

39th

BIENNIAL REPORT



AGRICULTURAL RESEARCH IN KANSAS

DIRECTOR'S REPORT FOR THE BIENNium JULY 1, 1996 TO JUNE 30, 1998
AGRICULTURAL EXPERIMENT STATION, KANSAS STATE UNIVERSITY

Agricultural Research in Kansas

39th Biennial Report of the Kansas Agricultural Experiment Station

Report of the Director for the Biennium Ending June 30, 1998



FRONT COVER

*New alliances among
research, education, and industry
address all aspects of
wheat production, processing,
and marketing.*

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Letter of Transmittal

Office of the Director

***To the Honorable William Graves,
Governor of Kansas***

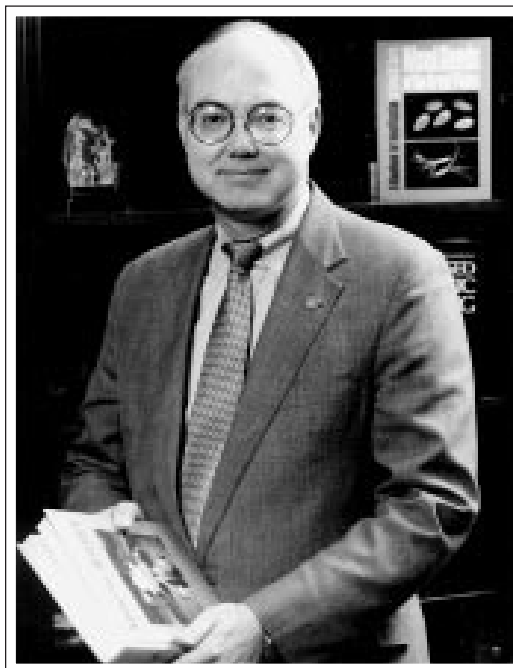
It is my pleasure to transmit herewith the report of the Agricultural Experiment Station of the Kansas State University of Agriculture and Applied Science for the biennium ending June 30, 1998. This report features the Grain Industry Alliance and the Wheat Research Center. The research highlights include animal and crop production, environmental issues, food safety, and economic aspects of agriculture. In addition, there are lists of publications by Station scientists, lists of research projects still active and those terminated during the biennium, a record of personnel changes, and a financial statement for each year of the biennium.

Marc A. Johnson, Director

A Message from the Director

This document represents a report of progress for 1997 and 1998, as well as a report of current research activity of the Kansas State University Agricultural Experiment Station and Cooperative Extension Service. K-State Research and Extension provides knowledge relevant to the important issues affecting every citizen of Kansas and the nation, namely, a competitive agricultural industry, economic development, food safety, and environmental quality.

K-State Research and Extension has developed new strategies to assure that research and education address issues from a multidisciplinary perspective. The Wheat Research Center was established to coordinate all aspects of wheat research from basic science of genetic improvement to variety breeding to production practices to marketing, processing, and policy. The Center concept provides a single point of contact among the grain production, merchandising, and processing industries and K-State scientists and educators. We want Kansas citizens to have ready access to the professional resources of our staff, and the Wheat Research Center facilitates that goal.



K-State has placed emphasis on genetic improvement of wheat through the Plant Biotechnology Center, the Wheat Genetics Resource Center, and wheat breeding program. It also has a unique concentration of chemists and engineers in the department of Grain Science and Industry who focus on the storage and processing of wheat into food and industrial products. Disciplines of agricultural economics, biological and agricultural engineering, entomology, plant pathology, and others contribute to round out the research and education programs related to wheat.

Another venture undertaken by K-State Research and Extension is a formal collaboration with the USDA Grain Marketing and Production Research Laboratory, the American Institute of Baking, and DPRA, Inc. The Grain Industry Alliance is a not-for-profit corporation designed to generate cooperation in science and education among the major grain science organizations in Manhattan, Kansas. It will greatly enhance Manhattan's position as an international grain center.

K-State Research and Extension is committed to providing scientific solutions to contemporary issues. We provide knowledge for life.

***Marc A. Johnson
Dean and Director
Agricultural Experiment Station***

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Research Departments, KAES

■ COLLEGE OF AGRICULTURE

Agricultural Economics
Agronomy
provides soil testing service
Animal Sciences and Industry
includes International Meat and Livestock Program
provides chemical analyses of feedstuffs
Communications
includes Weather Data Library
Entomology
provides scanning electron microscope service
Grain Science and Industry
includes International Grains Program and Agricultural Institute
Horticulture, Forestry and Recreation Resources
Plant Pathology
includes Wheat Genetics Resource Center

■ COLLEGE OF ARTS AND SCIENCES

Biochemistry
Biology
provides plant identification service
Sociology, Anthropology, and Social Work
Statistics
provides statistical consultation and assistance

■ COLLEGE OF ENGINEERING

Biological and Agricultural Engineering
Chemical Engineering
Civil Engineering

■ COLLEGE OF HUMAN ECOLOGY

Clothing, Textiles and Interior Design
Foods and Nutrition
includes Sensory Analysis Center
Hotel, Restaurant, Institution Management and Dietetics
School of Family Studies and Human Services

■ COLLEGE OF VETERINARY MEDICINE

Anatomy and Physiology
Food Animal Health and Management Center
Diagnostic Medicine/Pathobiology

■ BRANCH STATIONS/CENTERS

Agricultural Research Center–Hays
Horticulture and Forestry Research-Extension Center
John C. Pair Horticultural Center
Northwest Research-Extension Center
Southeast Agricultural Research Center
Southwest Research-Extension Center

■ EXPERIMENT FIELDS

Cornbelt*
East Central*
Harvey County*
Irrigation**
Kansas River Valley**
North Central*
Pecan Field*
Sandyland**
South Central*

*Agronomy

*Biological and Agricultural Engineering

*Horticulture

The Grain Industry Alliance



The Grain industry Alliance represents the world's largest assemblage of grain scientists and research facilities in one location. It links Kansas State University, the American Institute of Baking, the USDA Grain Marketing and Production Research Center, and DPRA Incorporated.

The Alliance's mission is to meet the needs of the grain and oilseed industry by providing research, development, training, and consulting to agribusiness and public and private agencies. Its services address:

- Food, feed, and industrial uses of grains, oilseeds, and their products.
- Evaluation and preservation of quality grains and oilseeds for specific processing and end uses.
- Evaluation of economic and regulatory policies and new technologies associated with producing, handling, transporting, storing, processing, and marketing of grains and oilseeds.
- Environmentally sound alternative approaches for producing, storing, transporting, and processing grains and oilseeds to ensure safe and high quality supplies of food and feed.



Kansas State University

The university offers a multidisciplinary approach to increase knowledge and improve the growing, processing, and marketing of grains. The Department of Grain Science and Industry uses its unique facilities (pilot-scale flour mill, feed mill, extrusion center, and bakery) to investigate all aspects of grain processing and utilization. Entomologists study ways to control insects destructive to grains. Agronomists investigate improvement programs for wheat, sorghum, soybeans, and other grains. Economists conduct research on grain markets and transportation. Animal scientists experiment with grains as animal feed. Food and nutrition researchers examine grain nutrients as well as processing and utilization of grain for food and industrial uses.

American Institute of Baking

The Institute is a nonprofit organization providing education and research in the science of baking, nutrition, bakery management, and allied sciences. It also operates one of the largest food safety, sanitation inspection, and audit programs in the food industry. The School of Baking is renowned throughout the world as the leader in educational programs for baking and allied trades. Research relating to basic and applied cereal science, technology, and nutrition is conducted in the Institute's modern laboratories.

The Grain Marketing and Production Research Center

As part of the Agricultural Research Service of the United States Department of Agriculture, the Center solves problems related to conservation, production, harvesting, storage, marketing, and utilization of grain. Research emphasizes maximizing nutritional value, consumer acceptance, and end-



use performance, while conserving resources and maintaining soundness and overall quality during handling, conditioning, and storage. This research is oriented to wheat and corn, because of their importance to the grain industry, but also includes sorghum, rice, barley, oats, soybeans, and triticale. The Center focuses on technical food and agricultural problems in grain marketing that are of broad scope and high national priority.

DPRA Incorporated

This private company is a national and international leader in environmental services, economic and policy analyses, and information management. Its employees have strong academic backgrounds and demonstrated professional achieve-

ments in agriculture; chemical, environmental, and civil engineering; economics; business; law; geology; hydrology; environmental science and planning; information management; and computer science. The company has four program areas that relate to the grain industry: agriculture and agribusiness, pesticides, environment, and market development.



The Wheat Research Center

The vision for a Wheat Research Center came from the grassroots—members of the Kansas Association of Wheat Growers. These wheat producers envisioned a customer-centered research and resource organization that anticipates, prioritizes, and serves the needs of U.S. wheat producers, processors, and consumers. A proposal for the Center was developed by a committee of producers, processors, and scientists and approved by the Kansas Board of Regents.

Kansas is known worldwide as the Wheat State, and Manhattan in an international hub of wheat science. Nowhere else in the world is there such a vital network of people, institutions, and associations focusing on improving and promoting wheat. Therefore, Manhattan was the ideal location for the Wheat Research Center.

Core scientists in the Center are from Kansas State University. The Center also cooperates with the American Institute of Baking, the USDA Grain Marketing and Production Research Center, other land-grant universities, wheat producer groups, wheat merchandising and processing firms, seed and other input supply firms, and international research institutes. The Center's programs are guided by four goals:

- To gather scientific information from past and current research on wheat and make it available to users. This helps scientists to efficiently use resources to improve production, processing, and utilization of wheat for traditional and new products.
- To add value for producers, processors, and consumers of wheat by developing new varieties, new processing methods, and new food and industrial products. This increases the competitiveness and profitability of the U.S. wheat industry and provides more economical and diverse products for consumers.
- To improve the environment with better varieties that require less fertilizer and fewer pesticides, efficient processes that need less energy, and new uses of wheat by-products. This benefits everyone.
- To develop and update plans for the future of the wheat industry and ensure that the latest scientific advances benefit the producer, processor, and consumer.

The Center assembles and supports specialists in all areas of wheat science. They are involved in cooperative programs of research, development, and training to solve problems of the U.S. wheat industry.

Center programs emphasizing value-added efforts are ongoing in wheat production, processing, and consumption to improve the economics of the industry. Its scientists also focus on product development and utilization; food safety; biotechnology; and environmental quality. Producer groups, processor associations, and consumers are kept informed of research results and new developments through conferences, publications, and direct contact with Center members. Training programs are provided to update industry personnel, and students earn M.S. and Ph.D. degrees working with Center scientists.

Research Highlights 1996 to 1998

■ ANIMAL PRODUCTION

Cooked Molasses Blocks for Cattle

Deficiencies of degradable intake protein can reduce digestion of dormant forage, which can limit forage intake and reduce energy available to grazing cattle. Various supplements containing ruminally available protein are fed to counteract these problems. Previous studies have shown that cooked molasses blocks can increase forage intake and digestion. However, various molasses products can be used in the blocks, and their nutritional content can vary. Animal scientists evaluated blocks containing beet molasses, cane molasses, and concentrated separator by-product (desugared beet molasses). All blocks had at least 30 percent crude protein and were fed to cattle that had free access to prairie hay containing about 6 percent crude protein.

sults provided further evidence of the value of cooked molasses blocks for beef cattle and suggested that the nutrient content, especially protein, is more important than the molasses product used.

Supplemental Protein with Forage Sorghum Hay

Over the last decade, the approach to protein nutrition in ruminants has shifted from a crude protein system to a metabolizable protein system. Metabolizable protein is defined as the true protein absorbed by the small intestine. This system accounts for the degradation of protein in the rumen and separates protein requirements into the needs of ruminal microorganisms and the animal. Crude protein includes some that is ruminally degraded (degradable intake protein, DIP) and some that is not.

Beef cattle in the plains states often are fed forage sorghum hay as a roughage source, but it can be of low quality. Supplementation with DIP has been shown to improve intake and utilization of poor-quality prairie hay, but its effects with forage sorghum hay have not been studied thoroughly. Researchers in the Department of Animal Sciences and Industry and at the Agricultural Research Center-Hays designed an experiment to determine those effects.

Ruminally fistulated steers received infusions of DIP at three concentrations or no DIP and were fed sorghum hay. All measures of intake and digestibility increased with DIP supplementation and tended to level off at the highest concentration of 123 percent of body weight/day. Therefore, feeding this amount of DIP is sufficient to achieve positive effects with forage sorghum hay.

Use of Raw Soybeans in Steer Finishing Diets

A premium usually is paid for natural protein (e.g., soybean meal) and high quality fat (e.g., beef tallow) for use in cattle finishing diets. Whole soybeans contain about 42 percent crude protein and 20 percent fat but are not fed to cattle because of concerns about palatability and possible adverse effects of chemicals that they contain. If raw soybeans could be included in finishing diets at 7.5 percent on a dry matter basis, they would provide all of the protein and nearly half of the fat typically added. Then feedlots could afford to pay \$1.00 per bushel more for soybeans than currently is being paid by local grain handling companies. This would encourage more soybean production in western Kansas where many feedlots are located.

Cooked molasses blocks are effective nutrient supplements for cattle.



Steers fed the cooked molasses blocks consumed 22 percent more forage than control steers that received only hay. Intakes of digestible organic matter and neutral detergent fiber, indicators of available energy, were increased about 30 percent by block supplementation. Blocks made from different molasses products had similar effects on intake, but steers fed the beet molasses blocks tended to have greater digestibilities. These re-

Raw soybeans are good sources of fat and protein in cattle diets.



Researchers at the Southwest Research-Extension Center evaluated diets (based on steam-flaked corn) containing soybean meal, dry-rolled soybeans, and steam-flaked soybeans with lesser amounts of beef tallow compared to a control diet without soybeans. All diets contained the same amounts of nitrogen and fat. No differences were noted among groups of steers in average daily gain, daily dry matter intake, or feed efficiency. Carcass traits also were similar among treatments, except that the steam-flaked soybean diet resulted in fewer Choice carcasses. Differences in ration texture and condition were minimal. Therefore, raw soybeans can be used as sources of protein and fat in cattle finishing diets that contain steam-flaked corn.

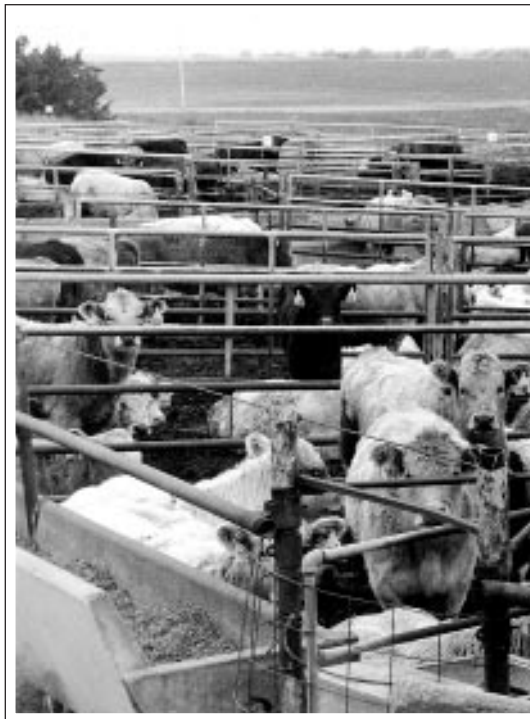
Ultrasound Evaluation of Calves for Future Carcass Potential

Ultrasound has become a useful technology for evaluating feedlot and purebred cattle. Estimates made by ultrasound in the feedlot as much as 100 days prior to slaughter have effectively predicted future quality and cutability grades.

Using ultrasound to evaluate calves at weaning and project carcass potential would have considerable value. Calves could be sorted for marketing programs that emphasize either carcass quality or leanness. The technology might enable selecting superior candidates for retained-ownership feeding programs.

A researcher at the Agricultural Research Center-Hays had an opportunity to evaluate a large number of calves. Ultrasound estimates of backfat thickness and marbling were made when calves were about 9 months old. The estimates were used to sort the calves into two groups based on one expected quality grade (Choice or Select). Only sets of calves in the two groups for which management was identical were used in the analysis; the total number was 796.

Assignment of calves to Select or Choice categories at weaning was 71% accurate. A strong mathematical relationship existed between weaning marbling score and future quality grade and would be useful to set criterion levels to obtain a desired proportion of Choice. Although a relationship also existed between ultrasound-estimated backfat at weaning and future cutability grade, it may be too small for most applications. Other research has shown that carcass backfat can be controlled by measuring cattle midway in the feeding period and sorting into outcome groups.



Mixing groups of cattle before slaughter causes stress that contributes to dark-cutting beef.

Factors Related to Dark-Cutting Beef

Dark-cutting beef is characterized by high postmortem pH (alkaline), increased water-binding capacity, sticky texture, and dark color resulting from depletion of muscle glycogen prior to slaughter. Such beef often is rejected by consumers, and carcasses are discounted severely. The incidence of dark cutters among finished cattle varies greatly and is associated with time of year and preslaughter stress. Animal scientists with the help of county extension agents in southwest Kansas collected information on feeding and preslaughter management of 31 groups of cattle from different feed yards during September, October, and November. The data forms used in the survey included questions on animal characteristics; diet; implants; feed additives; and observations of home pen, holding pen, and loading. At the packing plant, additional information was collected for 28 of the groups, including times of arrival and slaughter and various carcass characteristics.

Results showed that mixing different groups of cattle in holding pens was the major factor affecting incidence of dark-cutting beef. Cattle that were held in mixed groups for 16 to 40 hours prior to slaughter had a higher percentage of dark cutters than cattle not mixed or mixed and held for no longer than 15 hours. The stress associated with increased activity and resocialization during the longer holding times depleted muscle glycogen to a level that caused the unacceptable dark color. To prevent this condition, cattle should not be commingled or the time in mixed groups should be minimized.

An additional study of carcass data collected from four commercial slaughter facilities throughout the year attempted to correlate weather conditions to incidence of dark-cutting beef. Separating weather from other factors that affect the condition is not easy, but some trends were noted. A sustained period of high temperatures and exposure to extremely low temperatures may compromise the level of muscle glycogen. Warmer temperatures and large fluctuations of temperature in early winter also may increase the incidence of dark cutters. Other weather conditions, such as wind and precipitation, may be involved as well as related problems, such as reduced feed intake.

Swine Research

The focus of swine research in recent years has been refinement of feed for various growth phases. Numerous ingredients used alone or in combinations have been tested. In addition, new methods of processing diets have been evaluated. The goals are to improve swine performance and reduce feed costs, thus increasing overall profitability.

Feed Ingredients. With the increasing concerns about use of antibiotics in swine feed as growth promotants, microbial products are being considered as potential substitutes. However, the thermal processing of feed can inactivate or kill the organisms in these products. Animal scientists compared a new heat-stable, active yeast product and a conventional yeast added to diets that were steam conditioned and pelletized. Results showed that the heat-stable product survived the typical processing conditions used. Weanling pigs fed the pellets with yeast had a greater rate of gain and tended to have improved feed efficiency compared to those receiving pellets without yeast.

Advances in biotechnology have generated specialty grains, such as high-oil corn, which has

more oil and slightly more lysine (an essential amino acid) than conventional yellow dent corn. A new variety has a much higher content of lysine in addition to the higher oil content. Swine researchers compared it to the previously tested high oil corn in diets for young pigs. Results showed that the lysine in the high-lysine and high-oil corn was available for use and digestion and that growth performance of pigs was similar with both types of corn. Use of these new varieties could lessen the need for additions of synthetic lysine and energy sources (fat and oil) and lower diet costs.

Research on feed for growing-finishing pigs includes evaluation of carcass characteristics and meat quality. Previous studies have indicated that with each percent of fat addition to the diet, average daily gain increases 1 percent and feed efficiency increases 2 percent. However, some university research has shown a smaller response, probably because of high feed intake. An experiment was planned to more closely simulate commercial conditions. Nearly 500 pigs were fed three levels of fat in three different growth phases based on weight. Responses to levels of fat varied, but averages for the three phases were in the predicted range of 1 to 2 percent for each percent of added fat. The growth response was greatest during the initial phase (80 to 130 lb). Carcass characteristics were similar for all groups, indicating that up to 6 percent fat can be added to corn-soybean meal-based diets. The economics of adding fat depend on availability of space for growing-finishing pigs as well as prices of diet ingredients.

Different sources of fat in the diet can affect the quality of carcasses and meat. Another study compared choice white grease, a commonly used fat source, and poultry fat, which is relatively unsaturated. The poultry fat had only minor effects on carcasses. It did increase cooking loss from some muscles, decrease bacon-slicing score, and increase off-flavor scores for bacon. However, none of these changes were in the unacceptable range, so either source of fat could be used in swine diets.

Feed Processing. Expander conditioning is a relatively new processing technology for the feed-manufacturing industry. During expanding, heat changes the physical/chemical structure of starch and protein, making them more tacky. The tacky particles then can be pushed together to make extremely durable pellets. Animal scientists have conducted a series of experiments to evaluate the effects of expander processing on digestibility of several grains and to compare various processing conditions.

Swine research focuses on better feed for various growth stages.

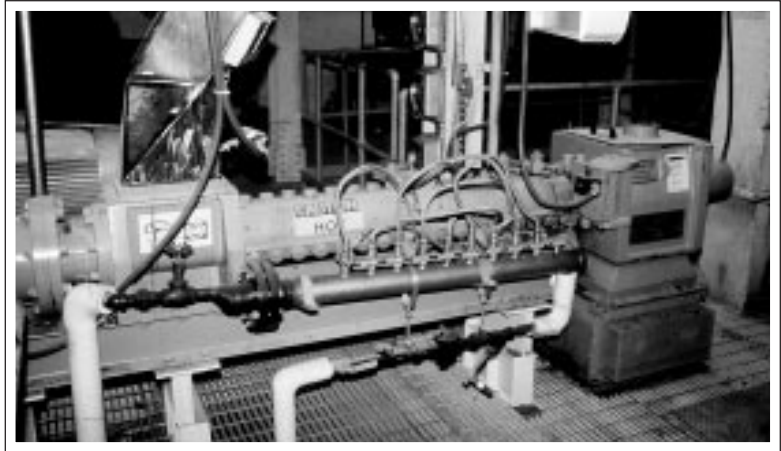


In one study, diets based on corn, sorghum, wheat, and wheat middlings were steam conditioned, processed through an expander with different levels of pressure, pelletized, and fed to pigs. Feces samples were collected from the pigs and analyzed to determine nutrient digestibilities and energy values of these diets. Pellet durability increased with higher levels of pressure. Nutrient digestibilities and digestible energy concentrations of all diets increased with expander processing. The greatest improvement was seen for wheat middlings, which had the highest fiber content.

Another study evaluated expander processing of raw soybeans as a way to inactivate antinutritional factors that limit their use in swine feed. Whole soybeans were expanded with or without steam, ground, and added to a corn-based diet. Processing improved nutrient digestibility of soybeans, but higher levels of pressure were needed than for other grains. Raw soybeans also performed well in diets that were steam conditioned, expanded, and pelletized. They had equal or greater digestibility compared to the more frequently used soybean meal.

To further define the best processing methods, researchers compared corn-soybean meal diets in the form of mash or pellets that received standard or long-term steam conditioning or expander processing. Pellet durability was increased by the long-term steam and expander treatments. Pelletizing generally increased nutrient digestibilities compared to mash or meal diets, and expanding improved digestibilities compared to standard conditioning.

Results of all these studies indicate that more extensive processing of ingredients or diets will increase their quality and, thus, improve performance of swine.



Programmed Artificial-Insemination Breeding of Dairy Cows

Improving reproductive management of dairy herds has been the subject of long-term research by animal science researchers. The following is a summary of the current status of programmed artificial-insemination breeding of dairy cows.

Management of the estrous cycle is now more practical than it was a decade ago because of understanding of follicular waves. With availability of three gonadotropin-releasing hormone products and two prostaglandin products, the cycle can be controlled for fixed-time inseminations with little loss in conception rate compared to inseminations after detected estrus. Various systems are effective for programming first inseminations with or without some heat detection. With the incorporation of transrectal ultrasonography for early pregnancy diagnosis 28 to 30 days after insemination, routine heat detection programs could be eliminated by reprogramming each cow after an open diagnosis. The most limiting factor in the control of the cycle is the proportion of missed heats in estrus-synchronization programs that rely partly or solely on heat detection.

Processing ingredients or mixed diets in an expander improves digestibility.



Recent advances have improved programmed artificial insemination for dairy cows.

Pregnancy rate (the proportion of cows that become pregnant of all cows programmed for insemination) is the best measure of an estrus-synchronization program, because it measures total number of pregnancies achieved per unit of time rather than simple conception success at any given insemination. Although most producers assume that programmed breeding is more costly, it generally pays for itself and provides a positive return.

Sampling and Interpretation of Milk Urea Nitrogen Concentration

Milk urea nitrogen (MUN) is a reasonable estimate of blood urea nitrogen (BUN), which, in turn, is a reasonable predictor of the protein status of dairy cows when used in conjunction with other herd information such as diet; age of the cow; sampling time after feeding; days in milk; stress from weather, exercise or health status; and method of sampling. Blood urea nitrogen is a by-product of ammonia clearance from the blood that maintains the pH at 7.0. The urea nitrogen in milk is in equilibrium with that in the blood; thus, milk samples provide a convenient method of determining BUN.

Research has shown that diet affects MUN. The impacts are related primarily to the contents of

ruminally available protein and carbohydrates and feed intake. Changes in dietary ingredients that result in an increase or decrease in ruminally available protein and carbohydrates usually increase or decrease MUN, if feed intake remains relatively constant. These changes support the potential benefit of using MUN as a management tool. However, this will be possible only if a low-cost sampling technique is available to all producers.

Animal scientists designed a study to assess various sampling techniques and determine the most convenient method of obtaining MUN values that accurately reflect management changes in the herd. Results showed that representative MUN values can be obtained by testing a milk sample before AM or PM milking or with an in-line siphon sampling device. The MUN values obtained from homogenous milking strings are as accurate as an average MUN value obtained by sampling each cow in the string. Bulk tank sampling is not advisable because of the variation in MUN caused by stage of lactation. For small herds fed a single total mixed ration, producers should use the average MUN from cows between 60 and 200 days in milk. Monthly sampling is recommended to build a database. The effect of diet changes on MUN can be assessed within 7 days.

■ CROP PRODUCTION

Hard White Wheat

For more than a century, Kansas has been known for growing wheat, particularly hard red winter wheat. But a change to hard white wheat is imminent to meet the needs of the world market.

The two types of wheat are similar and differ mainly in the color of the seed coat (bran)—white wheat lacks the red color. The white grain can yield slightly more flour per bushel, and this higher extraction rate often increases the protein

content. The main advantages are a lighter color in whole-wheat products and a milder flavor.

Development of hard white wheat in Kansas began in the late 1960s. A major obstacle was the tendency for preharvest sprouting, in which the grain sprouts in the spike under conditions of high humidity and low temperatures. Fortunately, a local wheat breeder developed a sprouting-resistant variety that was introduced into the K-State program. New wheat varieties also must be well adapted, high yielding, and resistant to pests and produce high quality grain. Combining all these traits in hard white wheat has been a long process, but two new varieties are scheduled for release by the end of 1998.

Customers from the miller to the baker to the home consumer prefer white wheat whenever they have a choice. The preference is particularly strong in foreign markets, which purchase one-half to two-thirds of the wheat produced in Kansas. Australia, a major competitor of United States wheat on the world market, grows only white wheat. China also grows some, as do a few other states in this country.

Hard white wheat is in demand worldwide for its quality and lighter color.



Introducing a new wheat into the established marketing system for hard red winter wheat is the final step. The Federal Grain Inspection Service in 1990 recognized two new classes: hard white wheat and soft white wheat. Keeping grain of red and white wheats separate will be essential to preserve the added value of white wheat. Extra care will be needed during planting, harvesting, storing, and moving grain. Hard white wheat might be produced initially under a contractual or identity-preserved system. However, when the market is established, it could be grown and sold in the same way as hard red winter wheat.

Hard white wheat has excellent potential to be a successful crop in Kansas. It has significant advantages and is well-suited to the state's climate and soils. The new K-State varieties with high grain yield and quality will ensure that the crop is competitive with hard red winter wheat.

Response of Wheat Seedlings to Dehydration and Rehydration

When surface soil is dry, producers often plant wheat seed deeper, where more moisture may be available for germination. However, this practice can result in low emergence and slow development. Continued dry conditions after germination can dehydrate seedlings and stop their growth until rain occurs and rehydrates them. The ability of seedlings to tolerate dehydration/rehydration is important for establishing stands of wheat. In addition, deep planting and delayed emergence deplete carbohydrate reserves in the endosperm that are needed by the seedlings.

Agronomists designed a study to determine the ability of wheat seedlings, especially the coleoptile (first leaf) and the root, to withstand desiccation and the effect of this stress at different stages of development. Tests of seeds and seedlings were done in growth chambers under conditions of controlled temperature and humidity.



The study produced four major conclusions.

1. Wheat seedlings that have germinated for 1 to 3 days might survive dehydration and rehydration by rain and produce a stand. Seedlings at advanced stages of germination might not survive even mild dehydration.
2. Dehydration shortens the coleoptile of wheat seedlings and reduces emergence from deep planting. Therefore, seed should not be planted deeper than 80 percent of the maximum coleoptile length of nonstressed wheat.
3. Dehydration injures roots as severely as shoots and might hinder establishment and survival of seedlings even if they emerge.
4. Poor survival and growth of seedlings after dehydration and rehydration are related to loss of tolerance to desiccation and depletion of seed reserves.

Fertilizer for Corn and Grain Sorghum

Maintenance of ground cover from crop residue to control soil erosion has become an important factor in crop production in Kansas. No-tillage systems have been shown to be effective in maintaining crop residues and reducing soil losses by erosion. However, early-season plant growth and yield can be poorer in no-tillage systems than in conventional systems. The large amount of surface residue maintained with no-tillage systems can reduce seed-zone temperature, and lower than optimum soil temperature can reduce the availability of nutrients. However, starter fertilizers can be applied to place nutrients within the rooting zone of young seedlings for better availability. Corn and grain sorghum hybrids may differ in rooting characteristics and ability to extract and use nutrients.

Agronomists conducted studies with 12 hybrids each of corn and grain sorghum at the North Central Kansas Experiment Field. Two starter fertilizers were applied with the seed at planting, and a

Dehydration damages wheat seedlings, and some may not recover even if rain occurs.

Several varieties of grain sorghum (left) receiving starter fertilizer show earlier maturity and higher yields.

third plot received none. The starter fertilizers increased early-season growth and nutrient uptake for all hybrids of corn and grain sorghum. The fertilizer also significantly decreased the number of days from emergence to mid-silk for seven of the corn hybrids. Dryland corn in central Kansas usually is planted as early as possible in April, so that pollination occurs in June when temperature and moisture are favorable. Any practice that promotes earliness often increases yield. The response of these corn hybrids was somewhat inconsistent, but the average yield increase was 17 bushels/acre for the seven that matured earlier. Earlier maturity also is desirable for grain sorghum, because frost can occur before the crop is ready to harvest. Starter fertilizers significantly reduced the number of days from emergence to mid-bloom in eight of the hybrids. Again, the yield response was mixed, but these hybrids showed an average yield increase of 15 bushels/acre. Use of starter fertilizer in no-tillage systems can benefit at least some hybrids of corn and grain sorghum.

Returning Conservation Reserve Program Land to Crop Production

Nearly 3 million acres of land in Kansas were enrolled in the Conservation Reserve Program (CRP), and about half of those are in the western part of the state. Although the new Farm Bill reauthorized the CRP, some of this land will be returned to crop production. A study was established at the Southwest Research-Extension Center to determine the best management practices for this process. Researchers evaluated residue treatments, grass control methods, and initial crop selection on CRP land with an established stand of warm-season grasses.

Results over a 2-year period provided several guidelines. Crop establishment and growth will not be adequate without good grass control. The warm-season grasses in western Kansas are difficult to control with herbicides alone. Burning the residue may be beneficial, and some tillage may be required. Soil water is depleted by the CRP grasses, and a fallow period to store soil water will be necessary prior to planting wheat or sorghum. Residual soil levels of inorganic nitrogen also are very low, so supplemental fertilization will be required, probably at higher than usual rates.

A Computer Model to Aid Soybean Production

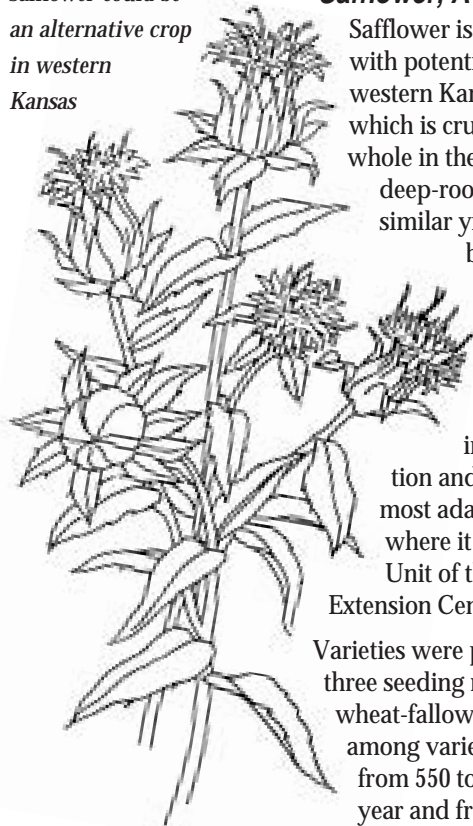
Soybean producers make numerous decisions both before and during the growing season, e.g., which cultivars to grow, when to irrigate, and how much of the crop to presell. Each decision has some associated level of uncertainty. Producers use many sources of data (e.g., weather reports, soil tests, pest scouting reports). A tool not utilized widely by producers is crop simulation. The strong research orientation of current soybean models makes them too difficult for other uses. Therefore, a researcher in the Department of Agronomy col-

Drought-resistant safflower could be an alternative crop in western Kansas

Safflower, A Potential Dryland Crop

Safflower is an annual broadleaf plant with potential as an alternative crop in western Kansas. It is grown for its seed, which is crushed for edible oil or used whole in the bird seed industry. This deep-rooted crop appears to have similar yield potential to sunflower but has better drought tolerance, is bird resistant, and has fewer problems with insects. Safflower can have significant disease problems, especially when grown in areas with high precipitation and humidity. Thus, it would be most adaptable in western Kansas, where it was evaluated at the Tribune Unit of the Southwest Research-Extension Center.

Varieties were planted on three dates and at three seeding rates on fallow land in a wheat-fallow system. Yields varied among varieties and years. They ranged from 550 to 1010 pounds/acre in a poor year and from 1640 to 2150 pounds/acre in a good year. Test weights of seeds varied from 37 to 45 pounds/bushel; the desired weight is 42 to 45 pounds/bushel. Safflower was planted and harvested with conventional wheat equipment. This alternative crop seems to be well adapted to western Kansas, although the nearest market currently is in Colorado.



A new computer model helps soybean producers make management decisions (right).



laborated with engineers at another university to develop a soybean simulation model in a windows-based, user interface that was more relevant for producers.

The resulting program, PCYield, is user friendly but incorporates features of more complex systems, including a soybean model, field-specific data management, Internet access to real-time weather data, production risk indicators, and graphical output displays. During a growing season, PCYields answer two specific questions: What effects will planting data and cultivar have on yield? What will happen if I don't irrigate for a time and the weather stays dry? The only required inputs are a simple field characterization and up-to-date weather information. Answers to these questions can help with several decisions, such as cultivar selection, planting date determination, and irrigation scheduling. This program has been tested at numerous sites across the soybean growing area. Initial reactions have been positive and have included requests for more advanced features. This suggests that simulation models will be accepted if they are simple and upgrades are based on needs of the producers using them.

Plants in Space

BioServe Space Technologies, a NASA Commercial Space Center program established in 1987, focuses on life science research in microgravity. Each year, more than 100 students at K-State and the University of Colorado participate in projects for this program, ranging from designing flight hardware to

preparing microgravity experiments. Researchers in the Division of Biology also have sent experiments on recent flights of the space shuttle Columbia in a plant bioprocessing apparatus, which is similar to a miniature greenhouse.

One experiment was part of a long-term study to transfer the nitrogen-fixing ability of clover to wheat. Application of fertilizer costs about \$30 per acre, so reducing the crop's need would be a tremendous saving for the farmer. Less use of nitrogen also would help the environment. Nitrogen fertilizer can wash out of the soil and get into groundwater or wells. It also can pollute lakes and rivers, where it causes excessive growth of algae that have adverse effects. Another experiment used tomato plants to examine how microgravity affects the concentration and distribution of auxin, a plant hormone. Auxin usually signals plants roots to grow downward and stems to grow upward. But plants in microgravity don't know which way to grow, presumably because of changes in auxin. A better understanding of the production and distribution of auxin will lead to improved crop production on earth. Experiments like these also may help develop plants that grow better in space and can be used on long missions in shuttles or space stations to recycle oxygen.



Crops experiments in space will improve production in Kansas.

FORAGE, HAY, AND SILAGE

Interseeding Small Grains in Bermudagrass

Bermudagrass is a productive forage species when intensively managed but has periods of dormancy that are particularly long in southeastern Kansas. Annual species often invade the dormant plots, but their production is sporadic and their quality short-lived. Small grain crops can be established in Bermudagrass sod to lengthen the grazing season, but their performance can be lower than in a monoculture. Researchers at the Southeast Agricultural Research Center compared the forage production of six small grains interseeded in Bermudagrass or in monoculture. Two cultivars each of rye and hard red winter wheat and one each of barley and soft red winter wheat were used. Forage was harvested several times during the growing season. Forage production of all grains was greater in monoculture. When interseeded with Bermudagrass,

they generally produced from about 1 to 2 tons per acre. The rye cultivars produced forage earlier than the others, but late spring (May) production was higher for barley. Any of these grains would be a reliable source of forage during the dormant period of Bermudagrass.

Protein Characteristics of Forage Grasses

Forages are the primary sources of nutrients for beef cattle. However, meeting the nutritional requirements of beef cattle grazing low-quality forage often requires protein supplementation. The amount of supplementation needed is related directly to the amount and availability of forage protein as well as the amount of forage consumed and its digestibility. Therefore, the protein characteristics of different forages must be known. A group of animal scientists undertook a study of the proteins in Bermudagrass, brome, forage sorghum, and prairie hays.

The hays were fed to ruminally fistulated steers, and at the same time, nylon bags containing samples of the same forages were incubated in their rumens for various periods of time. The bags were removed, and the residues in them were analyzed for protein content and type. The forages differed in the size of protein fractions and in the rate and extent of protein degradation. The predicted extent of ruminal protein degradation (indicating availability) was lowest for prairie hay, intermediate for Bermudagrass and forage sorghum hays, and highest for brome hay. The results of this study can be used in feed formulation systems to predict nutrient requirements and animal performance.

Smooth Bromegrass and Eastern Gamagrass for Silage

Smooth bromegrass is used primarily as a pasture or hay crop. Eastern gamagrass has received little attention until recently, because of difficulties in establishment. Little work has been done on use of these grasses for silage.

Researchers in the Department of Animal Sciences and Industry harvested these grasses at two stages of maturity, treated them with an inoculant containing lactic acid bacteria, and ensiled them. Similarly treated alfalfa was used for comparison. Because the supply of silage was limited, sheep were used in the intake and digestion trials.

Mechanical processing improves the quality of whole-plant corn silage (right).

Grasses harvested at both stages were well preserved as silage. Voluntary intake by sheep tended to be higher for bromegrass and alfalfa silages than for gamagrass silages. Chemical analyses showed that the two bromegrass silages were nearly equal in nutritive value; however, the digestion trial clearly indicated that the early-harvested silage was higher quality. Results of both chemical analyses and digestion trials showed that the early-harvested gamagrass was better. These grasses have potential for use as silages.



Eastern gamagrass has potential for use in silage.

Processing Whole-Plant Corn Silage

Corn silage is a major ingredient in rations for growing cattle. A group of animal scientists followed up a suggestion that processing whole-plant corn through a forage harvester with a kernel processor could improve growth performance and nutrient digestibility in feedlot cattle. Whole-plant corn was harvested and chopped. One batch was put through a kernel processor before ensiling. Two batches were ensiled as is, but one of them was processed after removal from the silo for feeding.

Intake and feed efficiency were improved by processing the silage, with a slight advantage for the preprocessing. Digestibility also increased for processed silage, with one measure showing an advantage for postprocessing. Mechanically processing whole-plant corn either before or after ensiling can have positive effects on feedlot cattle, particularly when kernels are near the black layer stage of maturity.

FLOWERS AND TURFGRASS

Postharvest Life of Perennial Flowers

Consumers are looking for new and speciality cut flowers, so growers and vendors need postharvest information about the expected vase lives of potentially useful flowers. A horticulturist expanded an ongoing program of postharvest evaluations to include several perennial flowers. They were cut and placed in water alone or with silver thiosulfate (STS) and/or floral preservative. The vase life was determined, and quality of flowers was noted.

Use of a preservative and/or STS generally lengthened vase life and sometimes improved quality, but results varied among plants. Autumn sedum, which has succulent leaves and clusters of pinkish-purple flowers, had a vase life of 3 to 4 weeks. A variety of cardinal flower, which has a spike of bright red flowers, lasted up to 3 weeks. The hardy amaryllis or naked lady, which has a cluster of large pink flowers on a tall stem, had a vase life of about 10 days. Floral preservative did not lengthen the time and caused an undesirable bluish tint in the petals. The popular herb oregano is an aggressive plant that can produce 18- to 24-inch flowering stems if it's not cut back regularly. They are covered with clusters of small lavender to purple flowers and make an attractive filler for



bouquets. The vase life averaged 8 days and was improved only slightly by additives. Several smaller varieties of sunflowers had vase lives of 6 to 11 days.

Summer Performance of Bentgrass

The growth and quality of creeping bentgrass often decline in the summer. Many environmental factors could be involved, such as high temperature, humidity and soil moisture, restricted air movement, and disease. However, cultural practices could modify microenvironmental conditions and affect physiological processes and turf quality. Researchers in the Department of Horticulture, Forestry and Recreation Resources compared two varieties of bentgrass with two irrigation regimes (watering daily and every other day) and two mowing heights (5/32 inch and 1/8 inch). Quality was evaluated, and photosynthesis and respiration were measured.

Irrigation regimes had no effects on bentgrass, but mowing height had significant effects. At the lower height, visual quality and leaf measurements were less and rate of photosynthesis and photosynthetic efficiency were decreased. Therefore, a slightly higher mowing height can help maintain bentgrass quality in the summer.

Drought Resistance of Turfgrass

Drought is one of the major stress factors limiting turfgrass growth in Kansas. The surface soil layer becomes very dry, but moisture often is available in deeper soil. Drought-sensitive species can suffer damage even with localized soil drying. Growth, viability, and water and nutrient uptakes of roots can have significant impacts on turfgrass tolerance to surface soil drying. Researchers evaluated the responses of buffalograss and zoysiagrass to soil drying in a greenhouse setting. Three levels of irrigation were provided: entire soil profile watered daily, the bottom layers of soil watered daily and top layers allowed to dry, or soil profile watered once and allowed to dry throughout.

Under drying conditions, roots of buffalograss elongated faster, so it had a greater proportion of roots in the lower layers of soil than did zoysiagrass. Buffalograss had a high rate of water depletion in the deep layers, whereas zoysiagrass had a higher rate in the upper layers. Soil water in the upper drying soil increased at night for both grasses but to a greater extent for buffalograss. Leaf water potential, a sensitive indicator of water deficit, declined after 7 days' drying of the upper

Hardy amaryllis (left) could be a new addition to the cut flower trade.

layers for zoysiagrass but declined only when the entire soil profile was dried for buffalograss. These results indicate that the deep extensive root system of buffalograss facilitates water utilization in the deep soil layers and also enhances water status near the soil surface. The roots apparently transfer water from the deep layers to the surface area. This allows buffalograss to maintain viable roots in drying soil and increases its tolerance to localized drought stress.

Objective Measurement of Turfgrass Quality

Turfgrass researchers traditionally use a visual rating system that is highly subjective. A K-State researcher is investigating a more objective method of rating that uses computerized quantitative analysis.

Color photographs of turfgrasses were scanned, digitized, and stored in a computer. Then color spectra of the digitized images were obtained by separating the red, green, and blue components into three files and converting them into hue, saturation, and intensity. Comparison of these data plotted in graphs could distinguish mature plots of fall fescue and zoysiagrass (the latter is lighter green). This technique also could distinguish Bermudagrass and buffalograss during spring green-up and showed the different development of green color in plots of the two grasses.

Black and white photographs of four turfgrasses were scanned and digitized, then Fourier transforms were performed on the images, and a radial plot of the power spectrum was obtained from each image. The plot of the average peaks of the power spectra showed that zoysiagrass had the lowest dimension, tall fescue had the highest, and buffalograss and Bermudagrass were intermediate. The widths of the power spectrum peaks also differed. Fescue had the maximum dimension, zoysiagrass had the lowest, and Bermudagrass and buffalograss again were intermediate.

Further refinement of these sophisticated techniques may result in an automated and objective method to compare turfgrass quality.

Laboratory studies of turfgrass focus on water use and drought resistance.



An adhesive made from soybeans has good strength and water resistance.

VALUE-ADDED PROCESSING

A New Adhesive from Soybeans

Soybeans are processed into oil, tofu, and other foods, but they also provide raw materials for non-food products. For example, proteins from soybeans can be modified chemically to make an adhesive. Petroleum-based adhesives contain formaldehyde, whose toxic fumes are health hazards to workers in adhesives and furniture factories and to consumers. The soy-based adhesive developed in the Department of Grain Science and Industry uses nontoxic chemicals.

Samples of plywood made with different types of woods glued together with the soy adhesive were tested for strength and water resistance. The adhesive performed well after three cycles of soaking in water for 48 hours and then drying. Pine, cherry,



and walnut plywoods showed no delamination and only a slight reduction in adhesive strength. Maple and poplar plywoods, which expanded much more, showed 20 to 40 percent delamination. The adhesive also remained strong after 8 weeks in a chamber with 90 percent humidity.

These results indicate that a soy protein-based adhesive could replace toxic petroleum-based adhesives for many interior and exterior applications.

Dyes for Wheat Straw

Wheat straw is an underutilized agricultural residue that has been used traditionally for the craft of wheat weaving. Recent research at K-State has developed a method of making particle board from wheat straw, and two commercial facilities are manufacturing straw board in Kansas. Most straw items are made from undyed stalks, so the economic value and applications of straw could be increased by adding color. However, dyed products made from "hard" fibers like wheat straw tend to look dull and uneven and lack colorfastness.

A researcher in the Department of Clothing, Textiles and Interior Design used a variety of dyes on wheat straw and evaluated their intensity, colorfastness, and wetfastness. Basic dyes produced the most intense colors; they were distributed more evenly at higher temperatures and with longer dyeing time. Lightfastness of colors was less than



Wheat straw board already has several uses; adding color would increase its value.

that of basic dyes on acrylic fabric used for comparison, but the exposure level may have been excessive for straw products. Wetfastness of the basic-dyed straw was very good, if it was properly afterwashed. Dyed straw has great potential for commercial uses, including colored straw board, so the dyeing process adds further value to this abundant residue.

ECONOMICS OF AGRICULTURE

Payoff from Kansas Wheat Breeding

Public research on wheat breeding has resulted in higher yields for Kansas producers over the past several decades. Funding for wheat-breeding research at K-State comes mainly from the state and other nonfederal sources. Total support reached a high of \$6 million in 1988 but has declined since then to \$3.2 million. Continuation of funding for the breeding program depends on how well it is serving the public.

A researcher in the Department of Agricultural Economics measured the yield gains from semidwarf varieties of wheat released by KAES from 1977 to 1994. The increase in wheat yields represents an increase in the supply of wheat produced in Kansas and is the foundation of the economic impacts of the breeding program. An economic model was developed to determine these impacts on wheat producers and consumers in Kansas and in other areas. Special consideration was given to the timing of genetic improvement: development of a new variety can require as long as 17 years be-

tween the initial cross and release. Additionally, several years are needed for growers to adopt and plant new varieties. The economic analysis accounted for these long development and adoption periods, because the costs of breeding a new variety are incurred many years before the benefits of enhanced wheat yields are realized.

The long process of developing a new wheat variety starts in the greenhouse.



The comprehensive costs of the K-State wheat-breeding program for the 18-year period averaged \$3.8 million per year, including all research costs and overhead. During the same period, the new semidwarf varieties resulted in increased wheat production of more than 1 percent per year. As a result, the economic benefits to wheat producers averaged \$52.7 million per year. The benefit-to-cost ratio was 11.95 for the KAES wheat breeding program. In other words, for each \$1 invested in varietal improvement, nearly \$12 was earned by Kansas wheat producers.

Although the return to the investment in wheat breeding has been high, any decrease in the long development time for a new variety would result in greater economic benefits. Continued and increased funding of wheat breeding research would be an appropriate use of scarce resources.

The Future of Price Discovery for Fed Cattle

Price discovery is the process of buyers and sellers arriving at a transaction price. Several factors have caused price discovery to become a major concern to cattle producers in recent years. Therefore, an agricultural economist conducted a survey to project how this process will change over the next decade. Information was gathered through telephone interviews of persons at selected cattle-feeding, beef-packing, and related companies, including some of the largest.

A major theme was the need for the beef industry to provide products with greater value for consumers. Value means that the product is priced competitively, is convenient, and provides a consistently positive eating experience for the consumer. Specific trends were mentioned that will influence price discovery and vertical market coordination in the beef industry.

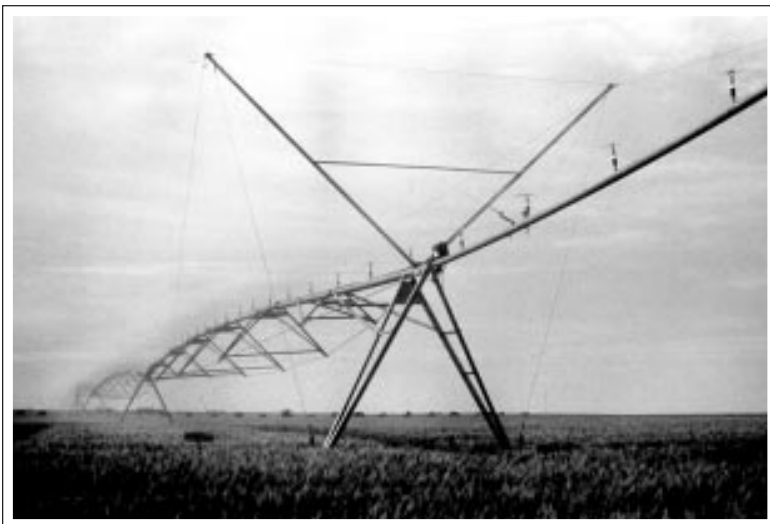
Technology that improves the ability to identify and sort beef products by quality and value attributes will be developed and adopted. Federal beef quality grades likely will be less important in 10 years. Many different means will be used to measure and describe beef quality differences, depending on the targeted consumer. Formula and grid-based pricing will become more common in procurement of fed cattle by packers. More cattle will be produced under alliances that directly link cow-calf producers all the way to retail and food-service outlets. Beef price discovery will shift away from the live market and toward the wholesale level. More beef will be marketed by brand names; some alliances and producer groups may introduce branded products. Live-cattle cash trade will decline, and dressed-weight pricing will increase. New marketing methods will mean more negotiations of terms of trade among market participants.

Irrigated Crop Lease Arrangements

Rental arrangements for irrigated cropland vary widely across localities and farming areas. The land can vary from undeveloped to land leveled for flood irrigation. Additionally, the landlord can own the well, pump, gearhead, and delivery system or any combination of these assets. Thus, each irrigation lease should be different depending on the quality and quantity of the various assets contributing to production. Traditional nonirrigated leases may be of little help in determining fair and equitable irrigation arrangements. Over 91 percent of the agricultural producers in the northwest, southwest, and south central Kansas Farm Management Associations (KFMA) lease part or all of the land, frequently from more than one landlord. Of the producers that grow crops under irrigation, approximately 75 percent lease irrigated cropland. Therefore, crop lease arrangements are important. An agricultural economist conducted a survey to obtain information on irrigated crop lease arrangements for 1997 from a sample of agricultural producers enrolled in the northwest, southwest, and south central regions of the KFMA program. Ninety completed questionnaires were obtained, representing 27.4 percent of all farms that rented irrigated cropland and 57.0 percent of the operations typed as irrigated farms. The survey results were compared with those of similar surveys taken in 1988 and 1994.

The most common type of landlord-tenant crop-share lease in northwest Kansas was a 25-75 percent arrangement, whereas the 33.3-66.7 percent crop production share arrangement was the most prevalent in southwest and south central Kansas.

Leases for irrigated cropland should consider the quality and quantity of assets contributing to production.



The average landlord's percentage share of crop production ranged from 29.2 percent in the northwest to 38.1 percent in the south central region. Government payments were shared at a percentage similar to the landlord's share of crop production. The shared percentage for fertilizer costs was similar to the landlord's share of the crop, with lower shared percentages for chemicals. Application costs for these inputs also were shared, as well as irrigation fuel and seed expenses. The landlord's share of crop production increased slightly from 1988 to 1997. The shares of input costs paid by the landlord were similar for 1997, 1994, and 1988, although the landlord paid a higher percentage of fertilizer and herbicide application expenses in 1997. In comparison to 1994, tenants owned a lower percentage of all irrigation equipment in 1997. Also, cash-only leases were more prevalent in 1997 compared to 1988 and 1994.

The low level of the landlord's sharing of the variable inputs, other than fertilizer and chemicals, could be related to customary lease arrangements in a region. However, one of the basic principles of a good lease is the sharing of production in the same proportion as resources contributed. If sharing of crop production is not based on the relative value of the resources contributed by the landlord and tenant, then lease adjustments should be made related to the sharing of such inputs as harvesting, drying, and hauling costs.

Living Expenses for Farm Families

Agricultural producers, credit institutions, farm management planners, and educators continuously need information on the level of living expenditures for farm families. Some agricultural producers enrolled in the Kansas Farm Management Association program keep detailed accounts; the proportion varies from 11 percent to 27 percent. An agricultural economist used these ac-



counts to analyze trends in family living expenses over a 20-year period, from 1976 to 1996.

Total expenditures for family living are dependent on a number of factors, including family size and the age of children. Over the 20 years, family living expenses increased and showed a high correlation to net farm income. Food averaged 21 percent, household expenditures averaged 18 percent, and medical expenses averaged 17 percent of total expenses. Food expenditures decreased over the 20 years, but medical and health insurance expenses increased. Families with children aged 5 and younger had lower average expenses than families with children aged 18 and older. Family living expenses were higher for agricultural producers in western Kansas than in the eastern region.

The detailed information compiled for this study can be used in many ways and serve as a basis for further research on family living expenses and their implications.

Records of living expenses for farm families are useful to financial institutions, planners, and researchers.

ENVIRONMENTAL ISSUES

Predicting Wind Erosion

Kansas lies in the center of the area of the United States with the greatest wind erosion, so it is an appropriate place for the Wind Erosion Research Unit. The United States Department of Agriculture established the unit in 1947, and since then, scientists have been working to understand the process of wind erosion and to find better ways to predict and prevent it.

In drought conditions, wind can uproot crops and remove valuable topsoil. Such erosion is a signifi-



Wind erosion causes major soil loss in Kansas.



Trees along stream banks stabilize soil and prevent erosion.

cant problem on 75 million acres in the United States, and about 5 million acres are damaged moderately to severely each year.

The 50th anniversary of the Unit was celebrated with a conference at K-State that brought together erosion scientists from all over the world. They discussed wind erosion problems and ways to control them using three basic techniques: slowing down the wind with features such as windbreaks; roughening the soil by bringing larger clods to the surface so it cannot blow away so easily; and covering the soil with crops or nonerodable particles.

Research at K-State has focused on a prediction system; first an equation, and then a computer model called the Wind Erosion Prediction System (WEPS). This model can simulate all the factors that contribute to erosion, such as weather and field conditions, and can estimate soil movement, plant damage, and emission of breathable particles that affect human health. Its uses include assessing wind erosion damage, planning soil conservation systems, and developing policy.

The newest addition to WEPS is a management submodel that attempts to simulate major processes related to the most prevalent cultural practices used by producers and land managers that influence a site's susceptibility to wind erosion. The range of practices includes primary and secondary tillage, cultivation, planting/seeding, harvesting, and fertilization, as well as irrigation, burning, and grazing. For the date when the operations are to be performed, the submodel will execute the specific routines required to simulate the effects of those operations.

Erosion researchers will continue to improve and update WEPS to make it even more useful in pre-

dicting wind erosion and planning ways to prevent it. The program and other information are available on the Internet and the World Wide Web, as well as from the Wind Erosion Research Unit in Throckmorton Plant Sciences Center.

Trees Protect Stream Banks

Lowland sites near streams and rivers have rich soil that produces high yields of crops as well as forest products. However, clearing woodland along the banks makes them vulnerable to erosion. Stream discharge varies greatly from year to year, so stream bank losses usually are not noticed until a major high-water event occurs. The 1993 flood in Kansas was such an event and provided an opportunity for forestry researchers to evaluate the influence of natural woodland vegetation on lateral erosion/deposition of stream banks.

The study area was a 4-mile portion of the Kansas River Basin. The mixed woodland along the river included cottonwood, silver maple, hackberry, sycamore, and elms. Aerial photographs taken before and after the flood were obtained. A computer program was used to calibrate the images to previously digitized maps; then the slide images also were digitized. Then a river centerline was added to serve as a reference. Data collection points were established at 500-foot intervals in the study area. Erosion and deposition amounts were estimated by comparing relative positions of stream banks in the two sets of images. Land-cover vegetation was categorized as forestland, cropland, grassland, or single tree-row (one row of trees adjacent to a nonforest land-cover type).

The analysis showed that 59 percent of the stream banks were tree lined, and vegetation significantly affected the amount of lateral erosion. Both forest and single tree-row vegetation types collected soil (10 feet and 4 feet, respectively), whereas grassland lost about 78 feet, and cropland lost about 150 feet. Translated to surface acreage for each mile of stream erosion, these losses were 9.5 acres for grassland and 18 acres for cultivated land.

Woody vegetation along stream banks slows water movement and thus reduces the energy available for erosion and allows deposition of suspended materials. The greater root depth, larger and stronger roots, and greater rooting density of trees also stabilize the soil. Natural stands of timber should be left along stream banks not only to protect soil but also to improve water quality and reduce downstream sedimentation. Cultivating land next to stream banks should be avoided because of the large acreage lost during high water events.

Atrazine in Surface Water Runoff

Contamination of drinking water in Kansas with the herbicide atrazine is a concern and has prompted studies to determine what factors affect its concentration in surface water runoff.

Researchers in the departments of Agronomy and Biological and Agricultural Engineering first considered the timing and rate of application and wheel traffic in a ridge-tilled field of grain sorghum. Concentrations of atrazine in surface water were influenced mainly by the number of days between application and the first rainfall causing runoff. A planting-time band application reduced the concentration by 54 percent in the first subsequent runoff compared to the planting-time broadcast application. Fall or spring timing did not affect concentrations in runoff after planting. Wheel traffic increased runoff and atrazine concentrations, but the extent varied over 2 years.

The research team next conducted field experiments to evaluate atrazine loss from three tillage systems used for grain sorghum over three growing seasons. Atrazine loss was less from the chisel-disk system than from the ridge-till and no-till systems. The ridge-till system had the most loss in 2 years and the highest average runoff. On poorly permeable soils, chisel-disk tillage with incorporation of atrazine may result in lower loss in runoff. However, weather conditions have major effects, especially if atrazine is not incorporated.

Food Wastes in Military Hospitals

The United States (US) Army has incorporated environmental and natural resource protection into its mission. It also is the world's largest generator of waste. Accurate data on solid waste generation in Army operations, including foodservice, are needed to reduce the waste stream and improve solid waste management programs. To obtain such data, researchers in the Department of Hotel, Restaurant, Institutional Management and Dietetics studied the foodservice operations in a military community hospital and an acute care facility.

They conducted waste stream analyses for 14-day periods and calculated the weight, volume, collapsed volume, and specific weight for each waste category on a per-meal basis. The average weight of waste per meal was 1.2 pounds. The average volume of uncollapsed waste per meal was about 1.5 gallons, but total volume was reduced significantly by collapsing the waste. Waste generation was affected by many factors, including food preparation, use of convenience foods, type of packaging, and quality of produce. Waste from patients' trays was affected by type of menu, use of insulated trays, and acuteness of illness.

The nutrient compositions of service and production food wastes were determined at one of the military hospitals. Food wastes from cafeteria service and from the kitchen were collected for all meals over a 14-day period. The wastes for each day from each location were placed in a refuse container and mixed thoroughly, then a sample was removed and frozen until analysis. Chemical analyses showed that production and service wastes contained similar amounts of protein, ash, carbohydrate, and energy. Production waste had significantly more moisture, and service waste had significantly more fat. The nutrient contents of these food wastes make them marketable as compost or animal feed. They should be diverted from the general waste stream and sold or donated.

Finally, a survey was conducted to assess the status of waste reduction and recycling programs in foodservice operations at other US Army hospitals. A questionnaire was mailed to foodservice directors of all such hospitals with inpatient services, and all 25 directors responded. Most foodservice operations used china, glass, or reusable plastic dishes and stainless steel or a combination of stainless steel and disposable plastic utensils. Nineteen of the sites had waste reduction systems (compactors or pulpers), and 21 participated in recycling programs, particularly for cardboard, paper, cooking oil, and aluminum. A majority of respondents ranked reduction and recycling as important. Limited staff was cited as the major problem in waste management. This survey showed that the US Army has established environmentally sound practices in its hospital foodservice. However, improvements are possible based on the results of the study in Kansas; food waste also can be reduced and recycled.

Food wastes from U.S. Army hospitals could be recycled as compost or animal feed.



KANSAS WILDLIFE

Wildlife on Conservation Research Program Land

Attitudes of Landowners. About 2.8 million acres of land in Kansas are enrolled in the Conservation Reserve Program (CRP). Provisions of the 1990 and 1996 Farm Bills made most of these acres eligible for release by 1997. The CRP land provides much-needed habitat for wildlife in an area with so much cropland. Policy makers concerned with

CRP land in Kansas provides valuable habitat for wildlife.



wildlife conservation need to know the fate of CRP land and potential effects on wildlife. Therefore, a forestry researcher conducted a survey to discover how Kansas CRP contract holders value wildlife on their farms and how they plan to use their enrolled acres when their contracts expire and to identify factors that might influence their decisions.

Annual burning of fields can reduce nesting by birds.

Questionnaires were mailed to a statewide random sample of 3,000 CRP contract holders, and useable responses were received from 2,146 (nearly 73 percent). Over two-thirds of respon-



dents indicated that wildlife was an important consideration in their choice of farming practices. About 60 percent said that providing wildlife habitat was an important or very important reason for CRP enrollment. Increased populations of wild birds and animals on CRP land were noted by half of the respondents and were regarded as desirable, except for coyotes. Most respondents were unsure of what they would do with CRP acres, although they indicated that some would be returned to grazing or crop production. However, they also said that they might extend CRP contracts for 5 or 10 years. Over three-fourths of respondents already allowed hunting on CRP land, and very few charged a fee. About one-third said that they would participate in a state-sponsored access program for hunting or recreation.

The positive attitudes about wildlife and supporting the CRP were encouraging, but some organized programs may be needed to maintain adequate habitat for wildlife in the state.

Impacts of Burning on Bird Populations. Most CRP fields in the Great Plains are planted to grasses, which has benefitted various species of grassland birds. Increased populations have been documented in unmanipulated CRP fields, but the effects of annual burning were not known. Biologists compared bird abundance, nesting success, species richness, and composition of populations in burned versus unburned CRP fields. They also considered the vegetative structure shortly after burning and again in July.

The differences in vegetation seen in May had nearly disappeared by midsummer. Bird abundance was significantly less on the burned fields. The composition of bird populations was different on burned fields in early summer but not later in the season. Species richness was similar on both types of fields. The unburned fields had 372 nests versus only 27 on burned fields, but the nesting success differed much less (34 percent versus 22 percent).

Annual spring burning obviously impacted bird nesting in summer of the same year, but further analysis of the data showed that this effect did not persist to the following summer if the field was not burned. Thus, to provide good habitat for grassland birds, CRP land should be burned less frequently. A 2- to 3-year schedule of burning prevents invasion of woody species on native prairie and should be sufficient for CRP land as well.

Benefits of Sustainable Agriculture for Birds

The increasing cultivation of land accompanied by more mechanization and greater use of pesticides and fertilizers have impacted grassland birds. Their populations have declined more drastically and consistently than populations of other bird groups in the United States. Long-term set-aside programs and the CRP provide some suitable habitat but of limited extent.

Low-input sustainable agriculture (LISA) is gaining in popularity. It uses less tillage to reduce soil erosion and cover crops to also protect the soil and increase organic matter and nitrogen. These practices are less disruptive to birds and can provide nesting habitat. However, the value to birds of various cover crops and the invertebrates they support has not been determined.

Biologists evaluated the vegetative structure and invertebrate populations in conventional fields of grain sorghum and fields with grain sorghum planted into established cover crops of sweet clover, hairy vetch, rye, and a rye/hairy vetch mixture. Invertebrates were collected by two methods and identified.

Some differences in vegetation were noted at one of the two sites. Pitfall traps collected many more invertebrates than sweepnets at both sites, and generally more were collected from the fields with cover crops. The sweet clover seemed more effective in providing increased vegetative cover and invertebrate biomass. In addition, the species of invertebrates were among the most important in the diets of grassland birds. Thus, increasing use of LISA especially with sweet clover could provide additional favorable habitat for birds in Kansas.

New Host Plant for the Buck Moth

The buck moth is distributed through the eastern states and west to Texas and the Great Lakes. It is quite rare in the Great Plains; only a few records exist from Kansas, Oklahoma, and Texas. Throughout much of its range, the buckmoth feeds on various species of oaks. Feeding on willows



and other plants has been reported, but the identifications of the insects are questionable.

This insect occurs on the Konza Prairie Research Natural Area in stands of bur oak or chinquapin oak. Stands of these trees extend onto rocky hillsides, where trees become progressively shorter and shrubby. Among the other woody shrubs on these hillsides is New Jersey tea, a member of the Rhamnaceae or Buckthorn Family.

Entomologists found eggs and young larvae of the buck moth on oaks, as expected, but also found older larvae feeding on New Jersey tea. The larvae were collected and taken to a laboratory. Those collected from oaks fed on oak leaves, and those collected from New Jersey tea would eat only leaves from that shrub and rejected oak leaves.

At least part of the Konza population of buck moths switches host plants, possibly because of nutritional needs of the larvae or a change in food quality. As leaves age, nitrogen and water concentrations decrease and concentrations of certain chemicals increase, which can diminish the food quality. New Jersey tea may offer a superior food supply in early June, when the host switch was observed. Another influence might be predators; the moths in groups on the stands of oak trees might be more vulnerable than individual moths on the widely spaced shrubs.

The rare buck moth has been found on a new host plant in Kansas.

FOOD SAFETY

Tracking Down a Pathogen

The foodborne pathogen *Escherchia coli* 0157:H7 originates in cattle. A long-term study by the Food Animal Health and Management Center and researchers in the Department of Animal Sciences and Industry is determining the prevalence of the organism in Kansas cow-calf herds, where it occurs, and what factors affect it.

Between 1.5 and 3 percent of cattle in the 10 herds on cooperating ranches in the study carry the organism. It is shed in their feces and also occurs in their drinking water. Wildlife in the area, particularly deer, also are carriers. The organism seems to travel between cattle in a herd. Retesting of several positive shedders detected only one that was still positive, but the overall incidence in the herd

Ongoing research in food science emphasizes faster and better ways to identify foodborne pathogens.



was the same. Prevalence was increased by long-distance hauling.

A high-tech genetic test is helping researchers to detect *E. coli* in cattle and environmental samples. The polymerase chain reaction is based on amplifying specific sequences of nucleic acid (such as DNA), so they can be analyzed and studied. For detection, the test allows increasing a portion of the DNA from just one cell, so very low numbers of organisms can be detected.

The goal of this comprehensive study is to build a management plan for farmers and ranchers that is economically sound, protects their health and public health, and produces a safer product.

Faster Identification of Food Pathogens

Food science researchers are involved in an ongoing program to develop faster and more accurate methods to isolate and identify food pathogens. Speed is essential when outbreaks of food poisoning occur, but identification must be accurate. Several food pathogens are motile, and methods have been developed to isolate them from food samples. However, no procedure has been available to simultaneously isolate two common motile

pathogens, *Listeria* and *Salmonella*. Food samples had to be incubated, enriched to increase numbers of bacteria, and then used in separate tests for the two pathogens.

A new method was developed that uses two glass pipettes each containing a selective medium for one of the pathogens. When the media solidified, a small amount of recovery broth was added on top of each. The two tubes (each with a tiny opening at the bottom) were placed in a stomacher bag containing sterile enrichment broth. A stomacher is an instrument that mixes materials placed in a bag by action similar to digestion in the stomach. Then mixtures of bacteria including *Listeria* and *Salmonella* were inoculated into the broth. The tubes remained in the broth for 24 hours.

Color changes in the selective media showed that both pathogens were recovered from the mixtures. In practical applications, samples of contaminated food would be added directly to the broth in the stomacher bag, and color changes in the tubes would confirm the presence of these dangerous bacteria.

Biodegradation of Aflatoxins

Aflatoxins are compounds secreted by a type of fungus that grows in agricultural products used for human food and animal feed. These compounds are very toxic and can cause genetic mutations and cancer. Several methods have been tested to detoxify these widely occurring contaminants. Physical and chemical procedures work but cause loss of nutrients and palatability of foods; biological methods seem more promising. One of these is the use of species of *Flavobacterium*, a non-pathogenic microorganism. A study was undertaken in the Department of Animal Sciences and Industry to learn more about how this organism degrades aflatoxin.

Various cellular fractions of *Flavobacterium* were tested against several types of aflatoxins in a laboratory. After 48 hours of incubation, two cellular fractions reduced the concentrations of aflatoxin B₁ by 95 to 97 percent. Prior incubation of the bacterial culture with aflatoxin enhanced its degradation ability. When the bacterium was incubated with two types of aflatoxin, it degraded more of aflatoxin G₁ (a less toxic form).

The study showed that cellular fractions of *Flavobacterium* can degrade aflatoxin probably by an enzymatic process. Further work is underway to isolate the enzyme system and to test the efficiency of the bacterium for decontaminating corn.

Safe Handling of Raw Milk

The quality of raw milk is affected greatly by handling conditions on the farm and throughout the distribution cycle. Cooling is an important step, and both the temperature and the rate influence quality. Assessing the quality of incoming milk is becoming more important. As dairy processing facilities decrease in number, milk must be transported greater distances. This delay allows microbial growth, which causes deterioration. Researchers in the Department of Animal Sciences and Industry evaluated the effects of several storage temperatures and cooling rates on the quality of raw milk. They also used a preincubation test designed to identify psychrotrophic (cold-tolerating) bacteria in milk. Their presence or absence indicates the effectiveness of on-farm sanitation and hygienic transportation procedures.

Results showed that as storage temperature increased from 35 to 45° for 0 to 72 hours, total bacterial counts increased, whereas the titratable acidity and pH values remained fairly constant. The latter are quickly measurable indicators of microbial activity. Cooling rate also affected microbial numbers. Cooling to 40°F within 30 versus 120 minutes reduced microbial counts by 50 percent. Therefore, cooling milk quickly to the lowest appropriate temperature is the best way to maintain quality. Finally, the preincubation test was shown to



Proper cooling of raw milk is essential to control bacterial contamination.

be an effective method to document possible psychrotrophic contamination before the milk arrives at the processing facility.

HEALTH AND WELL-BEING

Influence of Dyes on Ultraviolet Protection by Fabrics

Skin cancer is the most common form of cancer in the United States. It probably is caused by both acute and cumulative exposures to ultraviolet (UV) radiation from the sun. Some of the UV rays are absorbed by the ozone layer (UV-C), some are weakened as they pass through (UV-B), and some are hardly affected (UV-A). Depletion of the ozone layer has led to an increase in the amount of UV-B radiation reaching the earth and, hence, to increased incidence of skin cancer.

The risks of skin cancer can be reduced by use of protective sun screens, hats, and clothing. Various factors can affect the UV protection provided by clothing, such as fiber type, finishing chemicals, and dyes. Researchers in the Department of Clothing, Textiles, and Interior Design studied the influence of different dyes on the UV protection value of a cotton fabric. Samples of a lightweight cotton fabric with a low value were dyed with 14 direct dyes of different hues and chemical classes.

Then transmittance and absorption of UV radiation were measured.

All of the dyes reduced UV transmittance through the fabric. The extent of reduction depended on

Dark-colored dyes can increase the ultraviolet protection value of cotton fabric.



the concentration of the dye and its UV absorptivity. The latter characteristic is determined mainly by the chemical structure of the dye molecule. Certain red, green, blue, and brown dyes may provide better UV protection than black dye. White and light-colored clothes traditionally worn in summer are cooler because they reflect light but may not screen out the harmful UV rays.

Better Health for Greyhounds

Funding from the Kansas Racing and Gaming Commission has allowed the College of Veterinary Medicine to develop a major program on greyhounds. Research has included genetic studies but focuses on health problems. Dog racing has become very popular and profitable, so an investment in maintaining these valuable animals is worthwhile.

Veterinarians have investigated kennel cough and produced a more effective vaccine. This very contagious, airborne, bacterial infection causes intense coughing and sometimes pneumonia. It is related to whooping cough, so this study could benefit humans as well. In both diseases, emerging new strains of the causative organisms limit the effectiveness of vaccines.

K-State research also identified the cause of Alabama rot, a disease that produces skin lesions and eventually kidney failure. It is caused by a bacterium similar to *Escherichia coli*. This knowledge will lead to better treatment and prevention of the disease

Greyhounds develop food poisoning symptoms similar to those of humans when they are exposed to other strains of *E. coli*. The dogs are fed raw meat, which can be contaminated by several pathogens. Preliminary work is underway with greyhounds to develop a vaccine against *E. coli* poisoning. An immune serum injected in the dogs seems to produce antibodies in their system that protects them from *E. coli* toxin. This is another case in which research with greyhounds also will benefit humans.

How Pets Affect Young Children's Development

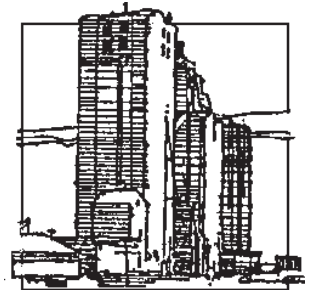
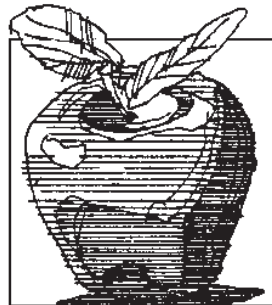
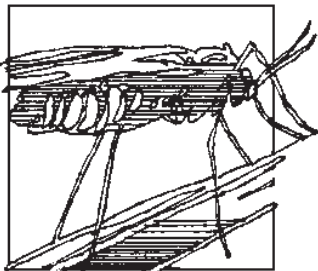
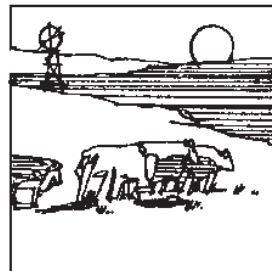
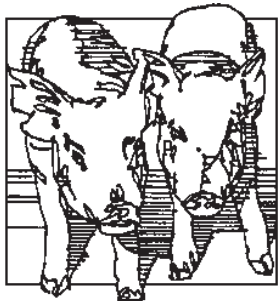
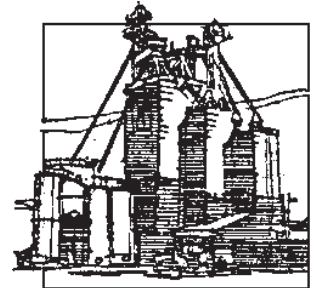
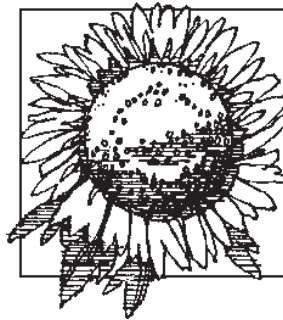
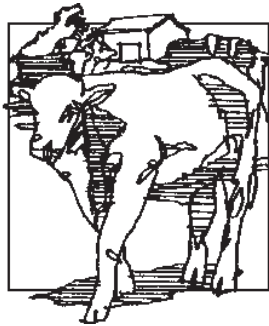
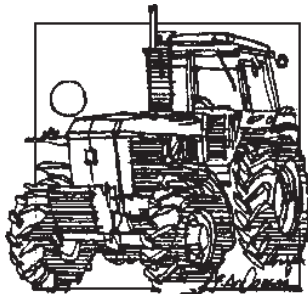
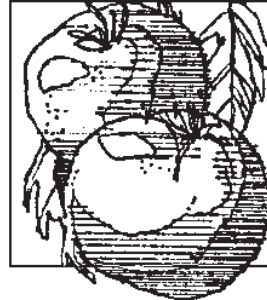
Numerous studies have indicated the health and psychological benefits associated with pets and have concluded that child-pet interactions generally facilitate the child's development.

A researcher in Family Studies and Human Services analyzed the role of companion animals in the lives of young children in the ecological context of the home and considering effects of age. The study involved 88 families with children ranging in age from 3 to 6 years, half of which had a dog or cat, and included a questionnaire for parents and home visits.

Results showed that children with stronger bonds to their pets had more empathy towards animals and were more cooperative. Older children and those from better home environments also obtained higher scores on several developmental measures, but the child-pet bond had the most positive impact on social development.

*A strong bond with
a pet improves the
social development
of children.*





Personnel Changes

■ APPOINTMENTS

Kassim Al-Khatib, agronomy
Joseph Arata, agricultural economics
Alok Bhandari, civil engineering
Michael Boland, agricultural economics
Rollie Clem, biology
Brendan Donnelly, head, grain science and industry
Doug Elcock, business office
Rolando Flores, grain science and industry
Lisa Freeman, anatomy and physiology
Roman Ganta, diagnostic medicine/pathobiology
Rebecca Gould, hotel, restaurant, institutional management and dietetics
Stephen Hamilton, agricultural economics
William Hargrove, director, Kansas center for ag resources and the environment

Bingru Huang, horticulture, forestry and recreation resources
Robert Hudgens, international agricultural programs
Finley MacRitchie, grain science and industry
Ronald Madl, director, wheat research center
Kyle Mankin, biological and agricultural engineering
Thomas Marsh, agricultural economics
David Mengel, head, agronomy
Richard Miller, family studies and human services
Moses Okot-Kotber, grain science and industry
Gita Ramaswamy, clothing, textiles, and interior design
Sonny Ramaswamy, head, entomology
Judith Roe, biology
Tim Rozell, animal sciences and industry

Janice Sargeant, food animal health and management center
John Schmidt, agronomy
Paul Smith, biochemistry
Paul St. Armand, agronomy
Xiao Yan Tang, plant pathology
Michael Tokach, animal sciences and industry
Harold Trick, plant pathology
Mitchell Tuinstra, agronomy
Matt Whiles, entomology
Kimberly Williams, horticulture, forestry and recreation resources
Kang Xia, agronomy
Jian Min Zhou, plant pathology
Anna Zolkiewska, biochemistry
Michal Zokiewski, biochemistry

■ RESIGNATIONS

Mary Albrecht, horticulture, forestry and recreation resources
Laura Andersson, biochemistry
M. Kathy Banks, civil engineering
Robert Borges, agricultural economics
Paula Bramel-Cox, agronomy
Gary Brester, agricultural economics
Parag Chitnis, biology

T. Stan Cox, agronomy
J. D. Dunn, anatomy and physiology
Jon Faubion, grain science and industry
John Havlin, agronomy
Kelly Kreikemeier, southwest research-extension center
William Lamont, Jr., horticulture, forestry and recreation resources

Yi Li, biology
Brian Marsh, agronomy
William Pfender, plant pathology
A. Paul Schwab, agronomy
James Schwenke, statistics
Eric Vanzant, agricultural research center-Hays

■ RETIREMENTS

Neil Anderson, food animal health and management center
Stanley Clark, head, biological and agricultural engineering
Larry Corah, animal sciences and industry
Charles Deyoe, grain science and industry

Gerald Greene, southwest research-extension center
Richard Hahn, head, grain science and industry
Carl Hoseney, grain science and industry
Charles Kramer, biology
Charles Long, horticulture, forestry and recreation resources

Robert Schalles, animal sciences and industry
William Stegmeier, agricultural research center-Hays
Barbara Stowe, dean, human ecology
M.W. Vorhies, diagnostic medicine/pathobiology

■ DEATHS

John Pair, horticulture, forestry and recreation resources

Joseph Smith, diagnostic medicine/pathobiology

■ APPOINTMENT CHANGES

T. J. Herald
from: foods and nutrition
to: animal sciences and industry

T. G. Nagaraja
from: animal sciences and industry
to: diagnostic medicine/pathobiology

Frank Schwulst
from: northwest research-extension center
to: animal sciences and industry

■ TITLE CHANGES

Jane Bowers
from: head, foods and nutrition
to: professor, foods and nutrition

James Koelliker
from: professor, biological and agricultural engineering
to: head, biological and agricultural engineering

Gerry Posler
from: head, agronomy
to: professor, agronomy

■ NAME CHANGE

Horticulture research center-Wichita changed to John C. Pair horticultural center

Station Publications

■ **REPORTS OF PROGRESS**

- 766 Economic Analysis of Alternative Irrigation Systems for Continuous Corn and Grain Sorghum in Western Kansas
- 767 1995 Production, Postharvest, and Freeze-Drying Evaluation of Fresh-Cut Peonies
- 768 Field Day 1996. Southwest Research-Extension Center
- 769 1996 Kansas Performance Test with Winter Wheat Varieties
- 770 1996 Woody Ornamental Evaluations. 25th Year Edition
- 771 Dairy Day 1996
- 772 Swine Day 1996
- 773 Cattle Feeders' Day 1996
- 774 1996 Kansas Performance Tests with Corn Hybrids
- 775 1996 Kansas Performance Tests with Grain and Forage Sorghum Hybrids
- 776 1996 Kansas Performance Tests with Soybean Varieties
- 777 Chemical Weed Control for Field Crops, Pastures, Rangeland, and Noncropland, 1997
- 778 Kansas Fertilizer Research 1996
- 779 1996 Kansas Performance Tests with Alfalfa Varieties
- 780 1996 Kansas Performance Tests with Sunflower Hybrids
- 781 Capability of Kansas Grain Elevators to Segregate Wheat during Harvest
- 782 1996 Great Plains Canola Research
- 783 1997 Cattlemen's Day
- 784 Roundup 1997
- 785 Kansas Sheep Research 1997
- 786 1997 Agricultural Research. Southeast Agricultural Research Center
- 787 Field Research 1997. Agronomy and Biological & Agricultural Engineering Experiment Fields
- 788 1997 Turfgrass Research
- 789 Field Day 1997. Southwest Research-Extension Center
- 790 1997 Kansas Performance Tests with Winter Wheat Varieties
- 791 1996 Production and Postharvest Evaluations of Fresh-Cut Peonies
- 792 Dairy Day 1997
- 793 Kansas Wheat Breeding. An Economic Analysis
- 794 Cattle Feeder's Day 1997
- 795 Swine Day 1997
- 796 1997 Kansas Performance Tests with Corn Hybrids
- 797 Chemical Weed Control for Field Crops, Pastures, Rangeland, and Noncropland, 1998
- 798 1997 Kansas Performance Tests with Soybean Varieties
- 799 1997 Kansas Performance Tests with Grain and Forage Sorghum Hybrids
- 800 Kansas Fertilizer Research 1997
- 801 1997 Kansas Performance Tests with Sunflower Hybrids
- 802 1997 Kansas Performance Tests with Alfalfa Varieties
- 803 1997 Great Plains Canola Research
- 804 1998 Cattlemen's Day
- 805 1997 Evaluation of Postharvest Life of Perennial Fresh-Cut Flowers
- 806 Spring Oat Varieties for Kansas
- 807 Trends in Family Living Expenses for Kansas Agricultural Producers—1976 to 1996
- 808 Roundup 1998

- 809 1998 Agricultural Research. Southeast Agricultural Research Center
- 810 Field Research 1998. Agronomy and Biological & Agricultural Engineering Experiment Fields
- 811 Trends in Irrigated Crop Lease Arrangements on Kansas Farms
- 812 1998 Turfgrass Research

■ **KEEPING UP WITH RESEARCH**

- 112 Soybean Response to Row Spacing and Seeding Rates in Northeast Kansas
- 113 Use of Long Days to Time Flowering of 'Freedom Red' Poinsettia
- 114 Planting Wheat Seed Damaged by Frost before Harvest
- 115 Planting Wheat Seed Damaged by Sprouting before Harvest
- 116 Response of Drilled Early Corn to Several Plant Populations
- 117 Dormant-Season Seeding of Alfalfa
- 118 Forage Yield and Soilborne Mosaic Virus Resistance of Several Varieties of Rye, Triticale, and Wheat
- 119 Growth and Survival of Wheat Seedlings after Dehydration and Rehydration
- 120 Hard White Winter Wheat for Kansas

■ **SPECIAL PUBLICATIONS**

Agricultural Research in Kansas: Thirty-Eighth Biennial Report of the Agricultural Experiment Station, 1994-1996

SUFFIX LETTERS FOR CONTRIBUTION NUMBERS (pages 28–72)

- A** Proceedings of Meeting or Symposium
- B** Bulletin published by KAES; Book or Chapter for Book
- C** Computer Program
- D** Department Report
- E** Extension Publication (co-authored by a KAES researcher but published by Cooperative Extension or externally as educational material) or research by an Extension person to be published in a refereed journal.
- J** Journal
- S** Station Publication: Report of Progress, Keeping Up With Research, Special Publication
- T** Trade Publication

Categories are based on information received before manuscripts are published. Place of publication sometimes changes later. Numbers are deleted if authors cannot supply publication data.

Station publications including Bulletins are available from KAES Editorial Office. Department Reports are available only from the appropriate department office. Copies of journal articles or other outside publications must be obtained from the authors.

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- 97-290-J Fed Cattle Spatial Transaction Price Relationships
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| Albrecht, M.L. (20) | 96-549-T, 97-81-D | Chambers, E. IV (18) | 96-29-J, 96-141-J, 96-201-J, 96-449-J, 97-31-J, 98-68-J, 98-75-A, 98-76-A | Dover, B. (15) | 96-189-J, 96-559-J, 97-208-J, 97-362-J, 97-438-J |
| Al-Khatib, K. (2) | 98-211-J | Chapes, S.K. (7) | 95-21-J, 96-123-J, 97-11-J, 97-118-J | Dritz, S. (17) | 96-115-J, 97-142-S, 97-213-A, 97-214-A, 97-279-J, 97-285-J, 97-377-J, 97-404-J, 97-413-J, 98-142-S |
| Armbrust, D.V. (2) | 95-206-J, 97-21-B | Charlton, R.E. (15) | 96-451-J | Drouillard, J. (4) | 97-309-S, 98-91-J |
| Arns, M. (4) | 97-84-J, 98-21-J | Chengappa, M.M. (13) | 95-629-J, 96-185-J, 96-454-J, 96-504-J, 97-91-J, 97-155-J, 97-166-J, 97-211-J, 97-395-J, 97-396-J, 97-413-J, 97-429-J, 98-305-S | Dryden, M. (13) | 97-302-J |
| Banks, M.K. (9) | 94-496-J, 97-88-B, 97-94-J, 97-229-J | Chitnis, P. R. (7) | 96-458-J | Dunn, J.D. (3) | 98-49-J |
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| Barkley, T.M. (7) | 97-384-J, 98-525-B, 98-526 -J | Choi, H.M. (11) | 97-29-J | Erickson, H.H. (3) | 95-87-J, 97-132-J, 97-254-J |
| Barnes, P.L. (6) | 97-157-S, 97-227-S, 97-372-S, 97-374-A, 98-45-A, 98-153-S, 98-227-S, 98-365-S, 98-470-S | Chowdhury, S. (13) | 96-82-J, 97-277-J, 97-366-J | Eustace, D. (19) | 97-388-J, 98-10-J |
| Basaraba, R. (13) | 97-180-J, 97-268-B, 97-414-J | Chung, D.S. (6) | 95-348-J, 96-355-A, 98-89-J, 98-240-J | Evans, P.M. (26) | 97-28-S, 97-157-S, 97-250-A, 97-251-A, 98-22-S, 98-153-S, 98-221-S, 98-230-S, 98-243-S, 98-326-S |
| Behnke, K.C. (19) | 97-142-S, 97-309-S, 98-142-S | Chung, O.K. (19) | 96-253-J, 96-340-J, 96-341-J, 96-342-J, 96-343-J, 96-542-J, 96-543-J, 97-103-J, 97-344-J, 98-81-J | Eversmeyer, M.G. (22) | 96-32-J |
| Benson, J.E. (23) | 97-456-A | Claassen, M. (2) | 94-520-J, 96-248-A, 97-28-S, 97-216-S, 97-226-S, 97-227-S, 97-231-A, 97-333-J, 97-372-S, 98-22-S, 98-216-A, 98-221-S, 98-227-S, 98-230-S, 98-326-S, 98-365-S, 98-513-S | Fairchild, F. (19) | 97-269-S |
| Blair, J.M. (7) | 94-545-J, 95-602-J, 97-187-B, 97-193-B, 97-202-B, 97-406-J, 97-407-J, 98-380-J | Clafflin, L. (22) | 95-572-J, 97-367-S | Fan, L.T. (8) | 96-264-A, 96-300-J, 96-318-J, 96-335-J, 96-484-J |
| Blecha, F. (3) | 95-511-J, 96-132-J, 96-147-J, 96-251-J, 96-474-B, 97-179-J, 97-309-S, 97-377-J, 98-60-B | Clark, G. (6) | 97-374-A, 98-4-A, 98-43-A, 98-44-A, 98-45-A, 98-46-A, 98-125-A | Featherstone, A.M. (1) | 96-377-J, 96-513-J, 97-142-S, 97-162-J, 97-343-J, 97-375-J, 97-465-J, 97-484-J, 98-100-S, 98-117-J |
| Bloomquist, L. (23) | 96-149-J, 96-217-B, 97-14-J, 97-36-E | Cochran, R.C. (4) | 95-596-J, 96-218-J, 96-219-J, 96-278-J, 96-350-J, 96-459-J, 97-309-S, 98-305-S | Fedde, M.R. (3) | 97-132-J, 97-254-J |
| Bockus, W.W. (22) | 97-93-B, 97-220-A, 97-221-A, 97-222-A, 97-223-A, 97-224-A, 97-333-J, 97-352-J, 98-22-S, 98-193-A, 98-194-A, 98-195-A, 98-199-B, 98-207-A, 98-208-A | Consigni, R.A. (7) | 95-516-J, 97-38-J, 97-73-J | Fenwick, B.W. (13) | 97-166-J |
| Bolsen, K.K. (4) | 94-267-J, 94-274-J, 95-596-J, 96-350-J, 96-530-J, 97-115-S, 97-154-S, 97-309-S, 97-460-J, 97-490-A, 98-132-S, 98-262-A, 98-305-S | Corah, L.R. (4) | 96-132-J, 96-147-J, 97-218-J, 97-309-S, 97-335-S, 98-305-S | Fick, W.H. (2) | 96-289-J, 97-217-S, 97-273-J |
| Boone, K. (12) | 96-281-J | Cox, T.S. (2) | 96-270-J, 96-271-J, 96-315-J, 96-340-J, 96-341-J, 96-342-J, 96-343-J, 96-468-J, 97-55-J, 97-124-J, 97-153-J, 97-353-J, 97-466-J | Flores, R. (19) | 97-498-T, 98-342-B |
| Bowden, R.L. (22) | 96-315-J, 97-55-J, 97-124-J, 97-242-A, 97-265-A, 97-333-J, 97-466-J, 97-28-S, 97-372-S, 98-22-S, 98-101-S, 98-215-A, 98-326-S, 98-365-S | Currie, R.S. (28) | 95-431-J, 96-368-J, 96-379-J, 96-380-J, 97-351-J, 97-458-S, 98-211-J, 98-494-S | Fox, J.A. (1) | 95-470-J, 96-158-J |
| Bowers, J.A. (18) | 93-283-J, 97-161-J | Davis, D.L. (4) | 97-20-J, 98-78-J, 98-142-S | Frey, R.S. (23) | 96-240-J |
| Boyer, J.E., Jr. (24) | 96-195-J, 96-427-J, 97-37-J, 97-337-J | Davis, L.C. (5) | 97-32-A, 97-33-A, 97-34-A, 97-35-A | Friebe, B. (22) | 93-447-B, 93-525-B, 96-55-J, 96-69-J, 96-271-J, 96-393-B, 97-42-J, 97-350-A, 97-353-J, 97-355-A, 97-401-J, 97-409-J, 98-98-J, 98-139-J, 98-258-J, 98-390-A, 98-407-A |
| Bramel-Cox, P. (2) | 94-520-J, 97-372-S | Deyoe, C.W. (19) | 97-344-J, 97-388-J, 98-10-J | Fritz, J. (2) | 95-493-J, 95-595-J, 95-596-J, 96-116-J, 96-350-J, 97-227-S, 97-273-J, 97-460-J |
| Brent, B.E. (4) | 97-309-S | Dikeman, M.E. (4) | 95-427-J, 95-437-J, 96-52-J, 96-358-J, 96-453-J, 96-519-A, 96-527-B, 97-309-S | Fry, J.D. (20) | 96-25-J, 96-109-J, 96-352-J, 96-452-T, 97-75-J, 97-170-J, 97-316-J, 97-400-S, 97-461-J, 97-474-J, 97-479-J, 97-501-J, 98-127-T, 98-202-J, 98-220-A, 98-274-T |
| Brester, G.W. (1) | 93-543-J, 97-291-J, 97-506-J, 98-51-J | Dodds, W.K. (7) | 93-357-J, 94-496-J, 94-545-J, 95-318-J, 96-223-J, 96-385-J, 96-439-J, 96-457-J, 97-7-J, 97-183-B, 97-184-B, 97-257-J | Fung, D.Y.C. (4) | 96-105-J, 96-121-J, 96-225-J, 96-238-J, 96-419-A, 96-533-A, 96-548-A, 96-552-B, 96-553-J, 97-259-J, 97-336-J, 97-365-B, 97-473-J, 98-79-J, 98-83-J, 98-156-J, 98-229-J |
| Brethour, J.R. (25) | 97-335-S, 98-340-S | | | Galland, J. (17) | 97-142-S, 98-142-S, 98-305-S |
| Broce, A.B. (15) | 96-537-J, 97-437-J | | | Gast, K. (20) | 97-81-D, 98-13-S, 98-310-S |
| Burchett, L. (2) | 97-141-S, 97-176-S | | | Gatewood, B.M. (11) | 96-29-J, 97-29-J, 97-40-J, 97-81-D, 97-287-J, 97-483-A, 97-485-J, 98-501-A, 98-518-A, 98-519-A |
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| Buschman, L.L. (15, 28) | 97-108-J, 97-240-A, 97-241-A, 97-458-S, 98-47-A, 98-470-S, 98-494-S | | | | |
| Cable, T.T. (20) | 95-246-J, 97-138-J, 98-64-J | | | | |

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| Gill, B.S. (22) | 93-447-B, 95-575-J, 95-609-J, 96-55-J, 96-69-J, 96-136-J, 96-161-J, 96-270-J, 96-271-J, 96-339-J, 96-393-B, 96-468-J, 97-42-J, 97-52-J, 97-55-J, 97-124-J, 97-153-J, 97-350-A, 97-353-J, 97-355-A, 97-401-J, 97-409-J, 97-466-J, 98-93-J, 98-98-J, 98-139-J, 98-258-J, 98-368-A, 98-381-A, 98-390-A, 98-393-A, 98-407-A, 98-408-A, 98-412-A | Herrman, T.J. (19) | 97-116-J, 97-164-J, 97-269-S, 97-352-J, 97-386-J | Kastner, C.L. (4) | 94-516-J, 95-448-J, 96-67-J, 96-121-J, 96-201-J, 96-238-J, 96-265-J, 96-372-J, 96-427-J, 96-466-J, 96-553-J, 97-31-J, 97-37-J, 97-41-J, 97-72-J, 97-309-S, 98-305-S |
| Goe, W.R. (23) | 97-507-J | Higgins, J.J. (24) | 96-538-J, 97-256-A | Kaufman, D.W. (7) | 96-186-J, 96-390-B, 97-129-J, 97-182-B, 97-186-B |
| Goodband, R.D. (4) | 93-469-J, 93-470-J, 94-440-J, 95-384-J, 96-99-J, 96-115-J, 96-142-J, 96-150-J, 96-151-J, 96-437-J, 96-517-J, 97-154-S, 97-214-A, 97-285-J, 97-286-J, 97-348-J, 97-349-J, 97-403-J, 97-404-J, 98-142-S | Higgins, R.A. (15) | 96-451-J, 97-108-J, 97-458-S, 98-494-S | Kelley, K. (27) | 95-155-J, 97-216-S, 97-227-S, 97-367-S, 98-227-S, 98-284-A, 98-377-S |
| Goodwin, B.K. (1) | 96-149-J, 97-102-J | Hines, R.H. (4) | 97-142-S | Kemp, K.E. (24) | 94-159-J, 95-279-J, 95-333-J, 95-335-J, 95-483-J, 95-612-J, 95-620-J, 96-28-J, 96-52-J, 96-454-J, 96-477-J, 97-104-J, 98-68-J, 98-305-S |
| Gordon, W.B. (2) | 96-133-J, 96-493-J, 97-28-S, 97-157-S, 97-216-S, 97-226-S, 97-227-S, 97-253-S, 97-267-S, 97-294-S, 97-333-J, 97-372-S, 98-22-S, 98-153-S, 98-221-S, 98-227-S, 98-230-S, 98-243-S, 98-269-S, 98-365-S | Hopkins, T.L. (15) | 95-533-J, 96-127-J, 96-444-J, 97-57-J, 97-201-J, 97-357-J, 98-29-J | Kenney, P.B. (4) | 96-121-J |
| Gould, R. (21) | 97-270-J, 97-271-J, 97-278-J, 97-509-J, 98-16-J | Horak, M. (2) | 96-529-J, 97-26-J, 97-416-J, 97-517-J, 98-494-S | Khatamian, H. (20) | 97-53-S |
| Greene, G.L. (28) | 96-159-J, 96-227-J, 97-154-S, 97-288-J, 97-373-J, 98-132-S | Hosenev, R.C. (19) | 94-32-J, 95-512-J, 95-600-J, 96-214-J, 96-494-J, 97-140-J, 97-185-J, 97-342-J, 97-457-J, 98-6-J | Kirkham, M.B. (2) | 96-89-J, 96-261-J, 96-420-A, 97-308-J, 97-367-S, 97-378-J, 98-34-J, 98-227-S |
| Guikema, J.A. (7) | 96-458-J, 96-556-J, 97-245-J | Huang, B. (20) | 97-400-S, 97-461-J, 97-501-J, 98-202-J | Klopfenstein, C.F. (19) | 95-373-J, 95-619-J, 97-61-J, 97-62-J |
| Gwitz, J. (19) | 97-388-J, 98-10-J, 98-92-J | Hulbert, S.H. (22) | 96-339-J, 96-405-J, 97-86-J, 97-225-J, 98-138-J | Kluitenberg, G. (2) | 95-270-J, 96-234-J, 98-34-J |
| Ham, J.M. (2) | 96-470-J, 96-495-J, 97-334-J, 98-34-J | Hunt, M.C. (4) | 93-74-J, 94-516-J, 95-448-J, 96-67-J, 96-71-J, 96-201-J, 96-265-J, 97-31-J, 97-37-J, 97-41-J, 97-71-A, 97-72-J, 97-309-S, 98-305-S | Knapp, A.K. (7) | 97-184-B, 97-186-B, 97-187-B, 97-187-B, 97-187-B, 97-191-B, 97-193-B, 97-202-B, 97-203-B, 97-204-B, 97-334-J, 98-380-J |
| Hancock, J.D. (4) | 97-142-S, 97-260-A, 98-142-S | Janke, R. (2) | 97-408-D, 97-482-D, 98-124-D | Knapp, M. (12) | 97-28-S, 97-53-S, 97-367-S, 98-22-S, 98-377-S |
| Haque, E. (19) | 96-528-J, 97-327-J | Janssen, K.A. (2) | 96-249-A, 97-28-S, 97-96-J, 97-157-S, 97-216-S, 97-226-S, 97-227-S, 97-233-A, 98-217-A, 97-372-S, 98-22-S, 98-153-S, 98-221-S, 98-227-S, 98-230-S, 98-326-S, 98-365-S, 98-513-S | Koelliker, J.K. (6) | 97-491-A |
| Harbers, L.H. (4) | 94-274-J, 96-431-J, 97-16-J, 97-17-J, 97-309-S, 98-116-B | Jardine, D.J. (22) | 96-248-A, 96-249-A, 97-157-S, 97-216-S, 97-231-A, 97-233-A, 97-234-A, 97-250-A, 97-251-A, 97-367-S, 98-153-S, 98-216-A, 98-217-A, 98-218-A, 98-230-S, 98-377-S | Kofoed, K.D. (25) | 95-376-J, 96-391-J, 97-216-S, 98-230-S, 98-513-S |
| Hartnett, D.C. (7) | 96-370-J, 96-557-J, 97-181-B, 97-182-B, 97-183-B, 97-184-B, 97-186-B, 97-187-B, 97-191-B, 97-193-B, 97-202-B, 97-203-B, 97-204-B | Jennings, P. (20) | 94-400-J | Koo, S. (18) | 97-122-J, 97-475-J, 98-32-J, 98-33-J |
| Harvey, T.L. (15, 25) | 96-333-J, 96-346-J, 96-391-J, 97-306-J, 98-48-J, 98-133-J, 98-513-S | Jeon, I.J. (4) | 96-105-J, 96-146-J, 96-225-J, 96-431-J, 97-115-S, 97-238-J | Kramer, C.L. (7,22) | 96-32-J |
| Hatchett, J.H. (15) | 96-271-J, 96-343-J, 98-22-S, 98-307-J | Johnson, D.E. (24) | 96-121-J, 96-179-J, 96-180-J, 96-278-J | Kramer, K.J. (5) | 96-54-J, 96-54-J, 96-127-J, 96-128-J, 96-212-B, 96-306-B, 96-403-J, 96-444-J, 96-531-J, 97-45-J, 97-57-J, 98-5-J, 98-29-J, 98-149-J |
| Havlin, J.L. (2) | 96-95-J, 96-234-J, 96-375-J, 96-406-A, 97-25-J, 97-96-J, 97-227-S, 97-267-S, 98-494-S | Johnson, L.B. (22) | 96-212-B, 96-403-J, 96-531-J, 98-314-J | Kreikemeier, K. (28) | 96-219-J, 97-188-J, 97-458-S, 97-488-J, 98-132-S |
| | | Jones, R. (1) | 97-381-D | Krishnamoorthi, R. (5) | 97-19-J, 97-518-J |
| | | Kambhampati, S. (15) | 96-73-J, 96-167-J, 96-189-J, 96-559-J, 97-22-J, 97-208-J, 97-362-J, 97-399-J, 97-438-J | Kropf, D.H. (4) | 92-405-J, 93-74-J, 94-516-J, 95-437-J, 95-448-J, 96-67-J, 96-71-J, 96-121-J, 96-201-J, 96-265-J, 97-31-J, 97-37-J, 97-41-J, 97-71-A, 97-72-J, 97-142-S, 97-309-S, 98-305-S |
| | | Kanost, M. (5) | 95-547-B, 96-306-B, 96-415-J, 96-416-J, 97-6-J, 97-447-J, 97-448-J | Kuhl, G.L. (4) | 97-66-J, 97-154-S, 97-309-S, 98-132-S, 98-305-S |
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| Lamond, R.E. (2) | 95-367-J, 97-227-S, 98-141-J, 98-227-S, 98-470-S | Martin, T.J. (25) | 96-333-J, 96-340-J, 96-341-J, 96-342-J, 96-343-J, 96-346-J, 97- 28-S, 97-306-J, 98-22-S, 98-48-J, 98-133-J | Owensby, C.E. (2) | 96-495-J, 97-203-B |
| Lamont, W.J., Jr. (20) | 98-24-A | | | Pair, J.C. (20) | 97-53-S, 97-237-A, 97-400-S, 97-494-J |
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| Langemeier, M.R. (1) | 96-513-J, 97-116-J, 97-162-J, 97-422-J, 97-484-J, 97-142-S, 97-309- S, 98-100-S, 98-142-S, 98-305-S | | | Paulsen, G.M. (2) | 96-261-J, 96-434-J, 97-143-E, 97-141-S, 97-176-S, 97-209-J, 97-210-J, 97-454-J, 98-286-S, 98-298-S, 98-333-A |
| Leach, J.E. (22) | 95-411-B, 96-156-A, 96-430-J, 96-500-J, 97-12-A, 97-369-J, 97-439-J | Meyers, R.G. (2) | 96-198-J | Pfender, W.F. (22) | 97-119-J |
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- 520492 Analysis of Farm-Level Risk Management
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- 520502 Fecal Coliform Contamination in Kansas River Basins: Source, Monitoring, Development of BMP's
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- 520854 Fecal Coliform Contamination in Kansas River Basins: Source, Monitoring, Development, Demonstration of BMP's
- 520870 Integrated Ag Management Systems (IAMS) Using BMP's to Improve the Quality of Kansas Surface Waters
- 522955 Value-Added Wheat Products
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- 523013 Quality-Based Marketing of Wheat: Pilot-Scale Evaluation
- 525075 The Effect of Variable Rate-Precision Planting on Corn Yields
- 526192 Integrated Ag Management Systems (IAMS) Using BMP's to Improve the Quality of Kansas Surface Waters
- 526713 Fecal Coliform Contamination in Kansas River Basins: Source, Monitoring, Development, Demonstration of BMP's
- 526714 *(number applies to title above)*
- 527580 Effects of Hybrid Maturity and Plant Population on Yields in Wheat-Corn Fallow Rotation
- 527741 Fecal Coliform Contamination in Kansas River Basins: Source, Monitoring, Development, Demonstration of BMP's
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- H073 An Economic Analysis of Farm Management Issues and Resource Use of Kansas Farms
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- H317 Economic Evaluation of Post-CRP Land Use Options
- H340 Livestock and Meat Prices under Structural Change
- H358 A Cost/Benefit/Risk Analysis of Various Soil-Improving Practices
- H427 Economic Impact of Crop Share and Cash Lease Arrangements on Kansas Farms
- H472 Whole-Farm Economic Analysis of Crop Rotations and Short-Season Crop Varieties
- H474 Consumer Risk Perceptions and Demand for Food Safety
- H502 Agricultural International Trade and Natural Resource Policy Impacts on Kansas
- R702 Deriving Farmer-Friendly Sustainability Indicators for the Kansas Farmer
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- 520796 Improvement of Yield and Quality of Hybrid Wheat

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- 520838 Improving Soybean Profitability through Breeding
- 520839 Integrated Weed Management
- 520841 Weed Control in Solid-Seeded versus Row-Planted Glyphosate-Resistant Soybean
- 520842 Reducing Herbicide Rates, Costs, and Carrier Volumes Using Methylated Seed
- 520843 Soybean Response to Simulated Herbicide Drift
- 520844 Development of Improved Soybean Varieties for Kansas
- 520845 Control of Residue-Borne Winter Wheat Diseases
- 520846 Phosphorus in Surface Runoff—Best Management Practices and Soil Dynamics
- 520847 Carbon, Water, and Energy Fluxes from a Tallgrass Prairie: Effect of Land
- 520848 Transferring Soybean Production Technology to Specific Sites
- 520851 Novel Approach Identifying Durable Genetic Resistance to Greenbug in Sorghum
- 520852 Cluster Use of Whole-Farm Planning with Decision Cases and Evaluation
- 520853 Addition of Pest-Resistance and Drought-Tolerant Genes to Wheat Cultivars
- 520854 Fecal Coliform Contamination in Kansas River Basins: Source, Monitoring, Development, Demonstration of BMP's
- 520855 Influence of Row Spacing and Plant Population on Corn Production
- 520856 Effect of Irrigation Rate, Planting Date, and Tillage on Varied-Maturity Corn Production
- 520857 Implementation of Best Management Practices in the Blue River Basin of Kansas and Nebraska
- 520859 Income for Cluster Use of Whole-Farm Planning with Decision Cases and Evaluation
- 520860 Integrated Ag Management Systems (IAMS): Using BMP's
- 520861 *(number applies to title above)*
- 520862 Cluster Use of Whole Farm Planning with Decision Cases and Evaluation

Research Projects Active June 30, 1998 (Continued)

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| 520863 | Animal Waste Lagoon Water Quality Study | H056 | Use of Crop Models in Sorghum and Corn Management | H681 | Genesis, Classification, and Mineralogy of Kansas Soils |
| 520864 | The Impact of Golf Courses on Soil Quality | H064 | Effect of Previous Crop on Ammonium Nutrition of Corn | H682 | Wheat Transformation for Enhanced Resistance to Biotic Stress |
| 520865 | Fecal Coliform Contamination in Kansas River Basins: Source, Monitoring, Development, Demonstration of BMP's | R086 | Tillage and Phosphorus Fertilizer Management Effects on Surface Phosphorus Runoff and Crop Yield | R702 | Deriving Farmer-Friendly Sustainability Indicators for the Kansas Farmer |
| 520866 | Gene Flow, Distribution, Growth, and Competitiveness of Pursuit-Resistant Common Sunflower | H092 | Physiological Control of Crop Productivity | R713 | BMP's for Available Phosphorus-Stratified Surface Soils |
| 520867 | Kansas EPA EPSCOR: Enhancement of Environmental Remediation Research | H096 | The Biology and Ecology of Weeds in Crop Ecosystems | R714 | Phosphorus in Surface Runoff: Best Management Practices |
| 520868 | (number applies to title above) | H103 | Crop Sequence and Tillage Interaction Effects on Crop Yield and Soil Environment | R722 | Starter Fertilizer Interactions with Corn Hybrids |
| 520869 | (number applies to title above) | H106 | The Impact of Fertilizers and Herbicides on Water Quality | R723 | Evaluation of Time of Nitrogen Application in No-Till Production Systems |
| 520871 | Educational Tools for Wind Erosion Control | F143 | Forage Crop Genetics and Breeding to Improve Yield and Quality | H724 | Range Improvement Investigations |
| 520893 | Addition of Pest-Resistance and Drought-Tolerant Genes to Wheat Cultivars | F188 | Improved Characterization and Quantification of Flow and Transport Processes in Soils | R725 | Incorporating Nitrogen Response into SORKAM |
| 521812 | Effects of Endosperm Waxiness and Processing on the Nutritional Value of Sorghum in Swine and Poultry | F193 | Spatial Dynamics of Leafhopper Pests and Their Management on Alfalfa | R727 | Use of Nitrogen Mineralization in Spatially Variable Nitrogen Recommendations |
| 522347 | Bacterial Volatiles Attractive to Stable Flies | F218 | Characterizing Nitrogen Mineralization and Availability in Crop Systems to Protect Water Resources | F779 | Variables in Agriculture-Weather Information Systems |
| 522359 | Breeding for Greenbug and Virus Resistance and Drought Tolerance and Development of Transgenic Plants in Sorghum | H271 | Improvement of Hard Winter Wheats and Other Small Cereal Grains for Kansas | F838 | Chemistry and Bioavailability of Waste Constituents in Soils |
| 522376 | Evaluating Corn Borer Resistance and Resistance Management Strategies for BT-Corn | H302 | Improving Forage Quality and Production in the Central Great Plains | F932 | Pesticides and Other Toxic Organics in Soil and Their Potential for Groundwater Contamination |
| 522991 | Improving the Feeding Value of Grain Sorghum for Livestock and Poultry | H305 | Legumes as a Nitrogen Source in No-Till Rotations for the Eastern Great Plains | H976 | Crop Responses in Stressful Environments |
| 524470 | Breeding Soybeans for Increased Productivity Using Cultural Practices to Reduce Soybean Cyst Nematode and Charcoal Rot Damage in Soybeans | H306 | Effects of Long-Term Crop Residue Removal and Fertilizer Application on Soil and Crop Yield Development and Evaluation of Commercial Soybean Cultivars for Kansas | R993 | Agronomy/Agricultural Engineering Experiment Fields Research |
| 524550 | Characterization Mapping of Five New Leaf Rust-Resistant Genes | H307 | Plant Nutrient Cycling in Soil | | |
| 524606 | Improving Soybean Profitability through Breeding | H308 | Plant Tissue Culture, Stability of Organellar Genomes, Chromosome Mapping, and Plant Transformation | | |
| 524611 | Evaluation of Scab Tolerance in Wheat | H309 | Production, Quality, and Physiology of Eastern Gamagrass | | |
| 525754 | Canola Research | H320 | Development of Hard White Winter Wheat Varieties for Kansas | | |
| 525757 | Tillage, Irrigation, and Hybrid Maturity Class Effects on Corn Production | H322 | Sorghum Breeding and Genetics | | |
| 525765 | Water-Efficient Practices for Corn Production | H328 | Enhancing Nutrient Efficiency for Western Kansas | | |
| 525767 | (number applies to title above) | H358 | A Cost, Benefit, and Risk Analysis of Various Soil-Improving Practices | | |
| 525958 | Canola Research | H374 | The Impact of Fertilizers and Herbicides on Water Quality | | |
| 525982 | Development of Sorghum Germplasm Tolerant to Greenbug-, Aphid-, and Mite-Transmitted Potyviruses and Drought | H375 | Genesis, Classification, and Mineralogy of Kansas Soils | | |
| 525987 | Breeding for Greenbug and Virus Resistance and Drought Tolerance and Development of Transgenic Plants in Sorghum | H377 | Soil Acidification and Amelioration in Controlled-Traffic Fertilizer Bands | | |
| 526167 | Tillage, Irrigation, and Hybrid Maturity Class Effects on Corn Production | R378 | Coordination of Crop Variety Testing | | |
| 526183 | Water-Efficient Practices for Corn Production | H380 | Effect of Application Method, Time, and Rate of Supplemental Nitrogen on Irrigated Soybeans | | |
| 526192 | Integrated Ag Management Systems (IAMS) Using BMP's to Improve the Quality of Kansas Surface Waters | H387 | Weed Ecology and Management in Crop Ecosystems | | |
| 526396 | Using Cultural Practices to Reduce Soybean Cyst Nematode and Charcoal Rot Damage in Soybeans | H411 | Field-Scale Fluxes of Carbon, Water, and Energy from Irrigated Corn (<i>Zea mays</i>) | | |
| 526707 | Improvement of Soybean via Biotechnological Approaches | H431 | Measuring and Modeling Three-Dimensional Canopy Structure in Soybeans | | |
| 526713 | Fecal Coliform Contamination in Kansas River Basins: Source, Monitoring, Development, Demonstration of BMP's | H442 | Reduced Tillage and Crop Rotation Systems with Winter Wheat, Grain Sorghum, Corn, and Soybeans | | |
| 526714 | (number applies to title above) | H449 | Improvement of Crop Models for Sorghum and Corn Management | | |
| 527608 | Assessing the Potential for Biological Control of Field Bindweed with the Gall Mite and a Moth | H456 | Physiological Limitations of Wheat Yield and Quality | | |
| 527740 | Fecal Coliform Contamination in Kansas River Basins: Source, Monitoring, Development, Demonstration of BMP's | H475 | Soil Moisture Monitoring in the Black Vermillion Watershed | | |
| 527741 | (number applies to title above) | H482 | Resistance to Acetolactate Synthase Inhibitor Herbicides in Common Sunflower | | |
| 527954 | Bioremediation of Hydrocarbon-Contaminated Soils Using Vegetation: A Field and Greenhouse Study | H483 | Rotation/Tillage Alternatives to Continuous Dryland Wheat on Sandy Soil | | |
| 528159 | Characterizing Flavors of Sorghum Cultivars Potentially Useful for Foods | R550 | Field Crop Variety Identification and Pure Seed Maintenance | | |
| 529354 | Processes Affecting Carbon Fluxes of Grassland Ecosystems under Elevated Atmospheric CO ₂ | | | | |
| H040 | Prediction and Correction of Zinc Deficiency in Sorghum in Kansas | | | | |

■ Anatomy and Physiology

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| 481889 | Distribution of Blood Flow during Rest and Exercise in the Equine Lung |
| 528257 | Anti-Idiotypic Immunity and Receptor Interactions in Bovine Respiratory Disease |
| 528575 | Neurons and Neuropeptides in Sea Anemones |
| 528581 | REU Supplement to: Neurons and Neuropeptides in Sea Anemones |
| 528589 | Mechanisms of Prolonged Sympathetic Nerve Inhibition |
| 528598 | Porcine Antibacterial Peptides |
| 528602 | Neurons and Neuropeptides in Sea Anemones |
| 528606 | Involvement of KC, PR-39, and Syndecan in Coronary Angiogenesis |
| 528607 | High Resolution Regional Maps of Swine Chromosomal Segments Containing QTL |
| 528608 | (number applies to title above) |
| 528610 | Modulation of Reperfusion Injury by a Neutrophil Peptide |
| 528611 | Involvement of KC, PR-39, and Syndecan in Coronary Angiogenesis |
| 529292 | Mechanism of Exercise Inhibition during Lung Congestion |
| 529293 | (number applies to title above) |
| 529302 | Coronary Collateral Function in the Conscious Pony |
| 529303 | (number applies to title above) |
| 529313 | Control of Rhythmic Sympathetic Activity Acute Stress |
| 529381 | The Pig Granulosa Cell Slow K ⁺ Channel: A Mink Protein |
| H075 | Mechanisms of Capillary Stress Failure in Exercise-Induced Pulmonary Hemorrhage |
| H077 | Intestinal Cellular Immunity: Cytokine Interactions |
| F210 | Positional and Functional Identification of Economically Important Genes in the Pig |
| F299 | National Animal Genome Research Program |
| H356 | Morphometry of the Blood-Gas Barrier in Exercise-Stressed and Pneumonic Calves |
| H392 | Development, Regulation, and Efficacy of the Antibacterial Peptide, PR-39 |
| H499 | Uterine K ⁺ Channels as Therapeutic Targets for Parturition Induction |
| H503 | Modulation of Reperfusion Injury by a Pig Neutrophil Peptide |
| F579 | Stress Factors of Farm Animals and Their Effects on Performance |

F704 Metabolic Relationships in Supply of Nutrients for Lactating Cows

■ **Animal Sciences and Industry**

481821 Cloning and Expression of Leukotoxin Gene of *Fusobacterium*
 481878 Regulation of Porcine Mucosal Immunity
 481893 Function of Ovine Pituitary Stellate Cells in Endotoxemia
 520491 Alternative Marketing Organizations: Transaction Costs and Consumer Demand
 520494 Market Niche Identification and Education for Small- Producer Marketing Cooperatives
 520773 Digestibility and Feeding Value of Grain Sorghum: Manipulating Genotype to Improve Value
 520814 Alfalfa Research
 521747 International Livestock Program-International Trade Development
 521752 The Effect of Biological Inoculants and Enzymes on the Preservation and Nutritive Value of Corn Silage
 521766 Animal Science Food Safety Consortium-Kansas State University
 521776 Kansas Horse Industry Economic Impact Survey
 521779 Palatability, Color, and Shelf Life of Beef Subjected to Low-Dose Irradiation
 521780 Biological Detoxification of Aflatoxin and Fumonisin in Corn Products and Metabolites
 521781 Effects of Wheat Gluten and Spray-Dried Protein on Growth Performance
 521782 Soy Concentrates for Baby Pigs
 521783 Evaluation of Heated Soybean Meal Products Containing Levels of Lipid in Lactating Dairy Cows
 521784 Roasting Grain Sorghum to Improve Digestibility and Nutritional Value in Dairy Cattle Diets
 521785 Digestibility and Feeding Value of Grain Sorghum and Techniques to Improve Nutritive Value
 521786 Microbiological Baseline Tracking for Beef
 521787 Support of Value-Added Workshop for Food Processors
 521789 Evaluation of the Effectiveness of Monensin in Controlling Bloat in Cattle
 521790 Novel Milk Products Produced through High Hydrostatic Pressure Processing
 521792 Quality Study of Whole Muscle Pork Subjected to Two Types of Low-Dose Irradiation
 521793 Effects of Potato Protein on Starter Pig Growth Performance
 521799 Modification of the Flavor and Color of Extruded Mozzarella Soy Cheese Analogs
 521801 Effect of Ground Mustard on Microorganisms in Laboratory Medium
 521808 Evolutionary Conservation of the Molecular Mechanisms of Development
 521810 Quantification and Factors Affecting *Fusobacterium necrophorum* on Ruminant Wall
 521812 Effects of Endosperm Waxiness and Processing on the Nutritional Value of Sorghum in Swine and Poultry
 521813 Extrusion Conditions to Optimize Utilization of Full- Fat Soybeans by Finishing Pigs
 521819 Expeller Soybean Meal as a Source of Undergradable Intake Protein during Early Lactation in Dairy Cows
 521824 Regulation and Function of Interleukin 6 in the Porcine Anterior Pituitary
 521825 Utilization of Soapstock and Soybean Meal in Manufacturing a Novel, Value-Added Protein Source for Cattle
 521826 Effect of L-Carnitine and Chromium Nicotinate on Ovulation and Fertilization Rate of Gilts
 521827 Effects of Endpoint Temperature on Internal Cooked Color Development in Ground Pork and Loins

521828 Wheat Middling Evaluation
 521829 Processed Grain Sorghum and Grain Sorghum Combinations for Dairy
 521830 Broiler and Turkey Sorghum Digestibility Comparing Four Processes
 521831 Increasing Sorghum Utilization in Kansas Feedlots
 521832 Use of Grain Sorghum in Diets for Limit-Fed Growing Steers
 521833 Soyhulls as an Energy Source in Roughage-Free Diets
 521834 Effects of Increasing Pantothenic Acid on Growth Performance of High Health, Segregated Early-Weaned Pigs
 521835 HACCP Implementation and Evaluation in Small and Very Small Meat/Poultry Plants
 521836 Effect on Monensin on Frothy Bloat in Cattle Fed Bloat- Provocative Diets
 521837 Effect of Plants on Bioavailability and Toxicity of Contaminants in Soil
 528138 Influence of Conjugated Linoleic Acid (CLA) Source on Carcass Quality of Finishing Swine
 521839 Effect of Ground Mustard on Microorganisms in Laboratory Medium
 522991 Improving the Feeding Value of Grain Sorghum for Livestock and Poultry
 522992 Scale-Up Process Optimization for New Method of Manufacturing Imitation Mozzarella
 526179 Increasing the Use of Grain Sorghum in Kansas Feedlot Cattle Rations
 526180 Influence of Various Ratios of Steam-Flaked Rations on Steer Finishing
 526182 Influence of Feeding Combinations of Steam-Flaked Sorghum with High-Moisture Corn or Dry-Rolled Corn on Finishing Steer Performance
 528780 Biological Detoxification of Aflatoxin and Fumonisin in Corn
 H016 Nutrition of Developing, Gestating, and Lactating Swine
 H018 Optimum Processing to Maximize Utilization of Cereal Grains in Swine Feeding
 F026 Reproductive Performance in Domestic Ruminants
 F027 Methods to Increase Reproductive Efficiency in Cattle
 H043 Ruminant Microflora in Relation to Function and Dysfunction of the Rumen
 H084 Management of Beef Cattle Grazing Tallgrass Prairie
 H090 Process Optimization for Value-Added Dairy Products
 H111 Sterilization of Beef Cattle Using Recombinant Peptide Vaccines
 H112 Sulfur Amino Acid Utilization by Cattle
 F186 Metabolic Relationships in Supply of Nutrients for Lactating Cows
 H300 Improving Poultry Nutrition and By-Product Utilization
 H301 Processing of Novel Dairy-Based Products
 H323 Assisted Reproductive Technologies in Horses
 H325 Studies of Pituitary Folliculostellate Cell Function
 H337 The Prepubertal Pig Uterus: Responses to Progesterone
 H348 Beef Cow/Calf Nutrition and Management in Kansas
 H354 Osteochondrosis and Local Growth Factor Concentration in the Horse
 H371 Nutritional Management of Range Beef Cattle
 H384 Development of Recombinant Vaccines for Use in Immunocastration of Cattle
 H396 Amino Acid Utilization by Growing Steers
 H402 Red Meat Production, Processing, and Marketing Practices
 H404 Rapid Methods for the Detection and Prediction of Off- Flavors in Dairy Products
 H407 Branched Chain Amino Acids and Carnitine Needs of the Proflic Lactating Sow

H408 Innovative Uses of Spray-Dried Proteins and Carbohydrate Sources in Nursery Pig Diets
 H419 Identification and Quantitative Analysis of Fumonisin in Beef Products
 H420 Management Systems for Optimizing Beef Production
 H446 Enhancing Utilization of Carbohydrates and Soybean Proteins in Weanling Pigs
 H455 Protein and Nonprotein Nitrogen Utilization by Growing- Finishing Cattle
 H461 Use of Novel Processing Procedures to Maximize Nutritional Value of Swine Diets
 H473 Potentiation of Flavor Quality of Fat-Free Frozen Yogurt
 H484 Optimum Use of Harvested Forage Crops for Beef and Dairy Cattle
 H495 Microstructural Degradation of Starch by Rumen Micro-organisms
 F579 Stress Factors of Farm Animals and Their Effects on Performance
 F588 Dairy Herd Management Strategies for Improved Decision Making and Profitability
 F628 Development of New Processes and Technologies for the Processing of Poultry Products
 F691 Domestic and International Marketing Strategies for U.S. Beef
 H698 Innovative Red Meat Production and Processing Systems for the Modern Consumer
 F748 Forage Protein Characterization and Utilization for Beef Cattle
 H765 Pelvic Area of Bulls as a Predictor of Maternal Calving Ease
 F865 Increased Prolificacy in Sheep and Its Impact on Nutritional Needs
 H897 Management Systems for Optimizing Beef Production
 F937 Modeling Responses of Growing Pigs

■ **Biochemistry**

520780 Acquisition of High Performance Liquid Chromatograph, Gas Chromatograph, Mass Spectrometer
 526707 Improvement of Soybean via Biotechnological Approaches
 522998 Molecular Structure, Dynamic Behavior, and Functional Properties of Soy Proteins
 527179 2-D NMR of Protein-Inhibitors of Blood-Coagulation Factor
 527190 The Role of NA+ K+ ATPase in Diabetic Retinopathy
 527210 Improvement of Soybean via Biotechnological Approach
 527214 An Inhibitor-Phage Library against Enzymes of the Contact System
 527216 Protein Kinase C and Signal Transduction
 527218 Function of Phosphatidylcholine Hydrolysis in Plants
 527219 Glucose Studies of Human Lysosomal Glucocerebrosidase
 527221 Isolation and Promoter Analysis of Phospholipase D Gene
 527222 (*number applies to title above*)
 527223 Aphid Pectinases in Insect-Plant Interactions
 527226 Protein Kinase C and Signal Transduction
 527228 Regulation of Membrane Lipid Hydrolysis in Lipid-Based Signalling of Plants
 527229 Role of Phospholipase D in Plant Membrane Deterioration and Senescence
 527239 Development of Insect Chitinolytic Enzymes as Biopesticides
 527241 Induction of Chloride Secretion by Channel-Forming Peptides
 527242 Construct Agronomically Useful Genes for Sorghum Plant Transformation

Research Projects Active June 30, 1998 (Continued)

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| 481896 | Biological and Genetic Significance of <i>Streptococcus suis</i> Type 2 Hemolysin | H439 | Role of Iron Acquisition in the Virulence of <i>Actinobacillus pleuropneumoniae</i> | 522325 | Evaluate the Efficacy of Ecogen's <i>Bacillus thuringiensis</i> -Based Products |
| 481897 | Evaluating Disease Potential of <i>Cryptosporidium</i> in Ecosystems Impacted by Livestock | H450 | Serum Amyloid A as an Acute-Phase Response in Food-Producing Animals | 522326 | Chemical Signal Interception by Insect Antennae |
| 481898 | Virulence Signal Transduction in <i>Staphylococcus aureus</i> | H463 | Assessing Watershed Contamination due to Agricultural Waste: Amplifying <i>Cryptosporidium</i> DNA | 522327 | Elucidating the Mechanisms of Mating Disruption for the Artichoke Plume Moth |
| 520321 | Pathogenesis and Diagnosis of Congenital Defects in Cattle | H487 | Evaluation of Porcine PK-120 as an Acute-Phase Protein | 522338 | Management of Corn Insect Pests by Changing Corn Maturity and Planting Dates |
| 528255 | Characterization of <i>Salmonella</i> , <i>C. jejuni</i> , and <i>E. coli</i> Recovered from Greyhounds and Greyhound Diets | F644 | Integrated Methods of Parasite Control for Improved Livestock Production | 522339 | Evaluation of European Corn Borer Injury and Yield Effects in Corn |
| 528257 | Anti-Idiotypic Immunity and Receptor Interactions in Bovine Respiratory Disease | H739 | Cow/Calf Nutrition and Management in Kansas | 522340 | Development of Sorghum Germplasm with Enhanced Tolerance to Greenbug, Sugarcane Mosaic Virus, and Drought |
| 528261 | Confirm Efficacy of MK-324 as (MPA) Parasites in Dogs | H769 | Determination of the Inheritability of Episodic Weakness due to Hyperkalemia | 522341 | Molecular Phylogenetics, Speciation, and Evolution of Host Range in Aphidid Wasps |
| 528263 | Evaluate the Effects of Pitman Moore Insecticides for Cat Fleas | H777 | Immunological Expression of Proteins Pertinent to Bovine Respiratory Syncytial Virus | 522342 | Suppression of JH Esterase during Parasitism |
| 528265 | Confirming Cause of "Alabama Rot" in Greyhounds | H794 | A Search for Restrictive Fragment Length Polymorphisms (RFLP) in Bovine Genome | 522348 | Insect Cuticle Sclerotization: Interactions of Structural Proteins with Catecholamine Metabolites |
| 528266 | Application of a DNA Technique for Identification of Greyhounds | H799 | Respiratory Disease and Environmental Stress in Food Animals | 522349 | Dispersal of Insecticide Pour-on Formulations over the Animal's Body |
| 528370 | Amplification of <i>Cryptosporidium</i> DNA for Assessing Agricultural Waste | F831 | Bovine Respiratory Diseases: Risk Factors, Pathogens, Diagnosis, and Management | 522359 | Breeding for Greenbug and Virus Resistance and Drought Tolerance and Development of Transgenic Plants in Sorghum |
| 528374 | L-653,648/Cattle/Clinical/Dose Confirmation Endoparasites/Induced | F990 | Prevention and Control of Enteric Diseases of Swine | 522362 | Areawide Management of Corn Rootworms Using Semiochemical Baits |
| 528375 | Molecular Studies on BIV and BHV Interactions | ■ Director of Research | | 522366 | Molecular Analysis of Altered Acetyl Cholinesterase from Colorado Potato Beetles |
| 528376 | Investigate the Effectiveness of BT Toxins and Chitin Inhibitors of Roundworm and Hookworm Eggs | 520208 | Cooperative Educational Preceptorship Program for University Students to Gain Specialized on-the-Job Knowledge and Experience in Various Research Projects in the Agricultural Sciences | 522367 | Kansas Pesticide Impact Assessment Program |
| 528377 | Evaluate the Efficacy of MK-324 against Somatic Ascarids in Greyhounds | 520209 | Agricultural Research Activities | 522369 | Evaluation of European Corn Borer and Earworm Injury and Yield Effect on Corn Expressing Endotoxin from <i>Bacillus thuringiensis</i> |
| 528378 | Investigate the Effectiveness of BT Toxins and Chitin Inhibitors of Roundworm and Hookworm Eggs | 525053 | Mid-America World Trade Center Support for Agricultural Products | 522370 | Molecular Basis of Wing Polymorphism in the Pea Aphid |
| 528379 | (number applies to title above) | H397 | Planning and Coordination of Cooperative Research | 522371 | Identification of the Sex Pheromone of <i>Lygus lineolaris</i> (Miridae) |
| 528383 | Development of a DNA-Based Identity Registration System in Greyhounds | R403 | Agricultural Research Publications | 522373 | Second Generation European Corn Borer/Southwestern Corn Borer Research |
| 528384 | Molecular Studies on BIV and BHI Interactions | F573 | The Planning and Coordination of Cooperative Regional Research | 522374 | (number applies to title above) |
| 528385 | <i>Cryptosporidium parvum</i> -Enterocyte Interactions | ■ Entomology | | 522375 | Breeding Sorghum with Improved Grain Yield and Greenbug and Virus Resistance |
| 528386 | Role of BHV-1 and Five Glycoproteins in Pathogenesis | 520074 | Plant-Insect Interaction Research | 522376 | Evaluating Corn Borer Resistance and Resistance Management Strategies for BT-Corn |
| 528387 | Aerosolized Vaccines for Protective Immunity against Respiratory Infections | 520100 | Insecticide Management of Foliar and Stalk-Boring Insects Affecting Alfalfa, Corn, and Soybeans in Northeastern Kansas | 522377 | Platte River Wet Meadow Amphibian Study |
| 528390 | Attempt to Prevent Transplacental and Latogenic Transmission of Gastrointestinal Parasites in Greyhound Pups with Milbemycin Oxime | 520101 | Insecticide Management of Field Crop Insect Pests in Southwestern Kansas | 522378 | Isolation and Identification of Seriochemicals that Mediate Attraction/Mating of the Cat Flea |
| 528393 | Detection of Taoxin Genes in <i>E. coli</i> Recovered from Normal Greyhounds and Greyhounds with Diarrhea | 520103 | Chemical Control of Insect Pests of Corn and Other Field Crops, Small Grains, and Forages | 522380 | Control of Residue-Borne Winter Wheat Diseases |
| 528394 | Mouse Model to Assess Anthelmintic Efficacy/Resistance against Migrating Larvae...Greyhounds | 520106 | Biology and Control of Arthropod Pests of Livestock | 522381 | Efficacy of BT Corn against Corn Borers and Earworms |
| 528401 | BHV-1 and BHV-5 Neuropathogenesis Studies | 520107 | Biology and Control of Insect Pests of Stored Products | 522382 | A Gonodotropic Imperative for Polyandry in Higher Lepidoptera |
| 528402 | Development of Challenge Virus Stock of Bovine Coronavirus | 520342 | Insecticide Management of Field Crop Insects at Hays, Kansas | 522383 | Evaluation of Refuge Planting Patterns for Corn Borer Resistance Management in BT Corn |
| 528403 | Development of a Canine Model of <i>E. coli</i> -Induced Hemorrhagic Colitis and Hemolytic Uremic Syndrome | 520347 | Insecticide Management of Field Crop Insects in Southwestern Kansas | 522384 | (number applies to title above) |
| 528784 | Ecology of <i>E. coli</i> O157:H7 in Beef Cow-Calf Operations from Ranch through Feedlot | 520363 | Chinch Bug Dietetics | 522385 | Biotic Inventory to Support Land Condition Trend Analysis for KSARNG, Fixed Price Agreement |
| 528900 | Eradication of Swine Respiratory Pathogens by Medicated Weaning | 520709 | A Geographical Information System Procedure for Pesticide Impact Assessment | 522386 | Evaluation of Refuge Planting Patterns for Corn Borer Resistance Management in BT Corn |
| H018 | Optimum Processing to Maximize Utilization of Cereal Grains in Swine Feeding | 520747 | Assessing the Potential for Biological Control of Field Bindweed with the Gall Mite and a Moth | 522387 | Hyporheic Contract Study-Platte River |
| H059 | Temperature Regulation of Virulence of <i>Salmonella typhimurium</i> | 520805 | Development of Sorghum Germplasm Tolerant to Greenbug-, Aphid-, and Mite-Transmitted Potyviruses and Drought | 522388 | Evaluation of Refuge Planting Patterns for Corn Borer Resistance Management in BT Corn |
| H060 | Transmission and Control of Nematode Parasites in Kansas Greyhounds | 522293 | Genetics and Bionomics of Organophosphate Resistance Mediated by Two Esterase Systems in the Greenbug | 522389 | Exchange of Triticeae Germplasm and Molecular Biochemical Techniques for Enhanced Aphid Resistance in Wheat |
| F062 | Enteric Diseases of Swine and Cattle: Prevention, Control, and Food Safety | 522307 | Density and Origin of Urban Flies which Threaten Livestock Operations | 525982 | Development of Sorghum Germplasm Tolerant to Greenbug-, Aphid-, and Mite-Transmitted Potyviruses and Drought |
| F285 | Improving Dairy Cattle Genetically | 522308 | Testing for Greenbug Biotype and Resistance | 525987 | Breeding for Greenbug and Virus Resistance and Drought Tolerance and Development of Transgenic Plants in Sorghum |
| H345 | Bovine Herpesvirus Types 1 and 5: Molecular Pathogenesis and BHV-5 Seroprevalence | 522317 | Insect Genetics | 525993 | Breeding Sorghum with Improved Grain Yield, Greenbug and Virus Resistance, and Pre-Flowering Drought Tolerance |
| H418 | Respiratory Immunity in Large Animals with Propellant-Driven Aerosol Vaccines | 522318 | Methods for Control of Livestock Insects | 526638 | Bacterial Volatiles Attractive to Stable Flies |
| | | 522320 | A Geographical Information System for Pesticide Impact Assessment | 526712 | Biotic Inventory to Support Land Condition Trend Analysis |
| | | 522321 | Aphid Biological Control for Greenhouse and Cut Flower Crops | | |

Research Projects Active June 30, 1998 (Continued)

- 526180 Influence of Various Ratios of Steam-Flaked Rations on Steer Finishing
 527725 USDA/ARS Automatic Control of an Instrumented Two-Roll Mill
 528154 Development of Extrusion Technology for Novel Healthy Foods
 528159 Characterizing Flavors of Sorghum Cultivars Potentially Useful for Foods
 528205 State of Iowa Food Wastes Database Development
 H018 Optimum Processing to Maximize Utilization of Cereal Grains in Swine Feeding
 H063 Development of Hard White Winter Wheat Varieties for Kansas
 F072 Behavioral and Health Factors that Influence Food Consumption in Young Adults
 F124 *Fusarium* Mycotoxins in Cereal Grains
 F213 Marketing and Delivery of Quality Cereals and Oilseeds
 H271 Improvement of Hard Winter Wheats and Other Small Cereal Grains for Kansas
 H316 Wet Processing of Kansas Wheat and Grain Sorghum
 H320 Development of Hard White Winter Wheat Varieties for Kansas
 H329 Kansas Wheat Quality Profile
 H330 Large-Scale Milling and Baking Evaluation
 H344 Wheat for Oriental Noodles: Small-Scale Test for Methodology Development
 H385 Extrusion Processing to Add Value to Kansas Grains
 H389 Development of New Technology for Making Novel, Nutritious Foods from Grains
 H390 Effect of Use of Single Kernel Wheat Characterization System on Milling Performance
 H391 Adding Value to Kansas Wheat and Sorghum in Baking Products
 H393 New Uses of Grains and By-Products in Edible/Biodegradable Feed Packaging Material
 H394 Early-Generation Wheat Quality Testing
 H441 Utilization for Kansas Grain in Ready to Eat Breakfast Cereals
 H443 Infrared Probing of Wheat Quality
 H451 A Systematic Method for the Synthesis of Azeotropic Distillation Processes for Separating Solvents
 H456 Physiological Limitations of Wheat Yield and Quality
 H457 Utilization of Kansas Wheats for Frozen Dough Specialty Breads
 H479 Characterization of Glycosylation Site(s) in Glutenin Subunits of Wheat
 H485 Wet-Milling Tests on 100G of Grain Sorghum
 H492 Objective Grain Processing Quality Characterization
 R600 Agriculture Institute - International Grains Program
 F711 Market Quality of Hard Wheat for Domestic and International Foods
 H778 Improvement of Bread Quality: Role of Fats in Bread Staling
 H962 Analysis of Soybean Meal Flow Characteristics

■ Horticulture, Forestry and Recreation Resources

- 520152 Turfgrass Investigations
 520159 Horticultural Herbicides
 520161 Fertilization of Woody Landscape Plants
 520163 Herbicides for Weed Control around Woody Plants
 520165 Evaluation of Garlon 3A Herbicide and Related Formulation
 523860 Pecan Cultivar Evaluation
 523862 Efficacy of Insecticides against Vegetable-Feeding Insect Pests

- 523868 Production and Management of Landscape Plants
 523870 Evaluation and/or Assessment for Turfgrass
 523872 Root Control of Selected Container-Grown Landscape Plants
 523873 Evaluation and/or Assessment for Turfgrass
 523878 Fuelwood Consumption Survey
 523879 Evaluation of Species and Cultivars for the Great Plains
 523880 Pecan Cultivar Evaluation in Kansas
 523881 Rails to Trails Survey
 523885 Hardiness and Canker Resistance of Lacebark Elm (*Ulmus parvifolia*) Selections
 523888 Irrigation and Disease Management on Golf Course Fairways
 524060 Environmental and Physiological Factors Influencing Bentgrass Summer Decline
 524062 Reclamation of Native Tallgrass Prairie at Kansas Army Ammunition Plant
 524063 Environmental Impacts of Reducing Pesticide Uses on Fort Riley
 524064 National Turfgrass Evaluation-Kentucky Bluegrass
 524065 National Turfgrass Evaluation Program
 524066 The Importance of Carbon Balance and Root Activity in Creeping Bentgrass Tolerance to Summer Stresses
 524067 Biology and Management of Spring Dead Spot in Bermudagrass
 524598 Irrigation and Disease Management on Golf Course Fairways
 524615 Biology and Management of Spring Dead Spot in Bermudagrass
 H065 Sustainable Intensive Vegetable Production Using Legumes, Manures, and Municipal Compost as Fertilizer Sources
 F135 Seed Biology and Technology Investigations
 F140 Rootstock and Interstem Effects on Pome and Stone Fruit Trees
 F287 Introduction, Maintenance, Evaluation, and Utilization of Plant Germplasm
 M315 Agroforestry Ecosystem Management in the Central Plains States, USA
 H338 Composition and Alternative Uses of Food By-Products from Food Service Operations
 M347 Endangered Species and Ag Producers: Attitudes and Economics Ramifications
 H349 Postharvest Handling and Preserving of Peonies and Other Specialty Cut Flowers
 H357 Investigations of the Mechanisms of Chilling Injury and Tolerance in Crop Plants
 H361 Investigation of the Commercial Preservation of Decorative Plant Material
 H364 Fractal Geometry Neural Networks and Fuzzy Logic: Some Applications in Horticulture
 H367 Irrigation Management and Drought Resistance of Golf Turfgrass
 H383 Woody Plant Evaluation
 H409 Micropropagation and Somatic Embryogenesis in Selected *Acer* and *Quercus* Species
 H425 Developing Pecan Production Systems for Kansas and Missouri
 H445 Freezing Injury and Cell Cavitation in Grapes and Broad-Leaf Evergreen Species
 H467 Woody Ornamental Plant Adaptability to Various Landscape Environments
 H480 Environmental Stress Tolerance in Turfgrass
 H504 Evaluation and Characterization of Horticultural Food Crop Germplasm
 F710 Improved Systems of Control for Pecan Arthropod Pests
 R712 Adaptation, Propagation, and Evaluation of Ornamentals and Turfgrasses in Kansas
 F938 Freeze Damage and Protection of Fruit and Nut Crops
 F991 Rootstock and Interstem Effects on Pome and Stone Fruit Trees

■ Hotel, Restaurant, and Institution Management and Dietetics

- 528205 State of Iowa Food Wastes Database Development
 H338 Composition and Alternative Uses of Food By-Products from Food Service Operations
 H370 Applying Artificial Intelligence Technology in Foodservice Forecasting
 H465 Predictors of Success and Economic Impact of Rural Tourism Ventures

■ Kansas Water Resources Research Institute

- 525435 FY 1997 State Water Research Institute Program
 525436 FY 1998 State Water Research Institute Program

■ Plant Pathology

- 520190 Wheat Rust Fungicide Field Tests
 520199 Soybean Foliar Fungicide and Seed Treatment Tests
 520201 Evaluations and Testing of Fungicides and Nematicides on Horticultural Crops
 520202 Seed Treatment
 520205 Chemical Control of Phytoparasitic Nematodes
 520412 Breeding Sorghum for Tolerance to *Fusarium* Stalk Rot
 520669 Breeding Soybeans for Increased Productivity
 520789 Soybean Plot Combine
 520806 The Effect of Hybrid Maturity, Planting Date, Plant Population, and Row Spacing on Grain Yields, Weed Infestations, and Diseases of Grain Sorghum
 524460 Use of Oligonucleotide Synthesizer
 524478 *Fusarium* Research
 524489 North Central Soybean Research Program
 524492 Wheat Genetics Resource Center and Its Contributions to Kansas Wheat Industry
 524502 Winter Wheat Seed Treatment Tests
 524538 Improvement of Soybean via Biotechnological Approaches
 524558 Management of the Soybean Cyst Nematode
 524562 Impacts of Introduced Bioremediation Agents on Plant Productivity
 524563 Biology and Control of Seed Smut of Switchgrass
 524565 Nematode and Soybean Research
 524574 Enhancing the Duration of Popularity of Winter Wheat
 524575 Analysis of the RP1 and RP3 Loci of Maize
 524589 North Central Soybean Research Program
 524590 Origin and Healing of Chromosomal Breaks Induced by Gametocidal Genes
 524593 Testing BT Hybrids and Other Cultural Practices to Reduce Corn Ear Diseases
 524597 Agroecology and Biotechnology of Fungal Pathogens of Sorghum and Millet from the Greater Horns of Africa
 524598 Irrigation and Disease Management on Golf Course Fairways
 524601 Genetic Diversity in *Cephalosporium maydis* and Other Stalk Rotting Fungi of Maize in Egypt
 524603 *Fusarium* Metabolites
 524604 Regulated Secretion of Defense Response Compounds: Role of Phospholipase D
 524606 Improving Soybean Profitability through Breeding
 524608 Control of Residue-Borne Winter Wheat Diseases
 524609 Analyses of Roles of Viral and Host Proteins in Virus Movement in Plants
 524611 Evaluation of Scab Tolerance in Wheat
 524612 Development of New Sources of Resistance to Wheat Scab

- 524614 Molecular Characterization of Novel RPL Alleles
524615 Biology and Management of Spring Dead Spot in Bermudagrass
524616 Fumonisin: Immunology, Genetics and Enzymology
524617 Function of Tobacco EREBP Transcription Factors
524618 (number applies to title above)
525997 Breeding Grain Sorghum for Improved Dryland Production
526396 Using Cultural Practices to Reduce Soybean Cyst Nematode and Charcoal Rot Damage in Soybeans
526707 Improvement of Soybean via Biotechnological Approaches
527954 Bioremediation of Hydrocarbon-Contaminated Soils Using Vegetation: A Field and Greenhouse Study
H021 Development of Productive, Disease-Resistant Soybean Varieties
F215 Overwinter Survival of *Heterodera*, *Paratylenchus*, and Associated Nematodes in the North Central Region
F216 The Adoption of Sustainable Farming Systems: Implications to Agricultural Education
H339 Molecular and Genetic Characterization of the HRP Region of *Xanthomonas oryzae* pv. *oryzae*
H366 Cell Culture and Genetic Engineering for Crop Improvement
H367 Irrigation Management and Drought Resistance of Golf Turfgrass
H368 Comparative and Targeted Mapping of Useful Genes in Wheat
H372 Role of AVR Genes in Pathogenicity
H405 Genetic Investigations of Past Resistance in Alfalfa
H413 Characterization of Rust Resistance Genes in Cereals
H417 Genetics and Physiology of *Fusarium* spp.
H423 Host-Pathogen Interactions of Turnip Crinkle and Tomato Bushy Stunts Viruses
H426 Use of Rapid Marker Analysis to Differentiated Isolates of *Ramulispora sorghi*
H438 Population Genetic Structure of the Wheat Scab Fungus, *Gibberella zeae*
H447 Etiology, Epidemiology, and Control of Corn and Grain Sorghum Diseases
H453 The Biology and Control of Winter Wheat Diseases
H671 Wheat Genetic Engineering via *Agrobacterium*-Mediated Transformation
H681 Development and Utilization of Candidate Genes for Analysis of Disease Resistance
H684 Engineered Inhibitors of Potyvirus Proteinases
R732 Adaptation, Propagation, and Stress of Ornamentals and Turfgrass in South-Central Kansas
F923 Biocontrol of Soil-Borne Plant Pathogens
H961 Genetic Investigations of Pest Resistance in Alfalfa
H971 Interaction of Wheat Fungal Diseases on Yield Determinations

■ **Sociology, Anthropology and Social Work**

- 527625 The Effects of Economic and Social Restructuring on Rural Localities
R020 Potential for Incorporating the Kansas Farmer in the Agricultural Research Process
F185 Commodities, Consumers, and Communities: Local Food Systems in a Globalizing Environment
F259 Rural Labor Markets in the Global Economy
H386 Farm-Related Fatalities among Kansas Youth and Adults, 1987-1993

- R702 Deriving Farmer-Friendly Sustainability Indicators for the Kansas Farmer

■ **Statistics**

- 527606 Analysis and Interpretation of Insect Ecology and Control
527608 Assessing the Potential for Biological Control of Field Bindweed with the Gall Mite and a Moth
527611 Mixed Models Used in the Semi-Conductor Industry
527612 Mathematical Sciences Computing Research Environments
F213 Marketing and Delivery of Quality Cereals and Oilseeds
R825 Statistical Laboratory

■ **Veterinary Medicine**

- 528950 Determination of the Immunoenhancing Effects of Recombinant Bovine Interleukin-1B in Cattle Utilizing *Pasteurella haemolytica* Challenge Model
R650 Exploratory Research in Animal Health and Disease

■ **Agricultural Research Center-Hays**

- 520239 Breeding for Wheat Improvement and Wheat Pest Control in South-Central Kansas
520663 Breeding Grain Sorghum for Improved Dryland Production
520785 A Survey of Winter Annual Grass Distribution and Severity in Kansas
520805 Development of Sorghum Germplasm Tolerant to Greenbug-, Aphid-, and Mite-Transmitted Potyviruses and Drought
522347 Bacterial Volatiles Attractive to Stable Flies
522359 Breeding for Greenbug and Virus Resistance and Drought Tolerance and Development of Transgenic Plants in Sorghum
522375 Breeding Sorghum with Improved Grain Yield and Greenbug and Virus Resistance
524573 Application of Rhizobacteria to Weeds in Wheat
525953 An Alternative to Landfills for Disposal of Yard Waste and Newspaper
525954 Genetic Development of Higher Disease Resistance and Grain Protein in New Wheat Varieties
525976 Range Research
525979 Sorghum Research
525987 Breeding for Greenbug and Virus Resistance and Drought Tolerance and Development of Transgenic Plants in Sorghum
525989 Integrated Management Systems for Jointed Goat-Grass in Central Great Plains
525992 Sorghum Research
525993 Breeding Sorghum with Improved Grain Yield, Greenbug and Virus Resistance, and Pre-Flowering Drought Tolerance
525997 Breeding Grain Sorghum for Improved Dryland Production
525998 Integrated Management Systems for Jointed Goatgrass in Central Great Plains
525999 Economics of Integrated Weed Management in Dryland Grain Sorghum
526000 Weed Control in Solid-Seeded versus Row-Planted Glyphosate-Resistant Soybean
526001 Effect of Stockosorb Agro on Winter Wheat Grown in Central Kansas
526002 Evaluating Experimental and Non-Labeled Herbicides for Weed Control in Sunflower
H318 Management of Soil in Dryland Regions
H319 Genetics and Breeding of Sorghum

- H336 Improved Efficiency of Forage-Based Beef Cattle Production Systems
H341 Weed Management Investigations
H350 Beef Cattle Investigations-ANS Ultrasonic Cattle Sorting Machine
H359 Improvement of Pearl Millet, Rape, and Sunflower
H428 Pathogen-Host Investigation in Wheat and Sorghum
H454 Resistance to Greenbug and Wheat Curl Mite in Wheat and to Greenbug in Sorghum
H739 Cow/Calf Nutrition and Management in Kansas
H846 Genetic Improvement of Wheat
R847 Forestry Investigations in the Great Plains of Kansas
H869 Pathogen-Host Investigations in Wheat, Sorghum, and Sunflower

■ **Northwest Research-Extension Center**

- 520365 Sunflower Performance Testing Program
520722 Canola Research
520727 Tillage, Irrigation, and Hybrid Maturity Class Effects on Corn Production
520769 Water-Efficient Practices for Corn Production
520804 (number applies to title above)
525752 Winter Rape Testing Project
525762 Canola Research
525763 Increasing Yield and Water-Use Efficiency of Soybeans with Foliar-Applied Methanol
525766 Sunflower Investigations
526183 Water-Efficient Practices for Corn Production
F094 Micro-Irrigation for Optimum Crop Productivity and Minimum Groundwater Contamination
R378 Coordination of Crop Variety Testing
H398 Alternative Crops and Cropping Systems in Northwestern Kansas
H486 Macromanagement: Irrigation Scheduling Techniques for Corn
H501 Production Methods for Increased Efficiency of Ewe-Lamb Enterprises
R847 Forestry Investigations in the Great Plains of Kansas

■ **Southeast Agricultural Research Center**

- 520254 Weed Control in Farm Crops
520336 Yield and Quality of Hay from Sudangrass and Pearl Millet Lines
520366 Kansas Crop Performance Test of Short-Season Soybeans in Southeastern Kansas
520503 Integrated Ag Management Systems (IAMS) Using BMP's to Improve the Quality of Kansas Surface Waters
520789 Soybean Plot Combine
524593 Testing BT Hybrids and Other Cultural Practices to Reduce Corn Ear Diseases
525076 Testing by Hybrids and Other Cultural Practices to Reduce Corn Ear Diseases
525768 Increasing Yield and Water-Use Efficiency of Soybeans with Foliar-Applied Methanol
526367 Soil Fertility and Management Investigations in Southeastern Kansas
526398 Southeast Kansas Warm-Season Annual Grass Trials
526399 Double-Crop Soybean Performance Test
526404 Crop Performance
526406 Management of the Soybean Cyst Nematode and Charcoal Rot in Soybeans
526413 Testing by Hybrids and Other Cultural Practices to Reduce Corn Ear Diseases
526414 Effects of Crop Rotation and Tillage Systems on Soybean Yields in Southeast Kansas

Research Projects Active June 30, 1998 (Continued)

| | | | | | |
|--------|---|--------|---|------|--|
| 526415 | Improving Soybean Profitability through Breeding | 520804 | <i>(number applies to title above)</i> | H101 | Biology and Control of Arthropod Pests on Corn in Southwestern Kansas |
| R174 | Beef Cattle Production and Management in Southeast Kansas | 522357 | Biological Control of Insect Pests on Field Crops and Feedlots in Kansas | H346 | Fertility and Water Management for Western Kansas |
| H312 | Soil and Water Management for Crop Production in Southeastern Kansas | 522362 | Areawide Management of Corn Rootworms Using Seriochemical Baits | H352 | Improving the Health of Stressed Feeder Cattle and Improving Grain Sorghum Utilization in Kansas |
| H332 | Forage Management in Southeastern Kansas | 525765 | Water-Efficient Practices for Corn Production | H481 | Water Management for Increased Water-Use-Efficiency in Southwest Kansas |
| H414 | Evaluation of Crop Rotation and Tillage Systems for Southeast Kansas | 525767 | <i>(number applies to title above)</i> | R721 | Irrigation and Fertigation for Corn Using SDI |
| H444 | Soybean Production Research for Southeastern Kansas | 525997 | Breeding Grain Sorghum for Improved Dryland Production | R726 | Impact of Conservation Compliance on Nitrogen Recommendations for Dryland Winter Wheat |
| R729 | Short-Season Corn Growth and Yield Response to Nitrogen Fertilization and Tillage | 526151 | Weed Control Research in Southwest Kansas | R729 | Short-Season Corn Growth and Yield Response to N Fertilization and Tillage |
| | | 526152 | Quality Testing of Fly Parasites for Cattle Feedlots | R847 | Forestry Investigations in the Great Plains of Kansas |
| | | 526154 | Variety Testing of Alternative Crops | H967 | Dryland Cropping Systems for Southwest Kansas |
| | | 526155 | Soil Fertility and Soil Management Research for Western Kansas | H969 | Crop Improvement for Southwest Kansas |
| | | 526156 | Yield Appraisal of Crops for Southwest Kansas | H973 | Developing Weed Management Systems for Southwest Kansas |
| | | 526157 | Water Management for Southwest Kansas | | |
| | | 526161 | Frost-Damaged Grain Sorghum—An Evaluation of Varying Grain Test Weight Sorghums as Livestock Feed | | |
| | | 526177 | Water-Efficient Practices for Corn Production | | |
| | | 526186 | Feeding Raw Soybeans to Finishing Steers | | |
| | | 526192 | Integrated Ag Management Systems (IAMS) Using BMP's to Improve the Quality of Kansas Surface Waters | | |

■ **Southwest Research-Extension Center**

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|--------|--|
| 520247 | Management of Fertilizer and Irrigation Water in High Plains |
| 520249 | Evaluation of New Products to Improve the Efficiency of Production in Feedlot Cattle |
| 520251 | Herbicides for Weed Control on Fallow Ground |
| 520769 | Water-Efficient Practices for Corn Production |

F = Regional projects
H = Hatch projects
M = McIntire-Stennis projects
R = State projects
Numbers = Sponsored projects

Research Projects Terminated

■ Agricultural Economics

- 520462 Impacts of Federal Farm Policies on the Great Plains States
 520471 Water Conservation-Increased Efficiency in Usage
 520475 Value-Added Wheat Products
 520476 Pricing and Pooling of Kansas and U.S. Wheat
 520478 Optimal Capital Structure Grain Marketing/Farm Supply Co-ops
 520482 Consumer Willingness to Pay for Irradiated Meat
 520483 Analysis of Small Game Harvest Survey Data
 520485 Uganda Cooperative Alliance in Maplala, Uganda
 520487 Analysis of Small Game Harvest Survey Data
 520488 Retail Demand for Irradiated Meat Products
 520489 Water Conservation-Increased Efficiency in Usage
 520836 *(number applies to title above)*
 522948 Utilization of Wheat in Starch Thermoplastics Technology
 522955 Value-Added Wheat Products
 525771 Water Conservation-Increased Efficiency in Usage
 526191 Water Conservation-Increased Efficiency in Usage
 H119 An Economic Analysis of Impact of Agricultural Commodity and Environmental Policies on Cropping Systems in Kansas
 H122 The Impact of Agricultural Commodity Programs on Food and Feed Grain Markets
 H415 Competitiveness of Kansas Agribusiness Industries
 F691 Domestic and International Marketing Strategies for U.S. Beef
 H698 Innovative Red Meat Production and Processing Systems for the Modern Consumer
 R700 Analysis of Consumer Preference and Meat Processor Development of HACCP Systems
 R703 Measuring Effect of Tax Policy Changes on the Well-Being of Kansas Farmers
 F707 Performance of the U.S. Grain Marketing System
 F835 Changing Patterns of Food Demand and Consumption Behavior

■ Agronomy

- 520706 Digitization of the Kansas Soil Survey
 520708 Digitization of Soil Surveys
 520723 Alfalfa Research
 520726 Variable Nitrogen Management for Improving Groundwater Quality
 520741 Water Conservation: Increased Efficiency in Usage
 520743 Evaluation of *Tyta luctuosa* for Biological Control of Field Bindweed
 520762 Development of an Alfalfa Genome Database
 520767 Effect of Corn Hybrid Maturity and Planting Population on Grain Yields of No-Till Dryland Corn
 520768 Effect of Hybrid Maturity, Planting Date, and Weed Infestations in Grain Sorghum
 520771 Biological Control of Field Bindweed
 520772 Nitrogen Fertilizer Effects on Soybean Yield and Seed Protein and Oil Contents
 520776 Improvement of Soybean via Biotechnological Approaches
 520778 Work Station for Soil-Plant-Atmosphere Continuum Studies
 520779 *(number applies to title above)*
 520783 Enhancement of Bioremediation
 520785 A Survey of Winter Annual Grass Distribution and Severity in Kansas
 520788 Providing Soil Sample Analyses for Soil Survey Activities
 520789 Soybean Plot Combine
 520790 Biolistic Gametophyte Transformation of Alfalfa
 520794 Recurrent Selection for Reduced Autotoxicity in Alfalfa

- 520797 Improving Soybean Profitability and Reducing Risks of Environmental Effects: Decision Support Systems
 520799 Influence of Planting Date, Plant Population, and Hybrid Maturity on Corn Yields for Irrigated Sandy Soil
 520804 Water-Efficient Practices for Corn Production
 520805 Development of Sorghum Germplasm Tolerant to Greenbug-, Aphid-, and Mite-Transmitted Potyviruses and Drought
 520806 The Effect of Hybrid Maturity, Planting Date, Plant Population, and Row Spacing on Grain Yields, Weed Infestations, and Diseases of Grain Sorghum
 520809 Agronomic Effect of Corn Hybrid Maturity, Planting Date, and Plant Population on Grain
 520810 Ammonia Volatilization from Experimental Nitrogen Sources
 520811 Alternative Weed Control Methods for Grain Sorghum Production
 520813 Farmer-to-Farmer Cover Crop Network Complementing On-Farm and On-Station Trial
 520814 Alfalfa Research
 520816 Remodeling Instrument Combining 3D Plant Photogrammetry with Automated Physiological Monitoring
 520817 Corn and Sorghum Hybrid Responsiveness to Starter Fertilizers
 520818 Enhancing the Role of Fluid Fertilizers in Precision Farming
 520823 Pesticide Residue Data for Registration in Minor Crops
 520824 Dry Pea Response to Sulfonylurea and Standard Herbicides
 520831 *(number applies to title above)*
 520836 Water Conservation-Increased Efficiency in Usage
 520840 Site-Specific No-Till Information
 522330 Assessing the Potential for Biological Control of Field Bindweed
 522352 Development of Sorghum Germplasm Tolerant to Greenbug, Aphid- and Mite-Transmitted Potyviruses and Drought
 522353 Transgenic Corn for Pest Management—Research and Extension Needs
 524582 Use of *Fusarium subglutinans* as a Seed Treatment and Growth Promoter of Corn
 524594 Evaluation of a Potential Plant Growth-Promoting Fungus as a Means to Enhance Stand Establishment and Growth of Grain Sorghum
 525769 Corn Yield Potential and Economics under Various Irrigation System Capabilities
 525771 Water Conservation-Increased Efficiency in Usage
 525981 Alternative Weed Control Methods for Grain Sorghum Production
 526191 Water Conservation-Increased Efficiency in Usage
 527726 Corn Yield Potential and Economics under Various Irrigation System Capabilities
 529352 Processes Affecting Carbon Fluxes of Grassland Ecosystems
 529353 *(number applies to title above)*
 H040 Prediction and Correction of Zinc Deficiency in Sorghum in Kansas
 H056 Use of Crop Models in Sorghum and Corn Management
 H064 Effect of Previous Crop on Ammonium Nutrition of Corn
 F079 Integrated Systems for Improved Water and Nitrogen Management in Irrigation Environments
 H092 Physiological Control of Crop Productivity
 H093 Alfalfa Breeding and Genetics
 H103 Crop Sequence and Tillage Interaction Effects on Crop Yield and Soil Environment
 H105 Vegetation Responses to Cattle and Bison Grazing on Tallgrass Prairie
 H106 The Impact of Fertilizers and Herbicides on Water Quality

- F935 Environmental and Genotypic Control of Assimilate Allocation in Grain Crops
 F945 Health Maintenance Aspects of Dietary Recommendations Designed to Modify Lipid Metabolism
 H961 Genetic Investigations of Pest Resistance in Alfalfa

■ Anatomy and Physiology

- 481887 Mapping and Microdissecting the Porcine Genome for Disease Resistance Loci
 481890 Porcine Antibacterial Peptides: Novel Agents for Porcine Enteric Diseases
 528290 Limiting Neurological Damage from Stroke
 528578 Sequence Tagged Site Mapping of the Pig Genome by PCR
 528580 Mechanisms of Limbic Forebrain Control of ACTH Release
 528584 Development and Regulation of Porcine Neonatal Neutrophil Function
 528590 Limiting Neurological Damage
 528591 Expression of Heparin Sulfate Proteoglycans and Interleukin following Myocardial Infarction
 528592 Sequence Tagged Site (STS) Mapping of the Pig Genome by Rapid on-Slide PCR
 528593 Redistribution of Pulmonary Blood Flow during Exercise
 528594 Redistribution of Pulmonary Blood Flow during Exercise
 528595 Expression of Heparin Sulfate Proteoglycans following Myocardial Infarction
 528596 Limiting Neurological Damage from Stroke
 528597 Mechanisms of Prolonged Sympathetic Nerve Inhibition
 528599 Expression of Inflammatory Cytokines in Equine Tendon Injury
 528600 Porcine Antibacterial Peptides: A New Concept for Prevention and Treatment of Disease
 528601 Interleukin-1 Receptor Antagonist in Swine
 528604 Etiology of Elevated Pulmonary Vascular Pressures in Running Horses
 528605 What Causes High Pulmonary Vascular Pressure in the Racehorse
 529294 Mechanism of Exercise Inhibition during Lung Congestion
 F076 Mapping the Pig Genome
 H120 Cell-Surface Attachment Proteins for Bovine Herpes Virus-1

■ Animal Sciences and Industry

- 521743 Alfalfa Research
 521751 KSU Technical Assistance to Kansas Meat Processors
 521752 The Effect of Biological Inoculants and Enzymes on the Preservation and Nutritive Value of Corn Silage
 521765 Induced Hepatic Abscesses in Cattle Immunized with Leukotoxin of *Fusobacterium necrophorum*
 521778 Shelf-Stable Pumpkin Pies
 521783 Evaluation of Heated Soybean Meal Products Containing Levels of Lipid in Lactating Dairy Cows
 521791 Virginiamycin Effects on Rumen Metabolism in Cattle during Adaptation on High Concentrate Diets
 521794 Forage Preservation Additives Trials
 521795 Effect of a Continuous Flow Roasting and Processing Method on the Nutritional Quality and Value of Ground Whole Spent Fowl
 521796 Extrusion of Grain Sorghum to Improve Digestibility and Enhance Nutritional Value in Lactating Dairy Cattle Diets
 521798 Evaluation of Films for Use in a Modified Atmosphere System for Fresh Beef and Pork
 521800 Decontamination of Meat Carcasses Using Low Pressure Steam in a Commercial Beef Processing Facility

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|------------------------------|---|---|---|---|--|--|
| 521803 | Evaluation of Tenneco Packaging System on Shelf-Life of Beef, Pork, and Lamb | 529323 | NMR Studies of a Blood-Coagulation Factor Inhibitor | 526624 | Mycorrhizal Mediation of Grassland Biotic Interactions | |
| 521804 | Supplemental Carnitine during Lactation for High- Producing Sows | 529342 | Regulation of Mammalian Pyruvate Dehydrogenase | 526628 | (number applies to title above) | |
| 521805 | Alfalfa Research | 529343 | (number applies to title above) | 526629 | Mutational Analysis of Interactions of Ferredoxin | |
| 521806 | Verifying Purity of Mycotoxin Samples | H045 | Identification of Hormone-Responsive DNA Elements in Barley -Amylase Genes | 526631 | Molecular Analysis of Homeotic Genes in <i>Tribolium</i> | |
| 521807 | Evolutionary Conservation of the Molecular Mechanisms of Development | H100 | Detection and Characterization of Inhibitory Allosteric Sites on RUBISCO | 526634 | Function and Organization of Photosystem I | |
| 521809 | New Manufacturing Technology for Mozzarella Cheese Analogs | H104 | Chromosomal Regions Involving Genes for Gliadins and Glutenins | 526635 | Enhancement of Research Capacity Konza Prairie, Phase II | |
| 521811 | Effects of Choline and Betain on Finisher Pig Growth Performance and Carcass Characteristics | H477 | Mammalian Heme Proteins | 526636 | Nonclinical Research Studies of Geltex Prop Polymers | |
| 521814 | Level and Processing of Soybean Meal for Limit-Fed Steers | H541 | Biochemistry of Cyclic GMP | 526637 | Use of Remotely Sensed Data on Phenological Changes in Grass | |
| 521815 | Scale-Up Process for the Production of a Mozzarella Cheese Analog | H744 | Biochemistry of Genetic Systems | 526638 | Bacterial Volatiles Attractive to Stable Flies | |
| 521816 | Reducing Morbidity in Stressed Feeder Calves with Sugar | H906 | Efficiency of Nitrogen Fixation | 526639 | Effects of Altered Soil Moisture and Temperature on Soil in Grassland | |
| 521818 | Evaluation of Nutritional Effects of Annular Gap Expansion on Soybean Turkey Rations | H918 | Function and Regulation of Mammalian α -Keto Acid Dehydrogenase | 526641 | Relationships in the Native Great Plains Grasslands | |
| 521820 | Influence Poultry Fat on Swine Growth Performance and Pork Quality | <p>■ Biological and Agricultural Engineering</p> | | | 526646 | Identification of Great Plains Invertebrates |
| 526659 | Evolutionary Conservation of the Molecular Mechanisms of Development | | | | 520836 | Water Conservation-Increased Efficiency in Usage |
| 528123 | Evaluation of Tenneco Packaging System Effect on Beef Rebloom and Display Color Stability | 525771 | (number applies to title above) | 526649 | Characterization of Receptors for Shock Toxins | |
| H091 | Optimum Use of Harvested Forage Crops for Ruminant Livestock Production | 527698 | (number applies to title above) | 526656 | REU in Grassland Ecology at Konza Prairie Research Natural Area | |
| H105 | Vegetation Responses to Cattle and Bison Grazing on Tallgrass Prairie | 527705 | Cover Crop and Crop Rotation Used to Meet Conservation Compliance on Soybeans | 526657 | Plant Molecular Responses to External Stimuli | |
| H114 | Biodegradation of Aflatoxins in Agricultural Products and Culture Media | 527714 | Thermal Processing Laboratory and Wet Milling Laboratory | 526658 | (number applies to title above) | |
| H126 | NIR Analysis of Forage and Grain Sorghum | 527717 | Development of a Uniform Wheat Dockage and Shrunken and Broken Kernel Determination Procedure | 526659 | Evolutionary Conservation of the Molecular Mechanisms of Development | |
| F207 | Methods for Improvement of Fertility in Cows Postpartum | 527726 | Corn Yield Potential and Economics under Various Irrigation System Capabilities | 526660 | Genetic Control of T Helper Subset Selection | |
| H698 | Innovative Red Meat Production and Processing Systems for the Modern Consumer | 527731 | Bioch Isolation and Promoter Analysis of Phospholipase D Gene | 526661 | Role of Amino Acid Uptake by Mycorrhizal Ericaceous Shrubs in Nitrogen Economy | |
| F704 | Metabolic Relationships in Supply of Nutrients for Lactating Cows | 528142 | Preparation and Properties of an Extruded Corn Zein Film | 526663 | Characterization of <i>Arabidopsis</i> Mutants with Enhanced Expression of Auxin | |
| H744 | Biochemistry of Genetic Systems | F003 | Regulatory, Efficiency, and Management Issues Affecting Rural Financial Markets | 526664 | (number applies to title above) | |
| F865 | Increased Prolificacy in Sheep and Its Impact on Nutritional Needs | H053 | Bioenvironmental Control System for Enclosed Spaces | 526665 | Effects of Micro-G on Gene Expression in Higher Plants | |
| <p>■ Biochemistry</p> | | | H066 | Quantifying the Spatial Variation of Yield for Kansas Crops | 526666 | Konza Prairie Documentary Film |
| | | | H123 | Spatially Variable-Rate Herbicide Application in Kansas Winter Wheat Fields | 526668 | Role of Flies in the Spread of <i>Salmonella</i> in Greyhound Kennels |
| 520776 | Improvement of Soybean via Biotechnological Approaches | H422 | Efficient Surface Irrigation Systems | 526671 | Biochemical Characterization of Phosphatidylinositol (3,4,5) P35-Phosphatase | |
| 522962 | Process to Isolate Readily Accessible Starch | R728 | Monitoring and Modeling Nitrogen Management in Conservation Tillage Production Systems | 526676 | Genetic Improvement of Aspen for Biomass | |
| 527177 | Sheath Blight and Expression of Chitinase and B- Glucanase Genes in Resistant and Sensitive Cultivars of Rice | H899 | Evaluating Practices for Water Quality Enhancement | 526678 | Acquisition of Two Controlled Environment Chambers | |
| 527207 | Structure/Function Analysis of Engineered Mutants of Human Myoglobin | <p>■ Biology</p> | | | 526679 | Research and Development of Iodinated Resins and Devices Containing Them for Air and Water |
| 527215 | Wheat Mitochondrial DNA and Cytoplasmic Male Sterility | | | | 526680 | Local Validation of Global Estimate of Biosphere Properties |
| 527224 | Stored Grain Insect Control by Inhibition of Digestive Enzymes | 521807 | Evolutionary Conservation of the Molecular Mechanisms of Development | 526681 | In Vitro Assay for Cryosporidiosis | |
| 527225 | Thermodynamics of Hydrolysis of Blood-Coagulation Factor | 522360 | Role of Flies in Spread of <i>Salmonella</i> in Greyhound Kennels and Formulation of Control | 526685 | Research in Modeling Metabolism of Attached Stream Algae | |
| 527231 | Biochemical Isolation and Promoter Analysis of Phospholipase D Gene from Castor Bean | 522347 | Bacterial Volatiles Attractive to Stable Flies | 526686 | Evolutionary Conservation of the Molecular Mechanisms of Development | |
| 527235 | Role of Protein Kinase C in Retinopathy | 526580 | Fire, Grazing, and Climatic Interactions in Tallgrass Prairie | 526687 | (number applies to title above) | |
| 527236 | Glucose Studies of Human Lysosomal Glucocerebrosidase | 526587 | Decomposition and Geographic Information System (GIS) Projects at a Tallgrass Prairie LTER Site | 526693 | Stable Isotope Approach for Evaluating Influence of Native Ungulate Grazers in Tallgrass Prairie | |
| 527237 | Molecular Analysis of Mucin-Type O- Glycosylation | 526594 | An Evaluation of Low-Input Sustainable Agriculture for Wildlife Habitat | 526694 | Influence of Gravity as a Determinant in Cellular Biology | |
| 527238 | Metabolic Control of Mammalian Pyruvate Dehydrogenase Complex | 526598 | REU Supplement: Fire, Grazing, and Climatic Interactions in Tallgrass Prairie | 526695 | Long-Term Ecological Research in Tallgrass Prairie: Konza LTER Program | |
| 527247 | Molecular Analysis of Mucin-Type O- Glycosylation | 526602 | Mutational Analysis of Interactions and Function of Ferredoxin | 526696 | Supplement for Genetic Regulation of Developmental Fate | |
| 529048 | Lens Membrane in Relation to Human Cataractogenesis | 526611 | Role of the HSP70 Homologue from Chloroplasts in the Assembly of the Photosynthetic Apparatus | 526697 | Belowground Sinks for Carbon in Arctic Ecosystems | |
| 529049 | (number applies to title above) | 526613 | Lipid Metabolism in the Hibernating Marmot | 526701 | Tallgrass Prairie Documentary Project "Flint Hills: Last Stand of Tallgrass" | |
| 529217 | Serine Proteinsae Inhibitors in Insects | 526614 | The Genetic Control of Developmental Decision | 529260 | Bioserve Space Technologies: A NASA Center for Commercial Development of Space | |
| 529254 | Biochemistry of Insect Hemocytes | 526615 | Topology and Assembly of the Photosystem 1 Reaction Core | 529269 | (number applies to title above) | |
| 529276 | Role of Ordered Helical Segments in Membrane Proteins | 526618 | Evaluation of Wildlife Management Practices on Fort Riley | 529333 | Cell Transformation by Polyomavirus | |
| 529283 | NMR Studies of Protein-Inhibitors of a Blood Coagulation-Factor | | | 529361 | Densely Methylated DNA and Mammalian Replication Origins | |

Research Projects Terminated (Continued)

- F280 Regulation of Photosynthetic Processes
 F849 Pathogenesis, Epizootiology, and Control of Avian Respiratory Diseases
 H863 Crayfish Culture in Kansas
 F940 Avian Species in Diverted Farmland

Chemical Engineering

- H113 Gasification/Pyrolysis of Wood and Grain
 H898 Modern Systems Techniques for Value-Added Processes of Grain and Grain Products

Civil Engineering

- H132 Effect of Vegetation on Leaching of Heavy Metals from Mine Tailings
 H314 Impact of Colloid-Associated Transport of Pesticides on Groundwater Quality

Clinical Science

- 528365 Bald Thigh Syndrome in Greyhounds
 528770 A Dermal Irritation and Sensitization Study in Cats on Cat Litter Deodorizer
 528774 A Safety Study of Glade Carpet and Rug Deodorizer (Formula 2)
 528776 Effects of Intravenous Sodium Hyaluronate on Tendon Healing in Horses
 528777 Safety Study of a Benzyl Product in Cats
 528779 Comparisons of DTPA in Greyhounds
 528780 Biological Detoxification of Aflatoxin and Fumonisin in Corn
 528782 Plasma and Synovial Fluid Concentrations and Effect on Synovium of Ceftiofur Sodium after Intraarticular Injection in Horses
 H080 Advancement in Bovine Orthopedics
 H082 On-Farm Computer Program for Monitoring the Use of Livestock Production Chemicals

Clothing, Textiles and Interior Design

- 528006 High Tenacity Biogeneric Fibers and Films from Products of Corn, Grain Sorghum, and Soybean
 528008 Tensile Testing Instrument for Studying Textiles and Related Polymeric Materials
 528011 Weathering to Evaluate Flammability/Water Repellancy of Kenaf Textile
 F025 Assessment of the Environmental Compatibility of Textiles and Other Polymeric Materials
 H326 Development of Biogeneric Polymers from Agricultural-Based Carbohydrates and Polypeptides by Solvent Spinning Techniques

Diagnostic Medicine/ Pathobiology

- 481886 Interaction of *Pasteurella haemolytica* with Bovine Nasal Mucus
 481891 Pathogenesis of Chronic Bovine Coronavirus Infections
 528365 Bald Thigh Syndrome in Greyhounds
 528366 Greyhound Race Track Deaths
 528373 Investigations of the Impact of Pupae on a Flea Control Program
 528380 Role of *Staphylococcus aureus* Teichuronic Acid in Vivo
 528381 Cell Division Gene Products of *Bacillus subtilis* Disease Causing Potential of Shiga-Like Toxin-Producing Bacteria in Greyhounds: Is a Vaccine Justified?
 528388 Influence of Belly Buster P and Ironvite on Growth Performance and *Salmonella choleraesuis* Shedding in Nursery Pigs
 528389 *Pasteurella haemolytica* Vaccination Trial
 528391 Construction and in Vitro Characterization of Multi- Gene-Deleted Recombination

- 528392 Effect of Pyriproxyfen and Imidacloprid on Flea Population in Naturally Infested Pets and Residences
 528395 Molecular Studies on BIV and BHV Interactions
 528397 Propellant-Driven Vaccine Aerosols for Inducing Immunity against Influenza Virus Respiratory Infection
 528398 Immunogenicity of Oral Recombinant *Cryptosporidium parvum* Antigens in Cattle
 528399 Effects of Fipronil and Imidacloprid Applied Topically to Fleas on Cats
 528400 Preparation of Vaccine Master Seed Stocks for Antigenic Subtypes I and III of Bovine Coronavirus
 528779 Comparisons of DTPA in Greyhounds
 528790 Effects of Subtherapeutic Antibiotics on Shed of Mixture of Susceptible and Resistant *Salmonella typhimurium* Experimentally Inoculated into Pigs
 528902 Vitamin E Adjuvanted Vaccination Immune Response in Racing Greyhounds
 H125 Microsatellite Mapping of Deleterious Genes in the Bovine Genome

Entomology

- 520074 Plant-Insect Interaction Research
 520101 Insecticide Management of Field Crop Insect Pests in Southwestern Kansas
 520106 Biology and Control of Arthropod Pests of Livestock
 520107 Biology and Control of Insect Pests of Stored Products
 520363 Chinch Bug Dietetics
 522316 Ecology of Screwworms in Panama
 522324 Evaluation of *Tyta luctuosa* for Biological Control of Field Bindweed
 522330 Assessing the Potential for Biological Control of Field Bindweed (*Convolvulus arvensis*) with the Gall Mite *Aceria*
 522336 Insect Physiology and Biochemistry
 522344 Biological Control of Field Bindweed
 522345 Management of Corn Insect Pests by Changing Corn Maturity and Planting Date
 522347 Bacterial Volatiles Attractive to Stable Flies
 522350 A Geographic Information System for Pesticide Impact Assessment
 522352 Development of Sorghum Germplasm Tolerant to Greenbug, Aphid- and Mite-Transmitted Potyviruses and Drought
 522353 Transgenic Corn for Pest Management-Research and Extension Needs
 522354 Lipid Utilization during Flight of Female Asian Gypsy Moth
 522355 Use of Gaucho Seed Treatments for Control of Chinch Bug, Greenbug, MDM, Black Cutworm, Wireworm, and Other Pests of Sorghum
 522357 Biological Control of Insect Pests on Field Crops and Feedlots in Kansas
 522358 Kansas Pesticide Impact Assessment Program
 522360 Role of Flies in Spread of *Salmonella* in Greyhound Kennels and Formulation of Control
 522361 Economics and Fly Control of Management-Intensive Grazing System
 522363 Miniaturized Bioassay of Compounds Affecting Greenbug Growth and Reproduction
 522365 Evaluation of the Whitmire Microgen Flea Trap
 522368 University Testing Agreement-Bt Corn
 522372 CGA-293343 Testing
 525994 Identification, Detection, and Variability of the High Plains Pathogen
 526638 Bacterial Volatiles Attractive to Stable Flies
 528373 Investigations of the Impact of Pupae on a Flea Control Program
 H036 Corn, Sorghum, and Wheat Arthropod Pests and Their Management
 H101 Biology and Control of Arthropod Pests on Corn in Southwestern Kansas
 H118 Evaluation of *Gryon pennsylvanicum* for Biological Control of the Squash Bug

- H128 Molecular Systematics of the Hymenopteran Family Aphidiidae

Family Studies and Human Services

- 528055 Evaluation Proposal for the Head Start Family Service Center Demonstration Project
 H365 Rural Access to Health Care Systems in Times of Stress
 H930 Monitoring the Pulse of Kansas Families

Food Animal Health and Management Center

- 528388 Influence of Belly Buster P and Ironvite on Growth Performance and *Salmonella choleraesuis* Shedding in Nursery Pigs
 528389 *Pasteurella haemolytica* Vaccination Trial
 528787 Effect of Chromium Picolinate on Parity One Sow Reproduction and Farrowing
 528788 Antibiotic Induction of L-Form Bacteria
 528789 Growth Performance of Piglets Fed EB-100s after Challenge with a Sublethal
 528790 Effects of Subtherapeutic Antibiotics on Shed of Mixture of Susceptible and Resistant *Salmonella typhimurium* Experimentally Inoculated into Pigs

Foods and Nutrition

- 528135 Expert Evaluation of Products for Kansas Processors
 528136 Epidermal Growth Factor and Preservation in Lung Injury
 528137 Estrogen Replacement: Its Effect on Fat Absorption
 528138 Thermal and Rheological Properties and Textural Attributes of Reduced-Fat Meat Batter Systems Prepared with Corn Starch
 528139 Screening for Flavor of Waxy, Red, Tan, and White Sorghum Varieties for Food Uses
 528140 Evaluation of Grain Odor
 528141 Screening for Flavor of Waxy, Red, Tan, and White Sorghum Varieties
 528142 Preparation and Properties of an Extruded Corn Zein Film
 528143 Antioxidative Effect of Selected Antioxidants Obtained from Natural Sources for Soybean Oil
 528144 Effects of Honey in Heat-Processed and Fresh Salsa
 528145 Dietary Recall Research
 528146 Trained Descriptive Apple Pie Flavor and Texture Profiling Panel
 528149 Leco System of Nitrogen Determination
 528150 Epidermal Growth Factor and Surfactant Preservation in Lung Injury
 528151 Estrogen Replacement: Its Effect on Intestinal Fat Absorption
 528156 Dietary Recall Research-Year 2
 528373 Investigations of the Impact of Pupae on a Flea Control Program
 F628 Development of New Processes and Technologies for the Processing of Poultry Products
 H698 Innovative Red Meat Production and Processing Systems for the Modern Consumer
 R700 Analysis of Consumer Preference and Meat Processor Development of HACCP Systems
 R701 Barriers to Participation in a WIC/Extension Nutrition Education Program
 F945 Health Maintenance Aspects of Dietary Recommendations Designed to Modify Lipid Metabolism

■ Grain Science and Industry

- 521783 Evaluation of Heated Soybean Meal Products Containing Levels of Lipid in Lactating Dairy Cows
- 521796 Extrusion of Grain Sorghum to Improve Digestibility and Enhance Nutritional Value in Lactating Dairy Cattle Diets
- 522932 Research on Milling of Grain Sorghum
- 522934 Novel Bread Baking via the HTST Extruder
- 522936 Treatment of White Wheat Bran to Improve Bread-Making Performance
- 522942 Factors Affecting the Extrusion of Cereal-Based Foods
- 522946 Evaluation of Kansas Wheats in Oriental Noodles/Pasta Type
- 522948 Utilization of Wheat in Starch Thermoplastics Technology
- 522950 Mechanism of Glucose Oxidase in Bread-Making
- 522955 Value-Added Wheat Products
- 522959 Value-Added Flour Fractions from Hard White Wheats
- 522960 Starch in Top Quality Flours for Oriental Noodles
- 522961 Toward a Fundamental Understanding of the New Crop Year Phenomenon in Hard Wheats
- 522962 Process to Isolate Readily Accessible Starch
- 522967 Foamed Plastics Containing Starch
- 522968 Alkali Preprocessing of Corn for Value-Added Products
- 522969 Determination Factors Controlling Crumb Grain of Bread
- 522975 Asian Products Laboratory
- 522976 Techniques of Producing Poured Animal Feed Blocks Containing Cotton Seed
- 522977 Design, Construction, and Evaluation of a High-Velocity Impingement Oven Simulator
- 522980 Grain Extrusion Technology for Novel, Extruded, Healthy Foods from Corn
- 522979 Evaluation of Grade Standards, Tolerances, and Procedures for Garlic Wheat
- 522982 Design, Construction and Evaluation—High-Velocity Impingement Oven Simulator
- 522984 Preparation of a White Bran Fiber Ingredient from White Bran
- 522999 Development and Evaluation of Optimum Guar Grinding Technology
- 523001 Controlled Moisture Addition to Enhance Pelleting Characteristics
- 524258 IAPRG Review Ag Marketing Proposals—Macedonia
- 524259 FAO Consultancy/Tonga
- 525188 Crop Utilization Research Database-Wheat Option
- 525203 Crop Utilization Research Database-Sorghum Option
- 525211 Feeds Postharvest Handling/Uganda
- 525213 FAO Consultance Tonga/Fiji
- 525215 The Grain Storage Project
- 527731 Bioch Isolation and Promoter Analysis of Phospholipase D Gene
- 528147 Development of Extrusion Technology for Novel, Extruded, Healthy Foods from Grain
- 528148 Zinc Deficiency-Its Effect on Vitamin A Transport
- 528205 State of Iowa Food Wastes Database Development
- H051 Improvement of Bread Quality: Kansas High Protein Wheats for Frozen Dough and Specialty Breads
- H117 Early Generation Wheat Quality Testing
- H458 Understanding the Overmixing Phenomena of Bread Dough
- H459 A Capillary Rheometer to Be Used in HTST Extrusion Processes
- H471 Rheology of Doughs and Batters
- F691 Domestic and International Marketing Strategies for U.S. Beef
- H696 Effect of Kernel Hardness on Wheat Millability

- H827 Influence of Wheat Type, Flour Extraction, and Formulation on Quality of Leavened Flat Bread
- H844 Effects of Processing on the Nutritional Impact of Dietary Fiber
- H867 Wheat Utilization: Nonfood and Nonfeed Uses
- H868 Infrared Wheat Protein Screening
- H898 Modern Systems Techniques for Value-Added Processes of Grain and Grain Products
- H959 End-Use Objective Quality Determination in Grain Processing

■ Horticulture, Forestry and Recreation Resources

- 523874 Evaluation and/or Assessment for Turfgrass
- 523876 Perennial Ryegrass Evaluation
- 523877 Increasing Chilling Tolerance of Seeds with Early Germination
- 523882 Blueberry Germplasm Evaluation on Mineral Soils
- 523884 Riparian Buffer Strip-Width Demonstration
- 523886 Evaluating Hawthorn Fruit for Medicinal Purposes
- 523887 Growing Strawberries Using Plasticulture
- 524058 Evaluation of Ornamental Species for the Great Plains
- 524059 Relative Effectiveness of Interpretive Programs Directed by Youth and Adult Naturalists at Children's Forest
- 524061 A Study of Adjacent Landowners along the Kansas River
- H065 Sustainable Intensive Vegetable Production Using Legumes, Manures, and Municipal Compost as Fertilizer Sources
- H067 Turfgrass Water Conservation in Kansas
- H102 Evaluation of Grape and Red Raspberry Cultivars for Kansas
- H127 Determining Drought and Salinity Stress Tolerance Mechanisms of Turfgrass
- H421 High Tunnels for Intensive Vegetable Production in Kansas
- H640 Herbaceous Ornamental and Native Perennial Plant Species as Florist Crops
- R732 Adaptation, Propagation, and Stress of Ornamentals and Turfgrass in South-Central Kansas
- M742 Tree Improvement for Kansas
- H783 Evaluation of Landscape Plants for Kansas
- H856 Studies on the Cold Hardiness of Peach Flower Buds and Grapes

■ Hotel, Restaurant, and Institution Management and Dietetics

- 528203 Development of CD Rom Training Materials for Food Science
- 528204 Menu Development Project
- H069 Applying Expert Systems Technology to the Implementation of a Forecasting Model in Foodservice

■ Kansas Water Resources Research Institute

- 525434 FY 1996 State Water Research Institute Program

■ Plant Pathology

- 524470 Breeding Soybeans for Increased Productivity
- 524475 Non-Conventional Plant Improvement Technology
- 524532 Novel Strategies for Disease-Resistant Rice: Physiological Basis for Resistance to Bacterial Blight
- 524548 Myco-Pharmaceuticals
- 524550 Characterization Mapping of Five New Leaf Rust Resistant Genes
- 524554 Molecular Mapping in Wheat

- 524555 Molecular Cytogenetics and Plant Genome Mapping
- 524556 Role of Avrxa10 and HRP Genes of *Xanthomonas oryzae* pv. *oryzae*
- 524557 Role of Peroxidases in Resistance Pathogens in Rice
- 524560 Molecular Genetic Methods for Plant Pathogenic Bacteria
- 524561 Impacts of Introduced Bioremediation Agents on Plant Productivity
- 524564 Genetic Diversity of *Xanthomonas oryzae* in Nepal
- 524569 Study of the Genetics of Fumonisin Production
- 524570 (number applies to title above)
- 524576 Genetics of Vegetative Compatibility in *Fusarium moniliforme*
- 524582 Use of *Fusarium* Subglutinans as a Seed Treatment and Growth Promoter of Corn
- 524585 Development of DNA Probes and Stocks and Coordination of Wheat Genome Mapping
- 524586 Development cDNA Probes for *Xanthomonas campestris* pv. *holicola* and Determine the Incidence and Severity of Corn Diseases in Central America
- 524591 Ash Yellow in the Great Plains: Determination of Incidence and Damage
- 524594 Evaluation of a Potential Plant Growth-Promoting Fungus as a Means to Enhance Stand Establishment and Growth of Grain Sorghum
- 524596 Determination of the Minimal Inhibitory Concentration of Clorox Household Bleach for Fungicide
- 524607 Predicting Durability of Disease Resistance Based on Analysis of Cost of Pathogen Adaptation
- 524613 Assembling of Data for the IR-4 Program
- H022 Crop Improvement through Cell Culture and Genetic Engineering
- H081 Genetic Analysis of the Mechanisms of Weed and Pathogen Biocontrol by Rhizobacteria
- H093 Alfalfa Breeding and Genetics
- H107 Genome Mapping and Tagging of Useful Genes in Wheat
- H460 Nutrient-Amended Bioremediation of Pesticide-Polluted Soils
- H547 Genetics and Physiology of *Fusarium* spp.
- R705 Oral Immunization against Bovine Coronavirus
- R732 Adaptation, Propagation, and Stress of Ornamentals and Turfgrass in South-Central Kansas
- H895 Etiology, Epidemiology, and Control of Sorghum Diseases

■ Sociology, Anthropology, and Social Work

- 527624 Consequences of Rural Population Decline in the Great Plains
- H034 Cancer Morbidity among Kansas Farmers
- H115 The Effects of Economic and Social Restructuring on Well-Being in Nonmetropolitan Kansas
- H129 New Kansans: Immigrant Minority Students and School Adaptation Patterns
- F939 Community Change and Resistance: A Restudy of the Rural Life Study Series

■ Statistics

- 522330 Assessing the Potential for Biological Control of Field Bindweed
- 527610 Mixed Models Used in the Semi-Conductor Industry

Research Projects Terminated (Continued)

■ **Agricultural Research Center—Hays**

- 520811 Alternative Weed Control Methods for Grain Sorghum Production
- 525966 Canola Research
- 525974 Jointed Goatgrass Competition and Management in Western U.S. Winter Wheat
- 525980 Effect of Polyaspartic Acid on 1996 Dryland Winter Wheat Grown in a 22.5-Inch Precipitation Area
- 525981 Alternative Weed Control Methods for Grain Sorghum Production
- 525982 Development of Sorghum Germplasm Tolerant to Greenbug-, Aphid-, and Mite-Transmitted Potyviruses and Drought
- 525983 Jointed Goatgrass Competition and Integrated Management in Western United States Winter Wheat
- 525984 Beef Research
- 525985 Field and Growth Chamber Testing of Wheat Lines
- 525986 Crop Culture
- 525988 Effect of Rates of Polyacrylamide Applied Broadcast Subsurface and with the Seed on Winter Wheat and Grain Sorghum
- 525990 Effect of Placement and Rate of Polyaspartic Acid on 1997 Dryland Winter Wheat
- 525991 Effect of Polyacrylamides on Crops Grown in Central Kansas
- 525994 Identification, Detection, and Variability of the High Plains Pathogen
- 525995 Reduced Tillage and No-Till Weed Control
- 526187 Impact of Polyacrylamide on Irrigated Crop Production

■ **Northwest Research-Extension Center**

- 520836 Water Conservation-Increased Efficiency in Usage
(number applies to title above)
- 525758 Increasing Yield, Seed Quality, and Water-Use Efficiency of Wheat with Foliar-Applied Methanol
- 525767 Water-Efficient Practices for Corn Production
- 525768 Increasing Yield and Water-Use Efficiency of Soybeans with Foliar-Applied Methanol
- 525769 Corn Yield Potential and Economics under Various Irrigation System Capabilities
- 525770 Effect of Sprinkler Height on Corn Production
- 525771 Water Conservation-Increased Efficiency in Usage
- 525966 Canola Research
- 526177 Water-Efficient Practices for Corn Production
- 526191 Water Conservation-Increased Efficiency in Usage
- H095 Water and Nitrogen Management Using Sprinkler and Subsurface Drip Irrigation
- R294 Soil Management in Northwestern Kansas
- R721 Irrigation and Fertigation for Corn Using SDI
- F865 Increased Prolificacy in Sheep and Its Impact on Nutritional Needs
- H911 Production Methods for Increased Efficiency of Ewe-Lamb Enterprises

■ **Southeast Agricultural Research Center**

- 526402 Development and Evaluation of Commercial Soybean Varieties for Kansas
- 526403 Performance by Grazing Cattle Offered Magnesium-Mica
- 526410 The Effect of Fastrack Probiotic Pack on the Performance of Receiving Calves
- 526411 Effect of Monensin with Magnesium-Mica on Performance of Grazing Cattle

- 526412 Increasing Yield and Water-Use Efficiency of Soybeans with Foliar-Applied Methanol
- H015 Evaluation of Cropping Systems for Southeastern Kansas
- H109 Cultivar Evaluation and Cultural Practices for Soybeans in Southeastern Kansas
- H914 Use of a Tall Fescue with Different Rates of *Acremonium coenophialum* Infections

■ **Southwest Research-Extension Center**

- 520836 Water Conservation-Increased Efficiency in Usage
- 525769 Corn Yield Potential and Economics under Various Irrigation System Capabilities
- 525771 Water Conservation-Increased Efficiency in Usage
- 526165 Cattle Feedlot Management Program
- 526170 Water Conservation-Increased Efficiency in Usage
- 526181 Management Strategies to Maximize and Prolong the Profitability of a Declining Water Supply for Corn and Sorghum Production
- 526182 Influence of Feeding Combinations of Steam-Flaked Sorghum with High-Moisture Corn or Dry-Rolled Corn on Finishing Steer Performance
- 526183 Water Efficient Practices for Corn Production
- 526184 Adapted Woody Plant Materials and Establishment/Growth Technology for Western Kansas, Eastern Colorado, and Northern New Mexico
- 526185 Dispersal of Adult Stable Flies: Phenology of Dispersing Flies
- 526187 Impact of Polyacrylamide on Irrigated Crop Production
- 526188 Feeding High Moisture Milo to Finishing Steers
- 526189 Corn Yield Potential and Economics under Various Irrigation System Capabilities
- 526190 Precision Application of Phosphorus to Winter Wheat
- 526191 Water Conservation-Increased Efficiency in Usage
- R721 Irrigation and Fertigation for Corn Using SDI
- R834 Irrigation Management for Southwest Kansas
- H981 Pest Management of Livestock Insects in Western Kansas



FY97 and FY98 Income and Disbursement Statement, Kansas Agricultural Experiment Station

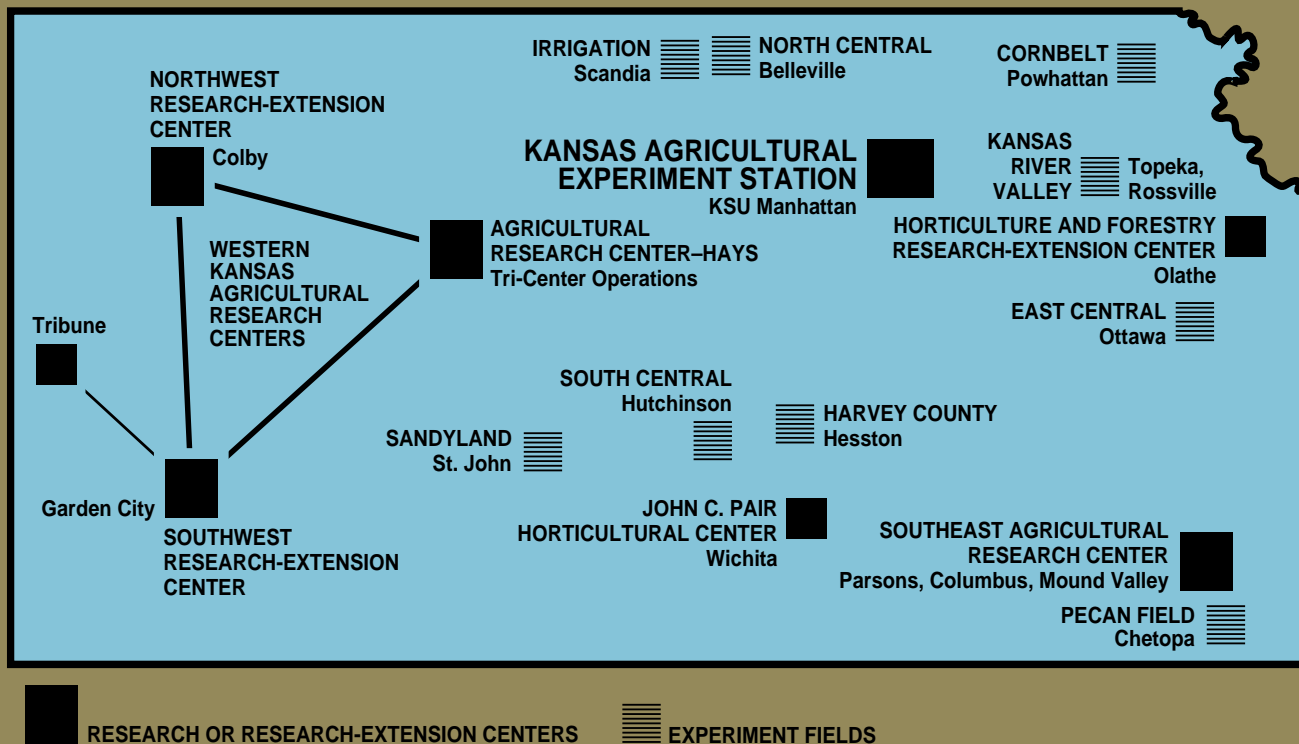
| | 7.26% | 50.22% | 14.86% | 27.65% | | |
|-----------------------------------|--------------------|---------------------|--------------------|---------------------|---------------------|---------------|
| FY97 FUNDING | \$3,484,581 | \$24,091,922 | \$7,130,111 | \$13,264,642 | \$47,971,256 | |
| | Federal | State* | Fees | Sponsors | Total | |
| FY97 EXPENDITURES | | | | | | |
| Faculty & Administrative Salaries | \$2,088,001 | \$14,698,345 | \$582,869 | \$6,222,401 | \$23,591,616 | 49.18% |
| Classified & Student Salaries | \$336,372 | \$5,568,119 | \$1,002,985 | \$1,300,515 | \$8,207,991 | 17.11% |
| Contract Services & Travel | \$338,445 | \$1,457,340 | \$1,322,073 | \$2,588,205 | \$5,706,063 | 11.89% |
| Supplies & Materials | \$462,562 | \$1,464,720 | \$2,971,026 | \$1,929,929 | \$6,828,237 | 14.23% |
| Equipment | \$259,201 | \$903,398 | \$1,251,158 | \$1,223,592 | \$3,637,349 | 7.58% |
| Other | \$0 | \$0 | \$0 | \$0 | \$0 | 0.00% |
| Totals | \$3,484,581 | \$24,091,922 | \$7,130,111 | \$13,264,642 | \$47,971,256 | 100% |

| | 6.19% | 49.17% | 16.74% | 27.91% | | |
|-----------------------------------|--------------------|---------------------|--------------------|---------------------|---------------------|---------------|
| FY98 FUNDING | \$3,193,111 | \$25,343,617 | \$8,630,351 | \$14,390,102 | \$51,557,181 | |
| | Federal | State* | Fees | Sponsors | Total | |
| FY98 EXPENDITURES | | | | | | |
| Faculty & Administrative Salaries | \$2,068,076 | \$15,884,413 | \$552,424 | \$6,601,337 | \$25,106,250 | 48.70% |
| Classified & Student Salaries | \$253,487 | \$5,762,735 | \$1,032,149 | \$1,408,876 | \$8,457,247 | 16.40% |
| Contract Services & Travel | \$283,975 | \$1,646,028 | \$1,438,662 | \$3,174,904 | \$6,543,569 | 12.69% |
| Supplies & Materials | \$416,683 | \$1,229,235 | \$3,842,054 | \$1,827,231 | \$7,315,203 | 14.19% |
| Equipment | \$170,890 | \$821,206 | \$1,765,062 | \$1,337,754 | \$4,134,912 | 8.02% |
| Other | \$0 | \$0 | \$0 | \$0 | \$0 | 0.00% |
| Totals | \$3,193,111 | \$25,343,617 | \$8,630,351 | \$14,390,102 | \$51,557,181 | 100% |

*Includes IGP and ILP

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