
 - **To inform, educate and motivate land managers to apply management practices that result in reduced atmospheric carbon levels**
- Website
 - www.oznet.ksu.edu/kccm

Kansas Coalition for Carbon Management

- **Objectives**
 - Inform and educate land managers on carbon management practices
 - Encourage research of greenhouse gas emission reduction and alternative energy uses
 - Explore and disseminate marketing opportunities as they develop.
 - Investigate the legal boundaries around carbon sequestration.

Kansas Coalition for Carbon Management Member Organizations

- Kansas Resource Conservation and Development Councils
- Kansas Corn Growers Association
- Kansas Grain Sorghum Producers Association
- Kansas Association of Wheat Growers
- Kansas Electric Power Cooperative
- Kansas Forage and Grasslands and Society for Range Management
- Kansas Livestock Association
- Kansas Farm Bureau
- Kansas Rural Center
- Kansas Association of Conservation Districts
- Kansas Department of Agriculture
- State Conservation Commission
- Kansas Department of Health and Environment
- USDA Natural Resources Conservation Service
- USDA Farm Services Agency
- Kansas State University

Ongoing Research at K-State

Purpose

- To determine how plant and soil management affect:
 - Quantity of C is stored in soils
 - Rate of C storage
- Identify additional benefits
 - soil, water, economic
- Climate variability
 - CO₂, water, temperature

Ongoing Research at K-State

- Soil C cycling basic
 - Biological, physical, chemical
- Plant C inputs
 - Fire and grazing on grasslands
 - Crop rotations
 - Varieties and cultivars
- Soil management
 - Tillage
 - Manure
- Economic and energy analysis

Ongoing Research at K-State

- Monitoring and Verification
 - Greenhouse gases from soil
 - Issues related to soil sampling
 - Database
 - Remote Sensing
- Economic and Policy analysis
 - Private program
 - Government Program –Conservation programs

Outreach at K-State

- Regional Extension Specialist
 - Printed materials
 - Field days
 - Training modules
- National Specialist
 - Soil and land management
 - Economic and policy analysis
- Decision Support Tools
- National Workshops
 - Monitoring and Verification at K-State

Kansas Coalition for Carbon Management

- Websites

www.oznet.ksu.edu/kccm

www.oznet.ksu.edu/ctec

www.casmgs.colostate.edu/

duced as soil organic carbon levels are increased. If the soil organic carbon is undisturbed, then it can remain in the soil for many years as stable organic matter. This carbon is then sequestered, or removed from the pool available to be recycled to the atmosphere. This process reduces CO₂ levels in the atmosphere, reducing the chances of global warming.

3. **How much impact can carbon sequestration have on greenhouse gases?**

It has been estimated that 20 percent or more of targeted CO₂ emission reductions could be met by agricultural soil carbon sequestration.

4. **What can agricultural producers do to enhance carbon sequestration?**

There are several practices that can increase carbon sequestration, including:

- a. No-till or reduced-till
- b. Increased crop rotation intensity by eliminating summer fallow
- c. Buffer strips
- d. Conservation measures that reduce soil erosion
- e. Using higher residue crops, such as corn, grain sorghum, and wheat
- f. Using cover crops
- g. Selecting for varieties and hybrids that store more carbon

5. **What can grazingland managers do to enhance carbon sequestration?**

Grazingland managers can increase carbon sequestration by:

- a. Improving forage quality
- b. Regular use of prescribed burning to increase forage productivity
- c. Reducing overgrazing

6. **Will agricultural producers get paid for carbon sequestration?**

It is possible that a private system of trading for carbon credits will be established, which could pay producers about \$1 to \$2 per acre. A few utility companies have already begun buying or leasing carbon credits in some cases, but this is not yet a widespread practice. It is also possible that the government will provide certain incentives for producers to sequester carbon. But even if there were no payments for carbon sequestration, it would still pay for agricultural producers to implement practices that would increase soil organic matter due to:

- a. Improved soil structure and quality
- b. Improved soil productivity through increased organic matter
- c. Reduced erosion through improved soil structure
- d. Improved water quality through reduced erosion

7. **What is soil organic matter, where does it come from and where does it go?**

Soil organic matter consists of decomposed plant and animal matter. It helps bind soil mineral particles together into clumps, called soil aggregates. Higher levels of soil organic matter lead to more stable soil aggregates, better soil infiltration capability and aeration, better water-holding capacity, more resistance to wind erosion, reduced potential for compaction, and better overall soil fertility. Organic matter helps hold soil nutrients in place, so they are not lost to runoff or leaching. If left undisturbed, soil organic matter can eventually be transformed into long lasting humus, a very stable form of organic matter. However, if the soil is tilled, soil organic matter will be oxidized and carbon will be lost to the atmosphere as CO₂. If the soil erodes, organic matter will be removed with runoff water.

8. **What affects the level of soil organic matter?**

Native levels of soil organic matter for any particular site are determined largely by the latitude location on the earth, and by the annual precipitation received. Native soil organic matter levels will generally increase as you move either north or south from the equator. In the Great Plains of the United States, organic matter levels increase from west to east following the precipitation gradient. Management by man can change the soil organic matter level. In general, as cropping inten-

As tillage frequency increases, soil organic matter tends to decrease. As tillage frequency increases, soil organic matter tends to decrease. For Kansas producers, eliminating periods of fallow and using no-tillage provides the greatest potential to increase soil organic matter level at a given location.

9. What is K-State doing to promote carbon sequestration?

K-State scientists are working to develop best management practices that will promote carbon sequestration. Research is being done to test the effect of tillage, various crop rotations, soil conservation practices, and several grazingland management practices on soil carbon levels.

10. What is CASMGS?

A team of scientists at 10 universities and government laboratories has recently formed the Consortium for Agricultural Soils Mitigation of Greenhouse Gases (CASMGS, pronounced "Kaz-ums"). With federal funding, this group will provide the science and technology necessary to help our nation realize this benefit. CASMGS brings together the nation's top researchers in the areas of soil carbon, greenhouse gas emission, conservation practices, computer modeling, and economic analysis. CASMGS is also working with international scientists on carbon mitigation efforts. Charles W. Rice, soil microbiologist in the Department of Agronomy at K-State, is the national CASMGS coordinator.

For more information on carbon sequestration:

www.oznet.ksu.edu/kccm
www.oznet.ksu.edu/ctec
www.casmgs.colostate.edu

Soil Organic Carbon and the Global Carbon Cycle,
MF-2548

Or contact:

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kmcvay@ksu.edu

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This material is based upon work supported by the Cooperative State Research, Education, and Extension Service, U.S. Department of Agriculture, Under Agreement No. 2001-38700-11092.

Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture.

Kansas State University
Agricultural Experiment Station
and Cooperative Extension Service

MF-2564

October 2002

It is the policy of Kansas State University Agricultural Experiment Station and Cooperative Extension Service that all persons shall have equal opportunity and access to its educational programs, services, activities, and materials without regard to race, color, religion, national origin, sex, age or disability. Kansas State University is an equal opportunity organization. Issued in furtherance of Cooperative Extension Work, Acts of May 8 and June 30, 1914, as amended. Kansas State University, County Extension Councils, Extension Districts, and United States Department of Agriculture Cooperating, Marc A. Johnson, Director.



Carbon Sequestration:

Top 10

Frequently Asked Questions

1. What is meant by carbon sequestration?

Carbon sequestration is essentially the process of transforming carbon in the air (carbon dioxide, or CO₂) into stored soil carbon. Carbon dioxide is taken up by plants through the process of photosynthesis, and incorporated into living plant matter. As the plants die, the carbon-based leaves, stems, and roots decay in the soil and become soil organic matter. This is the basic process called carbon sequestration.

2. How can carbon sequestration help reduce global warming problems?

Atmospheric carbon dioxide, and other greenhouse gases act to trap heat that is reflected from the earth's surface. This buildup of heat could lead to global warming. Through carbon sequestration, atmospheric carbon dioxide levels are

4-16

Agriculture's Role In Reducing Atmospheric Carbon Levels

It is a known fact that greenhouse gases, such as carbon dioxide and methane, are increasing every year in the earth's atmosphere. This buildup may well be leading to global warming. Scientists say there are two main ways of reversing this trend: (1) reducing fossil fuel emissions, and (2) taking more carbon out of the atmosphere and storing it in natural "sinks" on earth, a process known as carbon sequestration.

Agriculture can help in both ways. With sufficient economic incentives, producers can use currently accepted management practices to help store more carbon and reduce emissions, and this will help the U.S. meet greenhouse gas reduction goals. This can be done on cropland, grazing land, and set-aside ground. It is estimated that up to 20% of U.S. carbon emissions can be sequestered back into agricultural soils.

Agricultural soils represent one of the best sinks for carbon storage in the Earth's ecosystem. Deep ocean storage and deep geological storage are other potential carbon sinks, but are more costly and less practical than using agricultural soils.

How can producers increase carbon storage in agricultural soils? This is being studied by a federally-funded team of scientists at 10 universities and government laboratories known as the Consortium for Agricultural Soils Mitigation of Greenhouse Gases (CASMGs, pronounced "chasms"). CASMGs brings together the nation's top researchers in the areas of soil carbon, greenhouse gas emission, conservation practices, computer modeling, and economic analysis.

With the current state of knowledge, it is known that carbon sequestration can be accomplished by the following means:

Cropland

1. No-till or reduced-till systems
2. Increased crop rotation intensity by eliminating summerfallow
3. Buffer strips
4. Conservation measures that reduce soil erosion
5. Using higher residue crops, such as corn, grain sorghum, and wheat
6. Using cover crops
7. Selecting for varieties and hybrids that store more carbon

Grazing land

1. Improving forage quality
2. Regular use of prescribed burning to increase forage productivity
3. Reducing overgrazing

Set-aside land

1. Growing high-yield grasses, such as switchgrass or eastern gamagrass on Conservation Reserve Program land

Estimates of the carbon sequestration potential are available for some of these practices:

Agricultural practice	Amount sequestered (tons/acre/year)
Conservation tillage	0.12 - 0.20
Summer fallow elimination	0.05 - 0.15
Rotation with winter cover crops	0.05 - 0.15
Fertilizer management	0.025 - 0.075
Conservation Reserve Program	0.15 - 0.35

Many of these practices involve additional costs for producers, and would require some financial incentives to implement on a wide-scale basis. Part of that cost could be accomplished through a private system of "carbon credit" trading. It is estimated that producers who implement one or more practices proven to store carbon in agricultural soils might be able to sell carbon credits to utilities and other industrial concerns for about \$2 per acre per year on the open market. This type of trading system is in its infancy now, so there's no way to know how much producers can realistically expect to get from selling carbon credits.

Additional tax incentives or "green payments" from the government would probably be needed, especially for implementing practices with higher costs and limited returns. This would include such practices as buffer strips, most soil conservation measures, and the use of cover crops.

Other practices, such as no-till, increasing crop rotation intensity, manure application, and improved forage production, may be more profitable for producers in themselves. Where this is the case, the increased profitability will help get the practices implemented.

As an example, research at Kansas State University has shown that no-till grain sorghum in western Kansas is about \$30 per acre more profitable than conventional-till grain sorghum. The profitability of wheat is largely unaffected by tillage system, according to the research. The biggest benefit in western and central Kansas comes when no-till is used in combination with increased rotation intensity. For example, a long-term study in Hays showed that wheat-sorghum-fallow is about \$10 per acre more profitable than either wheat-fallow or sorghum-fallow. In eastern Kansas, no-till has not shown any increase in profitability in K-State research, so other economic incentives would be more important in this area to get farmers to adopt no-till.

The additional amount of carbon that can be stored in agricultural soils through the adoption of no-till and increased crop rotation intensity is estimated to be between 400-500 pounds of carbon per acre per year. Nationwide, this could total anywhere from 80 to 300 million tons per year.

No-till also involves less field work. By reducing the number of trips over the field from 8 to 4, carbon emissions would be reduced by 50%.

The amount of carbon that can be sequestered and the amount of emissions that can be reduced through the adoption of other potential practices, such as the use of buffer strips, requires further research.

If producers can be induced to adopt more practices that store carbon, there will be many benefits to the nation other than just helping to solve the problem of increasing greenhouse gases. Additional benefits include:

1. Improved soil structure and quality
2. Improved soil productivity through increased organic matter
3. Reduced erosion through improved soil structure
4. Improved water quality through reduced erosion

To sum up, changes in practices used on agricultural land can play a role in solving the problem of greenhouse gas buildup at very little cost to the economy. These same practices can also result in several long-term benefits related to the improvement in soil quality.

Storing Carbon in Soil:

Charles W. Rice

Carbon is a primary element of all organic life forms on Earth. Carbon also is distributed in geologic material, oceans and the atmosphere. Concern has been mounting about the rapid buildup of carbon dioxide in the atmosphere — which is increasing by more than 3 billion tons per year. Industrialization and the burning of fossil fuels (coal, oil and natural gas) have accelerated this buildup. Carbon dioxide is a gas that absorbs heat, and thus contributes to the greenhouse effect.

The potential ramification of elevated atmospheric carbon dioxide on climate change makes it necessary to reduce carbon dioxide emissions — through increased energy efficiency and greater use of non-carbon energy — or to sequester carbon dioxide by injecting it into geologic formations and oceans or enhancing its uptake by terrestrial and aquatic ecosystems.

Terrestrial ecosystems, both plants and soils, provide an attractive mechanism for carbon sequestration because we can manage them. We can manage plant growth to increase plants' capacity to uptake carbon dioxide. And we can manage plant growth so that soils in turn store carbon for long periods of time. Agricultural lands are a good example.

Why soils?

The estimated amount of carbon stored in world soils is about 1,100 to 1,600 petagrams (one petagram is one billion metric tons), more than twice the carbon in living vegetation (560 petagrams) or in the atmosphere (750 petagrams). Hence, even relatively small changes in soil carbon storage per unit area could have a significant impact on the global carbon balance.

Carbon sequestration in soils occurs through plant production. Plants convert carbon dioxide into tissue through photosynthesis. After the plants die, plant material is decomposed, primarily by soil microorganisms, and much of the carbon in the plant material is eventually released through respiration back to the atmosphere as carbon dioxide.

But some of it remains when organic materi-

als decay and leave behind organic residues, often called humus. These residues can persist in soils for hundreds or even thousands of years. At the same time, many factors can slow the decay of organic materials and, as a result, affect a soil's capacity for storing carbon. Inherent factors include climate variables (temperature and rainfall), clay content and mineralogy.

It is possible to manage agricultural lands to maximize the amount of carbon those soils can store. The work my colleagues and I have undertaken on the agricultural lands of Kansas attempts to map the benefits of such soil management.

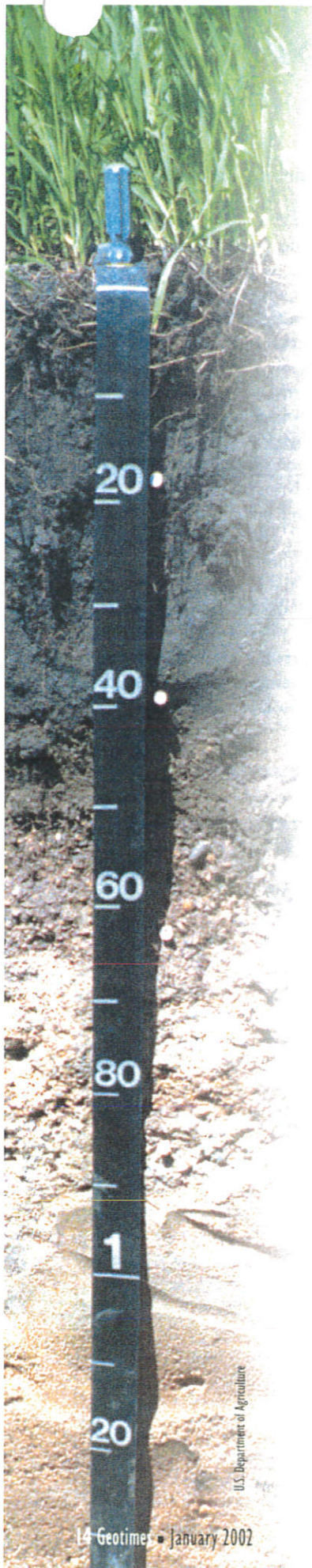
Staying in the soil

Climate affects soil carbon sequestration in two ways. First is the production of organic material entering the soil. Warm, moist climates generally have greater plant productivity. Cooler climates limit plant production. Hot climates may limit production because of reduced water availability, making water the limiting factor. Climate also affects the rate of microbial decomposition of plant material and soil organic matter. As temperature increases, microbial activity generally increases.

Soil water content also is important. Optimal microbial activity occurs at or near field capacity — the maximum amount of water that soil can hold against gravity. As soil becomes waterlogged, decomposition slows and becomes less complete. Peat soils are a common result. Decomposition also slows as soils dry.

Clay content stabilizes organic carbon by two processes. First, organic carbon chemically bonds to clay surfaces, which slows degradation. Clays with high adsorption capacities, such as montmorillinitic clays, retain the organic molecules. Secondly, soils with greater clay contents have a higher potential to form aggregates, which trap organic carbon and physically protect it from microbial degradation.

Generally, ecosystems that provide high quantities of plant material have the greatest potential to store carbon. Tropical ecosystems often provide some of the highest amounts of plant biomass, although these amounts are bal-



U.S. Department of Agriculture

Why and How?

anced by high rates of decomposition. Soils formed under tallgrass prairie, such as those my colleagues and I are studying on the Konza Prairie Biological Station near Manhattan, Kan., have high amounts of soil carbon. These amounts partly result from a high rate of plant productivity, with approximately 60 to 80 percent occurring

below ground. The amount of carbon stored in these soils is equivalent to soils of tropical forests.

Even in one handful of soil, not all carbon is the same and differs by its degradability. Soil organic carbon often is divided into three pools: active, intermediate or slow, and recalcitrant. These three pools

have different rates of turnover with the active pool on the order of months to years, the slow pool decades, and the recalcitrant pool hundreds to thousands of years. The active pool includes microbial biomass and labile organic compounds that make up less than 5 percent of the soil organic carbon. The slow pool usually makes up 20 to 40 percent, the recalcitrant 60 to 70 percent.

The goal of sequestering carbon in soils is to promote carbon transformations into the intermediate and recalcitrant pools. If more of the carbon ends up in the slow or recalcitrant pool, then it is less subject to loss and can remain in the soil for hundreds or thousands of years.

Carbon in soils under natural ecosystems often is at high levels and is considered at equilibrium, thus unable to sequester additional carbon. However, we have shown that in the soil beneath a native tallgrass prairie, soil carbon increased by 6 percent as deep as 50 centimeters when the tallgrass prairie was exposed to elevated carbon dioxide. The extra carbon dioxide increased plant production, which in turn increased how much carbon was incorporated into the soil. Most of the carbon was sequestered into a relatively slow pool, but some of the carbon was integrated into recalcitrant fractions, indicating longer-term storage.

The amount sequestered over the eight-year experimental period was equivalent to 6 megagrams per hectare. If one million acres absorbed this much carbon, it would store the same amount released by burning 4.3 million tons of coal. Furthermore, much of the carbon that was added from plant material was stored in macroaggregates larger than 250 micrometers, supporting the theory that physical protection of soil carbon is an integral part of carbon sequestration.

The potential of a tallgrass prairie

Agriculture in the 1800s and early 1900s relied on plowing the soil with low crop yields and on removing crop residues. This combination of agricultural practices resulted in reduced replenishment of organic material (carbon) to the soil. As a result, approximately 50 percent of the soil organic carbon (soil organic matter) has been lost over a period of 50 to 100 years of cultivation. However, this loss of soil carbon leaves space for new carbon. In recent decades, higher yields, retention of crop

Charles Rice of Kansas State University displays a carbon-rich soil sample from the Konza Prairie Biological Station near Manhattan, Kan. The soil's dark color shows the presence of organic material.



Don Dornert, Kansas State University

residues and development of conservation tillage practices have begun to increase soil carbon. Advances in crop and soil management practices can potentially allow soils to store more carbon.

No-tillage is one management practice that often preserves or increases soil carbon. My colleagues and I performed a study in western Kansas in which native sod was planted to a winter wheat-grain, sorghum-fallow rotation using either no-tillage or tillage to prepare the seedbed and plant the seed. After 10 years, the mass of aggregates larger than 2,000 micrometers in the top 5 centimeters was reduced and redistributed into aggregates of less than 250 micrometers when native sod was converted to cropping. The amount of carbon in macroaggregates of greater than 250 micrometers in native sod was double that observed in conventional tillage. No-tillage conserved the same amount of

macroaggregates that naturally occur in native prairie soil. The organic carbon associated with the macroaggregates was preferentially lost with cultivation. No-tillage soils have a higher potential for storing injected carbon for a long time.

In addition to preserving soil carbon from native conditions, no-tillage can increase soil carbon in soils that were previously cultivated and contained reduced levels. In my study of maize that ran continuously for 10 years at Kansas State University, no-tillage increased soil carbon by 9 percent when compared with tilled soil. Water-stable aggregates increased in no-tillage compared with tillage, especially in aggregates larger than 2,000 micrometers. The number of macroaggregates greater than 250 micrometers increased, as did the carbon associated with the aggregates, preferential to the smaller size aggregates. When manure was added as a nitro-

gen source, no-tillage also held more of the manure's carbon: the no-tillage soil held 32 percent more carbon from the manure than the tilled soil. Thus, manure added both nitrogen and carbon.

More frequent planting of crops (almost year-round) infuses the soil with extra plant material and increases the amount of carbon stored. In western Kansas, intensifying cropping systems by conversion from wheat-fallow rotation to wheat-grain, sorghum-fallow rotation has increased soil carbon levels.

Another factor that determines storage capacity is the quality of plant carbon entering the soil. Our research shows that carbon from roots may contribute more to soil organic matter formation than does carbon from straw. The reason for this difference between roots and above-ground material is not clear, but roots have a higher ratio of carbon to nitrogen, which would slow

Early evening falls on the tallgrass prairie of the Konza Prairie Biological Station in Kansas.



It is possible to manage agricultural lands to

decomposition and encourage formation of humus. This conversion of carbon into humus is important because humus is part of the recalcitrant pool and the carbon in humus lasts longer in the soil. This quality factor suggests that plant breeding may provide avenues for increased carbon sequestration, either by changing plant composition of carbon compounds so that more carbon will be converted to soil organic matter, or by altering ratios of roots to shoots.

Microorganisms convert plant carbon into soil organic carbon. Differences in the soil microbial community can affect the ratio of carbon converted to carbon dioxide vs. to soil organic carbon. In research on the Konza Prairie that changed water relations in a tallgrass prairie, the soil microbial community was changed to favor fungi. Because bacteria tend to respire more plant carbon to carbon dioxide, while

fungi tend to retain more carbon in the soil, the result was a greater retention of carbon into microbial products in the soil. Further research needs to be conducted on potential manipulation of the soil microbial community to find biogeochemical transformations of carbon that remain in soil.

Other pluses to soil carbon

Managing agricultural soils for sequestering carbon will yield additional benefits. When carbon is part of the soil organic matter fraction, the soil's capacity to hold basic cations increases, which in turn improves soil fertility. Soil organic matter also improves water holding capacity, thus increasing plants' ability to withstand short droughts. Soil carbon improves the structure of the soil, which results in improved drainage and aeration and better root

growth. For the microbial community, carbon provides an energy source resulting in greater nutrient cycling and biodiversity. In addition, management practices that increase soil carbon also tend to reduce soil erosion, reduce energy inputs and improve soil resources. Increasing a soil's capacity to store carbon means increasing how much carbon it contains, which in turn increases crop productivity and enhances soil, water and air quality.

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Learn more about the Konza Prairie Biological Station at www.konza.ksu.edu



maximize the amount of carbon those soils can store.

By Karl Kessler

CARBON WHAT?

Carbon sequestration can help clean up the earth's atmosphere, and add to your bottom line as well

Carbon sequestration hasn't become an everyday term in coffee shops and grain elevators yet, but the next time you hear it, you might want to listen up.

There's been more than a little talk about farmers and ranchers actually getting paid to sequester carbon, and at least a couple of fledgling programs are trying their wings. But even if a full-scale program never materializes, practices that sequester carbon can benefit your farm, the environment, and your bottom line.

Big word. Sequestration is a big word that basically just means putting carbon in the soil as organic matter and storing it there. Nature's primary tools for doing that are trees and the crops and grasses that blanket agricultural lands.

Through the process of photosynthesis, plants take carbon dioxide out of the air and use part of the carbon in it to build biomass. When the plants die and decompose, that carbon is returned to the soil as organic matter. The soil then becomes, in effect, a bank where the carbon can be safely kept to earn dividends for producers.

Carbon dioxide is the most abundant of greenhouse gasses. Removing it from the atmos-

phere is thought to be one way to help slow global warming.

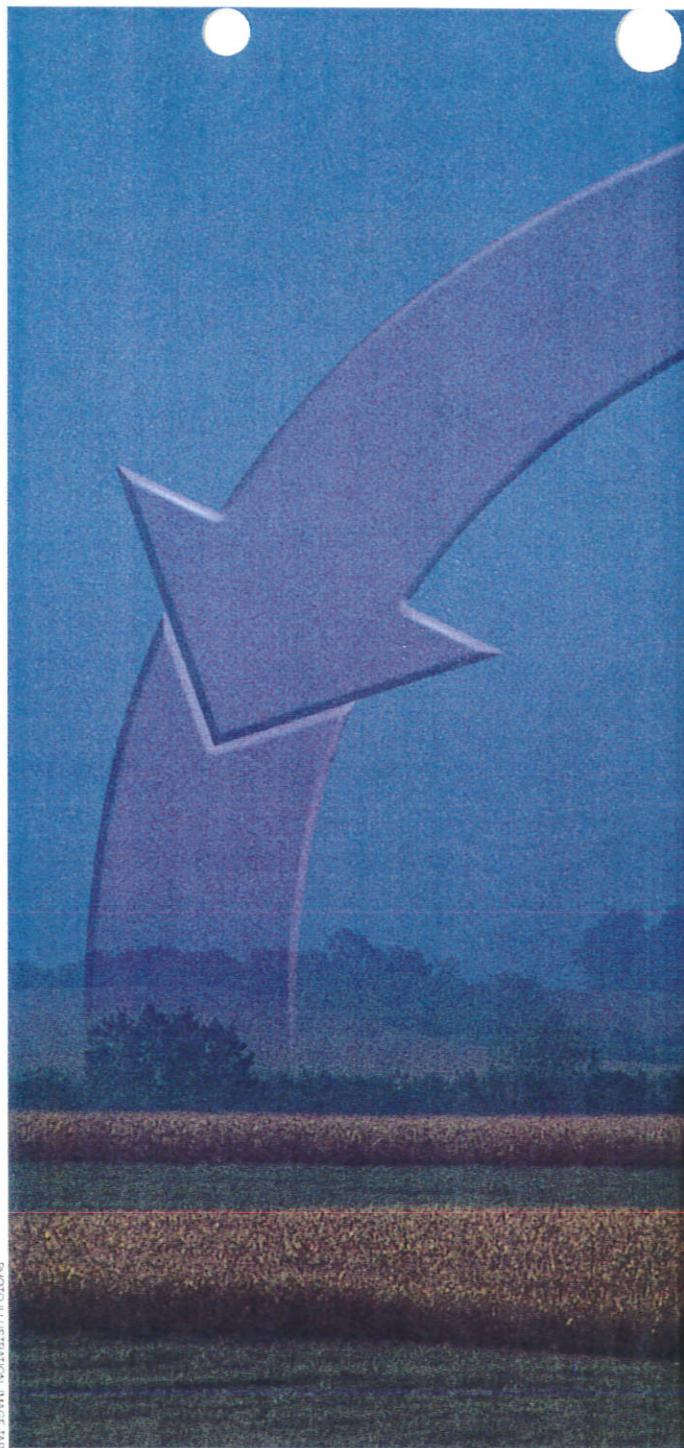
Most atmospheric carbon dioxide comes from burning fossil fuels for transportation or to generate power. The only way to keep the troublesome gas from building up in the atmosphere is to reduce emissions or tie it up and store it—to bank it if you will.

New interest. Sparked by concerns about global warming, and by international negotiations aimed at reducing greenhouse gases, the concept of paying farmers to sequester carbon has gained momentum over the past few years.

Scientists have recently calculated that U.S. farm and grazing lands are currently sequestering roughly 20 million metric tons of carbon a year. With improved management, the scientists say, that total could be boosted to some 200 million metric tons annually. Altogether, that would be 12 to 14 percent of total U.S. carbon emissions.

Similar estimates have been made for Canada. Experts there suggest that the nation's 60 million hectares of farm fields and grasslands have the potential to soak up as much as 34 million tons of carbon per year for the next two decades.

The primary banks, or sinks as they are often called, would be forests, farms, and grasslands. The way they sequester carbon is to keep it tied up in organic matter. Exposing soil to the air allows soil microbes to oxidize some of the carbon, turning it back into carbon dioxide. The gas can then es-



cape back into the atmosphere.

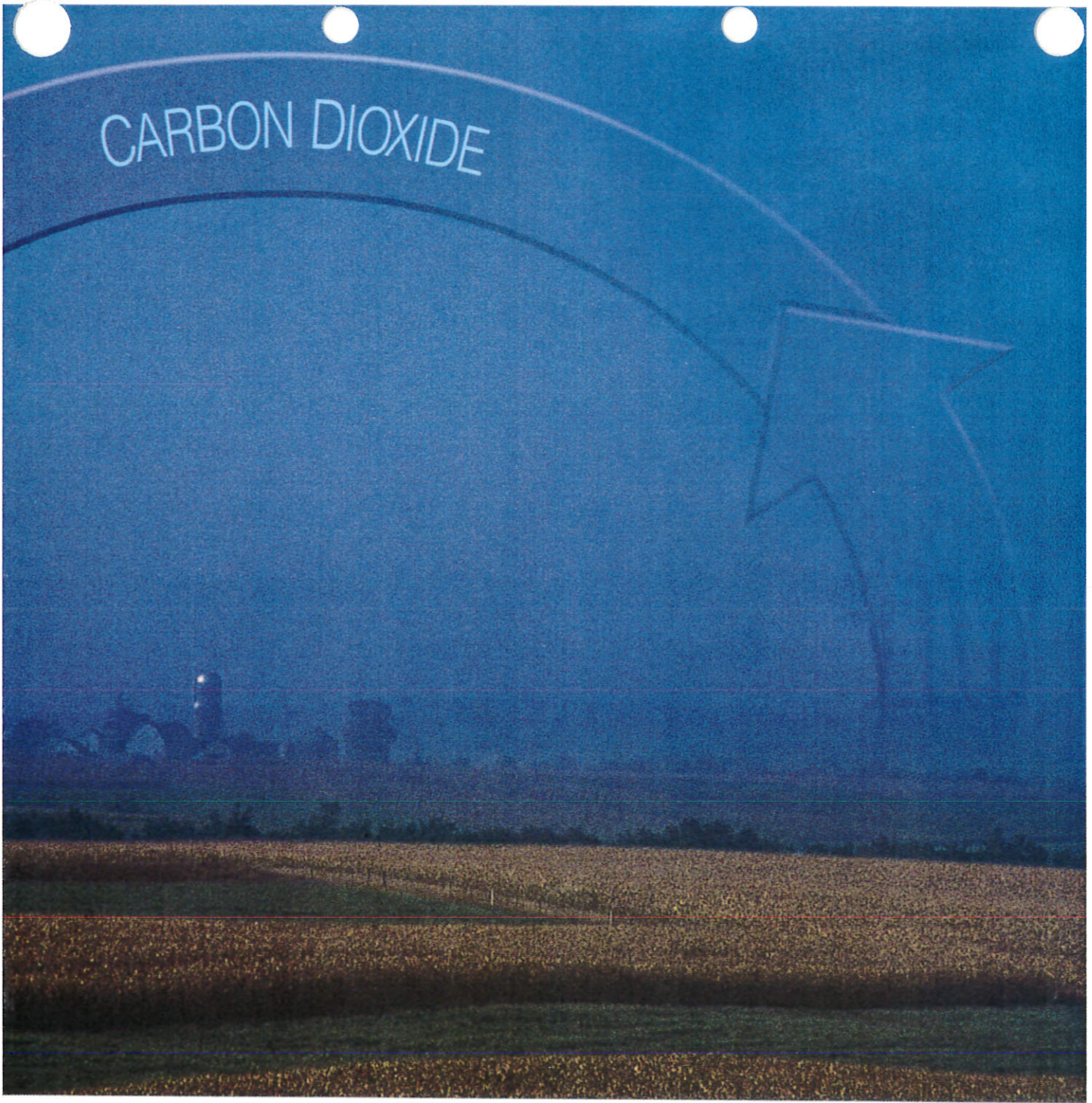
Undisturbed grasslands and CRP ground form a huge carbon sink. On cropland, practices that sequester carbon include conservation tillage, cover crops, rotations with alfalfa and other legumes, and planting trees and grass buffers.

Incentives. In view of the vast acreages of agricultural land, various programs have been proposed to encourage farmers to sequester more carbon. The prevailing thought is

that power companies and other major carbon dioxide emitters could be required to pay farmers and ranchers to store offsetting amounts of carbon.

Another approach would be to give farmers direct government payments for sequestering carbon, but most discussion and the programs devised so far favor having private industry foot the bill.

In either scenario, the payments probably would be based on scientific estimates of how



CARBON DIOXIDE

much carbon, or how many carbon dioxide equivalents, various tillage and other practices could be expected to sequester.

Looking ahead. Anticipating future regulation, a consortium of Canadian energy companies known as GEMCo has already initiated a carbon-offset program. Since announcing the program in late 1999, GEMCo has arranged to purchase 500,000 tons of carbon credits, and aims to contract for up to 2.8 million tons by 2008.

Above: Agricultural lands can help significantly reduce carbon dioxide overload in the earth's atmosphere.

Right: Chuck Rice heads a coalition of scientists organized recently to study carbon sequestration in depth.

A U.S. environmental firm, Chicago Climatic Exchange, is developing a pilot program to assess the feasibility of a carbon market. Field representatives for American Agrisurance, the nation's largest crop insurer, will help farmer clients establish carbon credits for the project. ◊

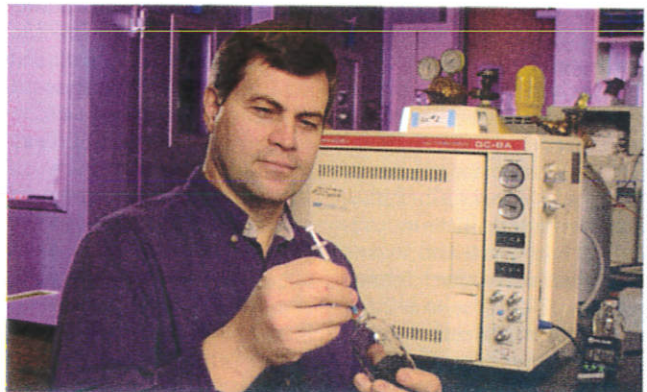


PHOTO: DAN DONERT, KANSAS STATE UNIVERSITY

Greg Livingston, who heads the insurance company's part of the effort, says they expect to roll the program out in seven Midwest states later this year. "Our goal is to make it available to farmers across the U.S. in 2003, and to go international with it by 2004," he adds.

Hangup. Livingston says many details remain to be worked out, but he thinks a carbon market is quite feasible. "The main hangup is an incentive for buyers," he says. "We don't see a full-scale market developing until there's some type of regulation that requires companies to limit carbon dioxide emissions or buy carbon credits to offset them."

"If the pilot project succeeds, we hope Washington will get behind this and that we'll eventually see a program that will put a few more dollars per acre in farmers' pockets."

Alberta's provincial government has already stepped in. Last December, utility companies there were put on notice that offset credits will have to be purchased as a condition for approval to build any new power plants. In the U.S., Washington and Oregon are considering similar regulations.

On a federal level, many proponents had hoped to see significant provisions regarding carbon sequestration in the 2002 U.S. farm bill. New priorities driven by the events of Sept. 11 dashed those hopes, but as the bill neared completion while this article was being written, it included funding authorization for carbon-sequestration research, along with demonstration projects and outreach.

Research. A good number of researchers have already gotten involved. At the National Soil Tilth Laboratory in Ames, Iowa, microbiologist Tim Parkin is heading a team that's measuring carbon gains and losses that result from various farming practices. They plan to use the data to create models for predicting changes in soil carbon when different practices are



Above: John Haas says practices that sequester carbon increase farm profits with or without carbon credits.

Right: Fragments of plant biomass, shown here at 25 times normal size, return locked-up carbon to the soil.

used on various types of soil.

Scientists at more than 25 locations throughout the U.S. are collecting data to use in developing and improving the models, and additional models are being developed by scientists in other locations.

Chuck Rice, a Kansas State University soil microbiologist, is heading up a group of scientists who will be studying the potential for storing carbon in agricultural land and coming up with better ways to get the job done.

Consortium. The recently formed task force, known as the Consortium for Agricultural Soils Mitigation of Greenhouse Gases, includes researchers from nine land-grant universities and the U. S. Department of Energy's Battelle-Pacific Northwest National Laboratory. USDA will fund their studies.

"Basically, we'll focus on determining how much carbon can be stored in agricultural land and what management practices sequester carbon most effectively under various conditions," Rice says.

"Discussions of carbon sequestration and carbon-storage programs have raised a lot of questions that need to be answered," he adds. "In another three to five years, we should know a great deal more than we do now."

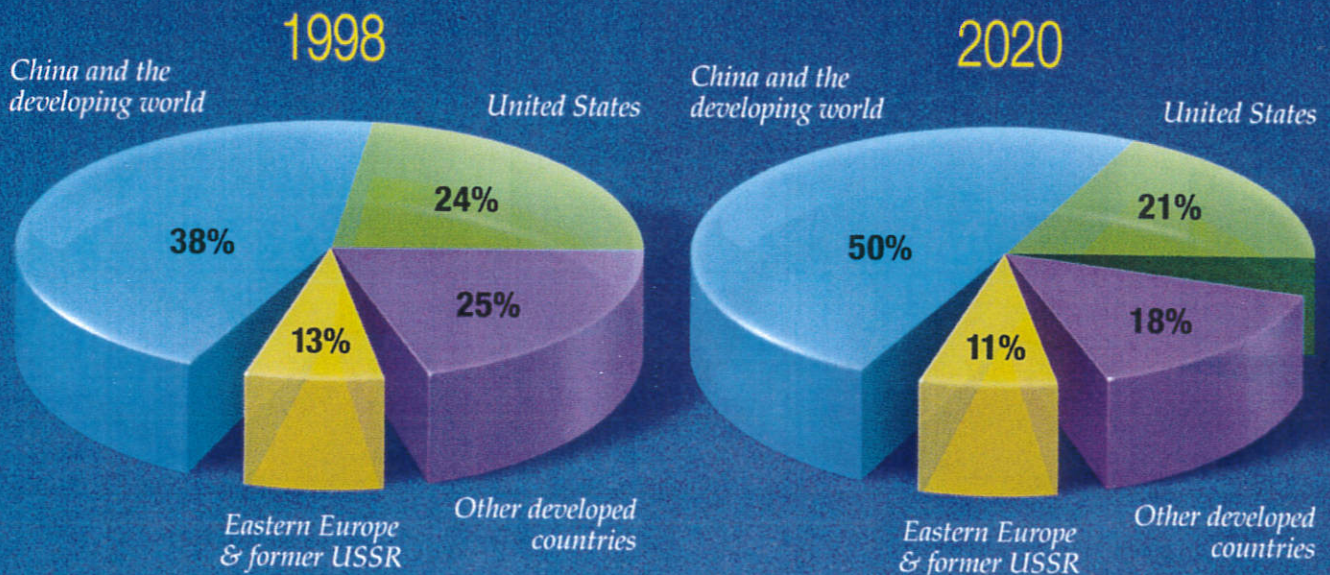


PHOTO: JILLIE JASTROW/ARGONNE NATIONAL LABORATORY



PHOTO: SCOTT BAIFRI/USDA

CARBON EMISSIONS



Increasing amounts of carbon dioxide, the most abundant greenhouse gas, are expected to come from developing countries. Experts believe U.S. farmers can help offset some of the increase by sequestering carbon.

Illustration: Image Tap/Source: U.S. EPA

Don Reicosky, a soil scientist at USDA's North Central Soil Conservation Research Laboratory near Morris, Minn., says he's begun to preach the message that carbon sequestration is good for everyone, not just for farmers.

Reicosky ticks off more than a dozen benefits soil organic matter provides. "Carbon is the primary energy source for soil microorganisms and that makes it the key for all of the physical, chemical, and biological processes in the soil," he says.

Other pluses. He adds that organic matter improves soil structure and tilth, and helps keep pesticides from leaching through soil and into ground water. It also increases water-holding capacity, infiltration rates, and fertility, and reduces soil compaction and erosion.

Reicosky says these and other benefits add up to a positive environmental impact that goes well beyond carbon se-

questration. "Farmers and the public alike need to understand and appreciate that," he adds.

John Haas is one farmer who does. He began reducing tillage in the early '90s and now no-tills most of the 3,800 crop acres he farms near Larned, Kan. Haas says he's producing bigger yields at lower cost than he used to. At the same time, he has reduced erosion and improved the structure and organic-matter content of his soil.

"When I found out about carbon sequestration three or four years ago, I realized that's basically what I was doing," Haas says. "And when I learned that I was helping the environment as well as myself, I wanted to do even more."

Haas, who has appeared before the U.S. Senate's agriculture committee to provide a farmer's perspective on carbon-sequestering practices, says he thinks there's a good chance farmers eventually will be able to get some sort of direct financial reward for banking carbon.

"That would be wonderful,



PHOTO: ADAM WILTS/USDA

but it would just be a bonus as far as I'm concerned," he adds. "I'm already raising better crops and making more money than I did before I started using carbon-sequestering practices."

"We still don't totally understand this phenomenon, but we know that it's something that happens in nature," he says. "If we can help nature clean up the air and make more money at the same time, then I'm all for it."

Buying time. Carbon sequestration isn't widely viewed as a long-term solution to the problem of carbon dioxide over-

load in the earth's atmosphere, but advocates say it's a place to start, and something that needs to be done.

Chuck Rice speaks for many when he says other alternatives such as biofuels and cars that are more fuel-efficient are needed, but it will take time to make them economically viable.

"Carbon sequestration is something we can do now, and it will buy us time to come up with better technologies," he says.

Microbiologist Tim Parkin is researching biological processes that release carbon from soil organic matter.

Carbon is the fundamental building block of all life. Carbon is present in the atmosphere, in plant and animal life, in nonliving organic matter, in fossil fuels, in rocks, and dissolved in oceans. Movement of carbon molecules from one form to another is known as the carbon cycle (Figure 1). Plants acquire carbon from the atmosphere through photosynthesis. Using carbon dioxide (CO₂) from the atmosphere and energy from sunlight, plants convert CO₂ to organic carbon as they produce stems, leaves, and roots. The cycle of life and death of plants results in accumulation of decomposing plant tissue, both aboveground and belowground (plant roots), and produces a significant amount of soil organic carbon.

Soil Organic Carbon

Soils vary in the amount of soil organic carbon¹ they contain, ranging from less than 1 percent in many sandy soils to greater than 20 percent in soils found in wetlands or bogs. Kansas soils had a native soil organic carbon content ranging from 1 to 4 percent. Most Kansas cultivated soils now have soil organic carbon levels of 0.5 to 2 percent.

In Kansas, native prairie grasses, such as big bluestem (*Andropogon gerardii* Vitman) and Indiangrass (*Sorghastrum nutans* (L.) Nash), helped develop deep soils. Roots of these and other grass species are fibrous, and can grow to great depths, producing a majority of their annual biomass belowground. Consequently, the significant organic carbon level in soils that developed under native grasses occurs to a depth of several feet. The dark black color associated with rich, fertile soil is largely a measure of its organic carbon content. As a soil's organic carbon content drops, the soil's color lightens and reflects its mineral content. Thus the red soils of

¹ Note: The chemical formula for soil organic matter is very complex, but consists primarily of organic carbon, nitrogen, and hydrogen. To convert soil organic matter (%OM) as reported in most soil tests to just soil organic carbon, divide percent organic matter by 1.7.

southeastern Kansas and northeastern Oklahoma are indications of higher iron concentration and lower soil carbon levels.

Soils that form under forests tend to accumulate high levels of soil organic carbon near the surface and have lower carbon levels in the subsoil. This layering of soil, is primarily due to the accumulation of leaf litter and decaying wood from limbs and trees that accumulate at the soil surface. But soil layering is also a function of higher annual rainfall and the accelerated weathering process that enriches the subsoil with clay.

Atmospheric Carbon

Scientists using ice core data, combined with long-term monitoring of CO₂ in the atmosphere, have verified tremendous fluctuations in atmospheric CO₂ over the past 200,000 years. Looking at the past 1,000 years, atmospheric CO₂ levels have increased significantly (Figure 2). The current level (2000 A.D.) of CO₂, approximately 369 ppm, is now higher than at any time in the past 1,000 years. More importantly, this unprec-

The Global Carbon Cycle

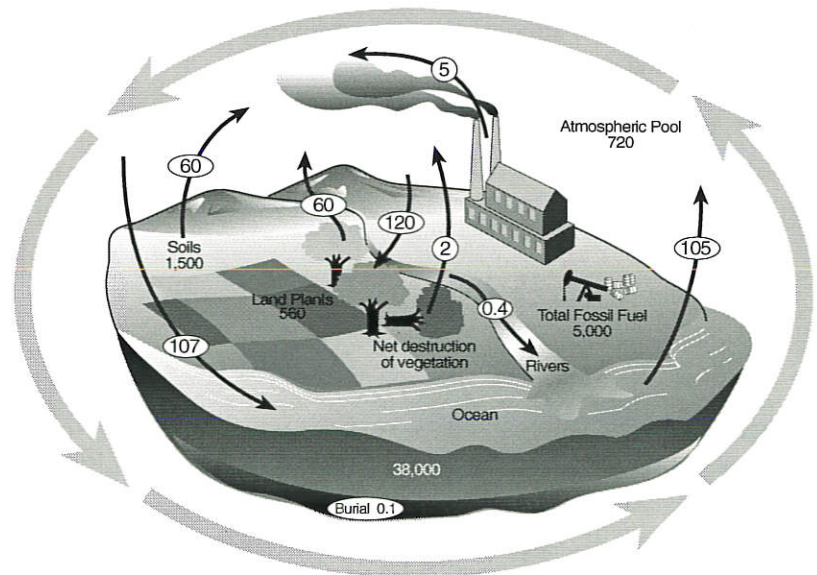


Figure 1. The present-day global carbon cycle. All pools are expressed in units of gigatons of carbon, and rates are gigatons of carbon per year. (from: Schlesinger, 1991)

edented rate of increase has accelerated so quickly that the ecosystem may be unable to adapt.

This rise in CO_2 corresponds with the use of fossil fuel, land clearing, and land use change as seen here in the Great Plains and around the world. The most significant factor that explains rising atmospheric CO_2 levels is fossil fuel use. At the current use rate of 5 Gt carbon per year, (Gt stands for a gigaton, which equals 2.2 trillion pounds), the total reserves of fossil fuel will likely be exhausted during the next 300 to 400 years.

As the fossil fuel inventory is expended, carbon that has been out of the cycle for millions of years is moved directly to the atmosphere. Atmospheric carbon will eventually cycle back into organic carbon, or into the oceans and reach a new equilibrium, but the process may take thousands of years to occur.

In the short-term, this "new" carbon will remain in the atmosphere as CO_2 . Current atmospheric models predict that the complete expenditure of the fossil fuel reserves will drive peak concentrations of atmospheric CO_2 to levels near 1,200 ppm. Some scientists believe even higher concentrations will occur. This increased level of CO_2 has led some scientists to believe that the average global temperatures may begin to increase. In the popular press this is referred to as global warming. The so-called greenhouse gases, CO_2 , methane (CH_4), and nitrous oxide (N_2O) that exist in the atmosphere, help retain heat that normally radiates away from the earth's surface. With greater concentrations of these gases, heat may not be able to escape, resulting in increased global temperatures. Changes in global temperatures so far are slight and show no definite trend, but changes in atmospheric CO_2 levels are well documented and are accepted by most scientists.

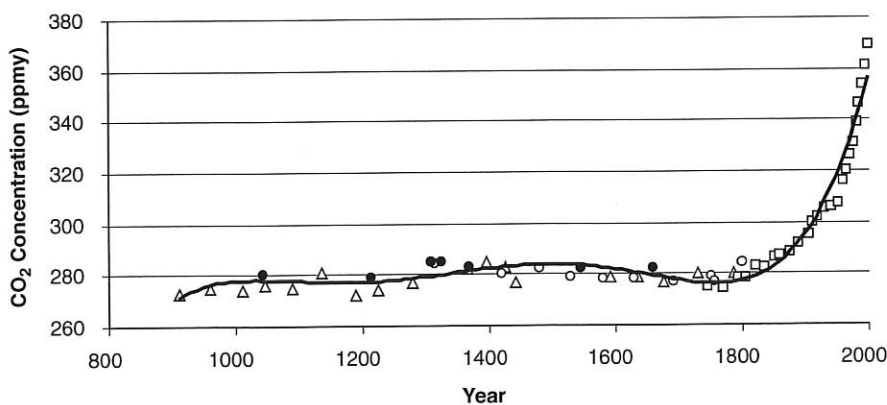


Figure 2. Changes in atmospheric carbon dioxide levels. (Note: This graph shows CO_2 levels from ice core data from Greenland, and Antarctica (various symbols represent different sampling sites) + monitoring at Mauna Loa, through ~2000. (Adapted from IPCC, 1995, and from CDIAC, U.S. Department of Energy, 2002)

Managing Carbon

What can be done to slow or reverse the increase in CO_2 ? Thinking in terms of sources, where CO_2 is produced, and sinks, where CO_2 is removed, an obvious solution is to reduce input of the source, by reducing fossil fuel use. This would limit the input of CO_2 to the atmosphere. Eventually, cleaner and more efficient energy sources will be required, but the current economics of fossil fuel limits the adoption and development of alternative energy sources. In the interim, as we develop alternative energy technologies, increasing the use of sinks may help stabilize atmospheric CO_2 levels.

An inventory of the world's carbon reservoirs (Figure 1) illustrates that carbon storage in the deep oceans is the major reservoir, but changes to this pool can take millions of years. In addition, our ability to manipulate that pool is limited. The next biggest pool is soil organic carbon. Soil organic carbon constitutes more than twice as much stored carbon as that of the earth's vegetation (plants, trees, crops, and grasses). One way to help stabilize atmospheric CO_2 would be to adopt practices worldwide that increase soil carbon levels.

How much carbon can be stored in a given Kansas soil? It's a simple question, but there is no simple answer. Storage potential for the soil is a function of the soil's current organic carbon level, atmospheric CO_2 concentration, and soil-management practices. For many Kansas soils, significant topsoil losses due to erosion, and frequent tillage operations have reduced carbon levels to less than half of their native values. With proper management, soil organic carbon of most soils can be increased.

Losses of soil carbon over the first half of the 20th

century were partly recovered in the second half as soil conservation practices improved and cropping systems intensified (Figure 3). Proper fertility practices and improved hybrids and cultivars have also played a role in building soil organic carbon levels. Higher yields and greater cropping intensities increase the amount of biomass returned to the soil, providing a larger input that can become soil organic carbon. The right-hand side of Figure 3 shows future projections of soil organic carbon levels assuming 1990 tillage and cropping practices.

Soils that are managed with no-tillage and intensified cropping systems could increase soil carbon at the rate of 0.1 percent per year. Currently in Kansas 10 percent of the 21 million acres of cropland is under no-tillage management and should be sequestering an additional 21,000 tons carbon per year. Increased adoption of no-tillage and intensified cropping systems would sequester more carbon.

Worldwide, the potential to use soil as a carbon sink does exist, but remains a short-term solution. After some period of time, likely 30 to 50 years, a new soil organic carbon equilibrium level will be reached, where further gains in carbon storage will be difficult to achieve. The long-term solution to stabilizing atmospheric CO₂ levels will involve reducing our dependence on fossil fuel for energy.

Summary

Carbon is the building block of plant life and a major constituent of soil organic matter. Carbon dioxide is the gaseous form of carbon and is a greenhouse gas. Since the beginning of the industrial revolution, CO₂ levels have risen at a rate of approximately 1.5 percent per year. The continued rise of atmospheric

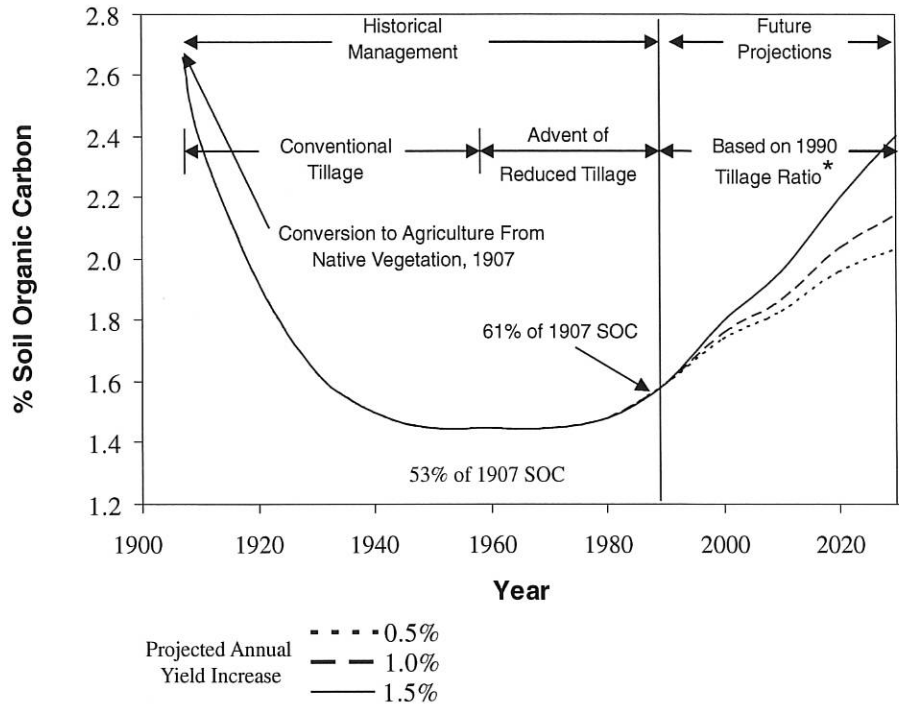


Figure 3. Measured and predicted changes in soil organic carbon content of a prairie soil throughout the period of cultivation. (from: Donnigan et al., 1998)

CO₂ concentration could lead to global warming. Fixation of CO₂ by plants into soil organic carbon is one possible mechanism for reducing the rise of CO₂ concentration in the atmosphere. A long-term reduction in atmospheric CO₂ levels will require a reduction of fossil fuel use and development of alternative energy sources.

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This material is based upon work supported by the Cooperative State Research, Education, and Extension Service, U.S. Department of Agriculture, Under Agreement No. 2001-38700-11092.

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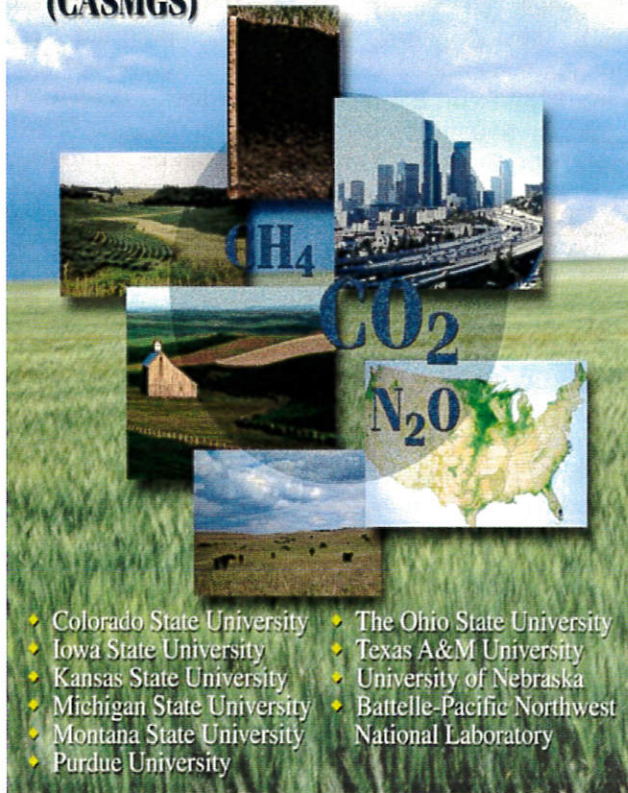
MF-2548

October 2002

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Consortium for Agricultural Soils Mitigation of Greenhouse Gases (CASMGs)



Background

Soil carbon sequestration will reduce the buildup of greenhouse gases in the atmosphere while improving America's farmland and the nations agricultural economy. The Consortium for Agricultural Soil Mitigation of Greenhouse Gases (CASMGs - pronounced like chasms) will provide the information and technology necessary to develop, analyze and implement carbon sequestration strategies.

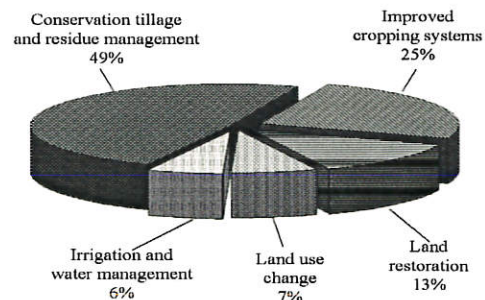
Concern has been mounting about the considerable buildup of carbon dioxide (CO₂) in the atmosphere. At present, the amount of CO₂ in the air is increasing exponentially, by over 3 billion tons of carbon per year. This atmospheric buildup has been greatly accelerated by industrialization and the burning of fossil fuels (coal, oil and natural gas). Crops and other plants remove carbon dioxide from the atmosphere and, as they are harvested, their residue and roots are deposited into the soil where portions can remain for long periods. Carbon accumulation in agricultural soils can be greatly improved by various forms of conservation management, such as no-till and replanting with grasses. This carbon sequestration occurs because there is less soil disturbance and more carbon is added to the soil. Corollary benefits of carbon

sequestration are increased soil fertility, reductions in erosion and increases in soil quality.

To help reduce greenhouse gases, a new plan is emerging; sequester carbon in U.S. agricultural soils, which helps the soil and air and benefits the U.S. agricultural economy. It has been estimated that 20-40% of targeted emission reductions can be met by agricultural soil carbon sequestration. Under a private emission trading strategy, U.S. farmers, practicing appropriate conservation practices, could sell carbon "credits" to carbon emitters. Alternatively, government policies might be implemented to directly support farmers for implementing conservation management practices. Either strategy would help mitigate carbon dioxide rise (the dominant greenhouse gas) while the needed long-term technical solutions are found for producing clean energy. Recent estimates of the potential for U.S. agriculture, using existing technologies, are on the order of 75-200 million metric tons C per year (see figure below).

Early estimates indicate that the potential for a carbon "credits" market for U.S. agriculture is \$1-5 billion per year for the next 30-40 years. Carbon markets are already emerging, as shown by recent contracts from Canadian and American utilities to purchase 6 million metric tonnes of sequestered carbon from Iowa farmers. If farmers are getting credit for their storage of carbon, they can better afford to adopt more environmentally friendly management practices.

Contribution of different conservation practices to carbon sequestration potential in the U.S. (From Lal, Kimble, Follett and Cole. 1998. The Potential of U.S. Cropland to Sequester Carbon and Mitigate the Greenhouse Effect. Ann Arbor Press)



Goals and Objectives

The goal of our consortium is **to provide the tools and information needed to successfully implement soil carbon sequestration programs so that we may lower the accumulation of greenhouse gases in the atmosphere, while providing income and incentives to farmers and improving the soil.** Such benefits include an increased and stable agricultural production and an overall reduction of soil erosion and pollution by agricultural chemicals.

The Consortium brings together the nation's top researchers in the areas of soil carbon, greenhouse gas emissions, conservation practices, computer modeling and economic analysis. Sophisticated information technology will be used to organize U.S. agricultural data, collected over decades, at a cost of millions of dollars, on soils, climate and management, and apply it to the problem of carbon sequestration. Powerful computer models of agricultural ecosystems and economic systems are already being used by CASMGS for preliminary predictions of the potential for carbon sequestration, carbon trading markets and verification schemes.

The keys to successful implementation of carbon sequestration programs are accurate quantification and verification methods and tools to assess the impacts of policies and economic factors on carbon sequestration rates and the farm economy. Furthermore, policies to foster soil carbon sequestration will need to consider their economic impacts, as well as the potential collateral effects (both positive and negative) on other greenhouse gas emissions (e.g., nitrous oxide (N₂O) and methane (CH₄)), nitrate and pesticide leaching and soil erosion.

Our specific objectives include:

- Evaluate management practices for carbon sequestration rates for grassland and agricultural lands.
- Identify other environmental benefits of carbon sequestering practices for air, soil and water quality.
- Provide measurement and modeling tools to quantify and verify soil carbon sequestration rates to support CO₂ emission reduction programs.
- Provide assessment models to evaluate alternative national and global economic and policy strategies for carbon sequestration and greenhouse gas reductions. These models will provide insights on the impacts of such programs on crop production potential, food security and environmental quality.
- Provide a standing capability to meet the rapid-response needs of Federal agencies, Congress and the White House, for information, data and analysis on issues relating to soil carbon sequestration and soil greenhouse gas emissions.
- Participate in the transfer to and adoption of technology by other countries for quantifying and verifying carbon sequestration rates.
- Provide information to each of the following stakeholder groups: policy makers, agricultural sector, energy and transportation industries, the scientific community and the general public, through annual and special reports, scientific and trade journals, popular publications and an Internet website.

The magnitude of the greenhouse gas mitigation problem is huge and requires an effort of matching proportions. When correctly instituted, the benefits will be substantial and long-lasting. CASMGS has received funding of \$335,000 (through EPA) and \$15 million (HR 2559) in FY 2001 and FY 2002 to initiate the Consortium's research program. To continue this effort CASMGS was authorized funding in the 2002 Farm Bill. CASMGS requests continued funding of \$10 million per year for the duration of the Farm Bill. Such funding would enable us to provide the R&D necessary to implement carbon sequestration and greenhouse mitigation strategies in agriculture. The funds will be utilized by a consortium of expert scientists from **Colorado State University, Iowa State University, Kansas State University, Michigan State University, Montana State University, The Ohio State University, Purdue University, Texas A&M University System, University of Nebraska, and Battelle-Pacific Northwest National Laboratory**, in conjunction with research groups within the USDA's Agricultural Research Service, Economic Research Service and Natural Resource Conservation Service.

For further information visit the website: www.casmgs.colostate.edu or contact:

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KANSAS DEPARTMENT OF AGRICULTURE
Report of the Kansas Dairy Marketing Advisory Board

Presented to the Senate and House Agriculture Committees of the 2003 Kansas Legislature

February 1, 2003

The Kansas Legislature created a Dairy Marketing Advisory Board in 1994. This board reports annually to the Senate and House agriculture committees.

Members of the board are designated as two representatives of dairy producers, one representative of dairy processors, one consumer, and the Secretary of Agriculture or his or her designee. Currently serving are Dennis Metz, a dairy producer from Wellington; Elaine Sauerwein, consumer representative from Newton; and the Kansas Secretary of Agriculture. Two positions, one representing producers and one representing processors are not filled.

The Kansas Dairy Industry

The dairy industry in Kansas has changed dramatically in the last twenty years. Today we have fewer dairies and fewer cows but a higher milk production rate. In 1981 we had 1,327 Grade A dairy farms and 738 manufacturing grade dairies with 123,000 cows producing around 1,397 million pounds of milk. In 2001 we had 550 Grade A dairies and 32 manufacturing grade dairies with 93,000 cows producing 1,610 million pounds of milk.

In September 2002, the 20 major milk producing states averaged 1,510 pounds, 38 pounds above September 2001. However, U.S. milk production decreased during 2001 by 1.3 percent compared to 2000. This was the first decrease in annual milk production since 1996. According to USDA's Economic Research Service, changes in milk cow numbers represent a tug-of-war between the dairy farmers who are expanding their farms or building new ones (mostly large farms with highly specialized division of responsibilities) and dairy farmers who are quitting dairying because they cannot generate an acceptable family income.

Other potential factors leading to changes in the dairy industry include:

- farms consolidating due to competition and opportunity;
- milk supply continues to increase to meet consumer demand;
- cheese demand may be leveling off;
- milk can be transported longer distances;
- changes in government programs;

House Agriculture Committee
February 12, 2003
Attachment 5

- consumers want more selection at affordable prices and;
- processors and retailers are increasingly focusing on consumer needs.

Regional Dairy Compacts

In 1999 the Kansas Legislature took action which would have allowed the Kansas Secretary of Agriculture to enter into a Southern Interstate Dairy Compact if it was determined this would benefit Kansas producers. The Kansas Dairy Association supported this action and had been supportive of the Northeast Interstate Dairy Compact. Congress allowed the Northeast Compact to expire September 30, 2001. There is still an active coalition working for the passage of compacts but no action has been taken.

Milk Prices

Various government and private institutions make up the system designed to ensure that the public gets the milk it wants, while dairy farmers get the economic returns needed to provide the milk. Economic theory posits that the milk pricing system must balance the supply of milk with the demand for milk. The physical uniqueness of milk complicates many of the pricing arrangements that are available for other products or commodities.

The advent of futures and options contracts for Cheddar cheese, butter, nonfat dry milk, and raw fluid milk was seen by some as the prelude to a new era in milk pricing. Were they to be widely used, futures and options contracts could manage price instability. As the role of the price support program has been reduced, milk price volatility has increased. As long as there is price volatility in cash markets for milk and dairy products, the dairy industry will continue to evaluate futures and options contracts for price risk management.

USDA predicts 2003 milk prices will rise slightly as there will be a realignment in supply and an increase in consumption of dairy products. They also predict that price supports for nonfat dry milk will decrease leading to an increase in price support for butter to maintain the price support for milk at \$9.90 per cwt.

Suggestions to the Legislature

The Kansas Dairy Marketing Advisory Board respectfully recommends to the Kansas Legislature that it continues to monitor the impact of volatile prices on the Kansas Dairy Industry.

The Dairy Marketing Advisory Board stands ready to appear before the Senate and House Agricultural Committees, if appropriate, to discuss these ongoing issues and any recent developments.

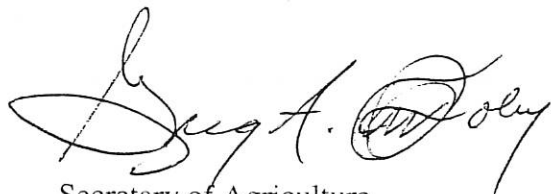
Sincerely Submitted,



Dennis Metz
Member, Kansas Dairy Marketing Advisory Board



Elaine Sauerwein
Member, Kansas Dairy Marketing Advisory Board



Secretary of Agriculture
Member, Kansas Dairy Marketing Advisory Board

KANSAS

DEPARTMENT OF AGRICULTURE
GREG A. FOLEY, ACTING SECRETARY

KATHLEEN SEBELIUS, GOVERNOR

MEMORANDUM

To: Chairman Dan Johnson and Members of the House Agriculture Committee

From: Acting Secretary of Agriculture Greg A. Foley

Subject: Questions about Meat and Poultry Inspection

Date: February 11, 2003

Several questions were raised about the meat and poultry inspection program during the February 6, 2003, committee meeting. The following information is intended to further clarify some of those issues.

Disposition Veterinarians vs. Contract Veterinarians

At least two members of the committee wondered why only specific veterinarians, employed by the department, could make decisions about injured animals when sometimes dispositions could be made more quickly by local practitioners.

Dr. Sumner explained that the state inspection program at one time did contract with a larger number of veterinarians to do dispositions. This practice, however, was one of the ways in which USDA found the Kansas program less than satisfactory several years ago. We adopted the current organization for veterinarians to improve our "equal to" standing with FSIS.

FSIS opposes the use of contract veterinarians because of the potential for conflict of interest. They say "No contract veterinarian may be employed for the purpose of making veterinary dispositions where such employment may expose the veterinarian to allegations of conflict of interest. States must enforce requirements for the prevention of conflict of interest among state and contract veterinarians and inspectors that are at least equal to those applying to federal employees."

They note that the most obvious potential conflict of interest would be a veterinarian inspecting and making a disposition decision at slaughter on an animal owned by one of his clients from private practice. This could easily happen in some of our rural communities. Our switch to the use of disposition veterinarians is to avoid these potential conflicts of interest and comply with USDA's requirements of the Kansas program.

Training for Veterinarians

One of the committee members posed a question about training and testing of veterinarians, wondering if an individual could "quiz out" and not have to take FSIS training if he or she could pass any tests required to become a disposition veterinarian.

FSIS answered "no" to this question. They said a new veterinarian is required to have 14 hours of training in antemortem and postmortem diagnosis and disposition by an FSIS-certified trainer. The alternate to that is study of FSIS self instructions modules, followed by a correlation exercise by an FSIS trainer. States also are required to have continuing education for the veterinarians.

Consistency

The audit cited answers to their survey by a small number of plant owners who questioned how consistent inspection and enforcement are at different locations in the state. Some committee members also asked about this.

Consistency is always an area of concern in a statewide inspection program staffed by a number of different individuals with different personalities. KDA is aware of this and has taken several steps to help ensure consistency, including employing a full-time training officer who offers the same training to all employees, whether they are new workers or existing inspectors who have questions and concerns on issues.

The program also conducts annual correlation reviews, during which territories and staff are traded and inspected. Teams then meet to discuss how consistent they found conditions in different areas of the state. This helps program employees learn from their peers and avoid becoming blind to conditions occurring in a plant they visit day after day, year after year.

The results of the federal review which we are awaiting also will address the question of consistency.

The inspected community, however, often has a tendency to think someone else in another area may be getting a better deal. This occurs in other regulated industries, and a program must take special care with training, guidance and correlation to ensure consistency.

"Equal to"

There were several questions about how the state program could be "equal to" federal, yet some plants have had to make costly structural changes in order to be accepted for federal inspections. Some plants have had to wait long periods before being accepted, and data from other states indicate some plants are never taken into the federal program.

The November 2002 Legislative Post Audit noted that between 1996 and 2001, six state plants received low interest loans totaling about \$340,000. Three used the money to convert their plants

for federal inspection, so we know there have been some structural changes required. But we also have heard of plants accepted "as is" by FSIS.

The changes in inspection in recent years do mean that FSIS may not be as rigid about structural changes as it once was, as long as a plant shows it can maintain sanitary conditions. There still are, however, certain facility requirements which must be met in federal establishments. Decisions are left to the discretion of a federal circuit supervisor, and can vary in different districts served by different circuit supervisors.

In brief, it is impossible to say what will happen to individual plants until they are actually reviewed by federal staff.

The Federal Meat Inspection Act (FMIA) and Poultry Products Inspection Act (PPIA) require that all states electing to administer their own meat and poultry inspection programs, do so in a manner which is "equal to" that of the federal inspection program. In 1967, the Meat Inspection Act of 1906 was amended by the Wholesome Meat Act and renamed the Federal Meat Inspection Act. This established the State-Federal Cooperative Inspection Program to provide for cooperation by FSIS with state agencies according to the provisions of Section 301 of the FMIA and Section 5 of the PPIA. This cooperative agreement allows for federal advisory, technical, laboratory, training and financial assistance in the development and administration of state meat and poultry products inspection programs, with a view to assuring that requirements which are **at least equal to** those of the federal meat and poultry inspection program are imposed and enforced. In 1968, the Wholesome Poultry Products Inspection Act amended the Poultry Products Inspection Act to extend the same provisions to poultry inspection.

In addition to emphasizing the need for cooperation between federal and state authorities, these acts give USDA the responsibility for establishing standards for meat and poultry inspection. USDA is therefore required to monitor state programs to assure that the development and enforcement of inspection requirements are "at least equal to" those of the federal system.

In order to accomplish this task, USDA-FSIS reviews State Performance Plans (SPP), conducts comprehensive reviews of state programs and examines annual reports which all state program are required to submit.

Each state program is required to submit an annual SPP to FSIS detailing all aspects of its inspection system in one document. This document must included a review of state laws, state regulations, funding and financial accountability, resource management (staffing, training and program operations), facilities and equipment, labels and standards, in-plant review/enforcement, specialty programs and laboratories. The SPP details the state's inspection program and is the standard to which the state is held when FSIS reviews the state program. State Performance Plans may vary somewhat form state to state, but the essential "equal to" elements must be included in all SPP's.

FSIS Directive 5720.2 was written to: "Be a single source of information on the policies and procedures for the management and administration of the State-Federal and Federal-State

Cooperative Inspection Programs, including cross-utilization requirements, training, and qualifications." The directive requires each state to provide for nine basic elements:

1. **Laws** -- State Law must be at least equal to the FMIA and PPIA by granting authority for the development, administration and enforcement of the state meat and/or poultry inspection program.
2. **Regulations** -- The state inspection program must promulgate regulations "at least equal to" the federal regulations.
3. **Funding and Financial Accountability** -- The state must appropriate funds commensurate with those provided by the USDA as specified by the Cooperative Agreement. The state must follow fiscal guidelines as contained in FSIS Directive 3300.1 and budgetary requirements as contained in the annual FSIS call letter.
4. **Resource Management** -- The state shall maintain records and information and shall outline procedures for determining the level and type of resources required in the following areas.
 - a. **Staffing** -- Having enough employees to carry out the responsibilities assigned to all organizational levels, units, and functions.
 - b. **Training** -- Providing directly or contracting for employees, the technical, professional, administrative, supervisory, and managerial training, required to maintain a competent and productive workforce.
 - c. **Program Operations** -- Maintaining records and reports that explain the full range of the activities and administration of the state inspection program.
5. **Facilities and Equipment** -- The state shall have a system for reviewing and approving blueprints for new construction and remodeled facilities and equipment that is "at least equal to" federal standards.
6. **Labels and Standards** -- The state must have a system for approving labels to assure accurate labeling of all products "at least equal to" USDA standards and developing accurate labeling for new or specialty items not covered by USDA standards.
7. **In-plant Reviews/Enforcement** --
 - a. The state must have a system of in-plant reviews to assure that slaughtering and processing inspection activities are conducted in accordance with USDA requirements.
 - b. The state must have a system comparable to USDA requirements for monitoring plants which are exempt from inspection requirements.

c. The state must have an enforcement system for detecting violations, and investigating and enforcing state meat and poultry laws. Enforcement includes activities to correct deficiencies inside and outside plants.

8. **Specialty Programs** -- The state must have an adequate residue monitoring and control program. Also the state must have programs (protein-fat-free, species determination, etc.) which may be addressed through participation in the current USDA program or by developing and conducting its own specialty programs that are at least equal to the USDA requirements.

9. **Laboratories** -- The state must utilize laboratories with analytical capabilities comparable to those of FSIS laboratories. The laboratories must be able to perform tests to determine product wholesomeness and compliance with regulatory standards, and employ experts in the disciplines of chemistry, microbiology and pathology. Such laboratories may be:

a. *State Laboratories:*

b. *Private Laboratories* (including laboratories accredited by FSIS); or

c. *USDA Laboratories.* State and private laboratories must be FSIS-accredited or participate in the check sample program conducted by FSIS or in chemistry check sample programs which may be approved by FSIS.

FSIS uses three oversight strategies for conducting reviews to help determine the “at least equal to” requirement:

Strategy 1. The review of the SPP related, reports and information derived from various sources.

Strategy 2. Strategy 1 combined with the results of a special review of the state's inspection program.

Strategy 3. Strategy 1 combined with the results of a comprehensive review of a state's overall inspection program.

The primary purpose of a comprehensive review is to determine if a state's inspection program is “at least equal to” that of the federal program. This determination is based on evaluation of the state with respect to the nine basic elements of the SPP. The procedures established for making an “at least equal to” determination are based on the idea that an inspection program is comprised of various systems and processes that must be viewed together before the adequacy of a state's program can be determined. The following principles of organization and performance are essential:

1. The state must have written standards and procedures in place that clearly outline the responsibilities and authorities of the inspection officials at all organizational levels.
2. The employees responsible for carrying out the procedures and standards must be qualified to do so.
3. A process must be in place for overseeing inspection operations to determine if they are working properly with respect to policy, procedure or performance.
4. There must be a corrective action process to be initiated when deficiencies are found.

Conclusion

“Equal to” is a difficult concept to explain, but we have a great deal of guidance from USDA on the issue. What we do not have is any sort of guarantee or sure knowledge of what would happen if Kansas did away with its state program. Information from other states which went to federal inspection show a drop in the number of small plants, but there is no way of knowing for sure what would happen in Kansas.