

*The Kentucky
Agricultural Experiment Station*

122nd

Annual Report
2009

To His Excellency,
The Honorable Steven L. Beshear
Governor of Kentucky

I herewith submit the one hundred and twenty-second annual report of the Kentucky Agricultural Experiment Station for the period ending December 31, 2009. This is done in accordance with an act of Congress, approved March 2, 1887, titled "An act to establish Agricultural Experiment Stations, in connection with the Agricultural Colleges established in the several states under the provisions of an act approved July 2, 1862, and under the acts supplementary thereto," and also the act of the Kentucky State Legislature, approved February 20, 1888, accepting the provisions of the act of Congress.

Very respectfully,

Nancy M. Cox

Nancy M. Cox, Associate Dean for Research
Director, Agricultural Experiment Station
Lexington, Kentucky
June 30, 2010

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Experiment Station-Affiliated Departments and Centers

Agricultural Economics
Animal and Food Sciences
Biosystems and Agricultural Engineering
Community and Leadership Development
Entomology
Equine Initiative
Family Studies
Forestry
Horticulture
Kentucky Tobacco Research and Development Center
Landscape Architecture
Livestock Disease Diagnostic Center
Merchandising, Apparel, and Textiles
Nutrition and Food Science
Plant and Soil Sciences
Plant Pathology
Regulatory Services
Robinson Center for Appalachian Resource Sustainability
Sustainable Agriculture and Food Systems Working Group
Tracy Farmer Institute for Sustainability and the Environment
UK Research and Education Center at Princeton
USDA-Agricultural Research Service-Forage Animal Production Research Unit
Veterinary Science

Purpose of the Kentucky Agricultural Experiment Station

As a land-grant institution, the University of Kentucky is responsible for serving the people of the Commonwealth of Kentucky. The College of Agriculture, with its research, teaching, and extension activities, has developed a structure and organization to provide the mandated land-grant services in agriculture and related areas.

The Kentucky Agricultural Experiment Station has been providing research results to farmers and rural residents for more than 100 years. The continued advancement of Kentucky agriculture attests to the benefits of applying new knowledge and technology. Much of the research leading to increased quantity and improved quality of Kentucky's agricultural output was performed by the Experiment Station. College researchers also have successfully addressed problems of agribusiness, consumers, international trade, food processing, nutrition, community development, soil and water resources, bioenergy, and the environment.

Although much Experiment Station research has immediate application to agricultural- and natural resource-related problems, scientists are also involved in basic research, generating new information to help solve present and potential problems. The ability of Kentucky producers to be competitive in domestic and world markets requires an expanded base of knowledge in emerging areas of research applicable to agriculture, food, and natural resources.

This Annual Report lists Experiment Station research projects and publications completed during 2009. A personnel list is also provided.

The research programs of the Kentucky Agricultural Experiment Station have benefited Kentucky's agriculture over the past century, and the results of present and future research will continue to serve Kentucky's primary industry.

Statewide Research

Research activities of the Kentucky Agricultural Experiment Station were conducted at Lexington, Princeton, Quicksand, and Owenton and in counties throughout the state in 2009.

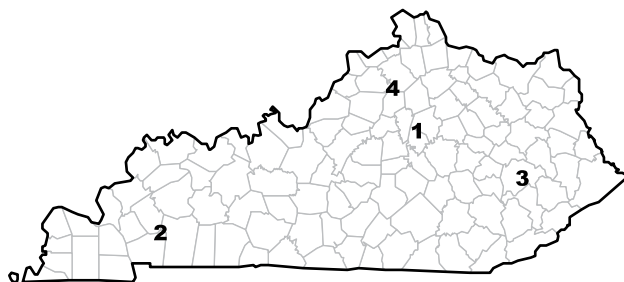
Efforts are constantly made to ensure that the research studies have application to the problems of all Kentucky farmers and other clientele groups. Locations of the experimental facilities provide conditions representative of most sections of the state.

Map Position 1

- **Campus**—Laboratories and specialized equipment for all research program areas.
- **Coldstream-Maine Chance-Spindletop Farms**—Dairy cattle, poultry, and horses; forages and grain crops, tobacco, and turf.
- **Horticulture Research Farm**—Fruits, vegetables, and ornamentals, including organic production.
- **UK Animal Research Center (Woodford County)**—This farm was purchased in late 1991 as a location for development of state-of-the-art food animal (beef cattle, sheep, and swine) research programs.

Map Position 2

- At **Princeton (Caldwell County)**, the Research and Education Center facilities and the West Kentucky Substation Farm are devoted to research on grain crops, beef cattle, fruits, ornamentals and vegetables, forages, and tobacco.



Map Position 3

- At **Quicksand (Breathitt County)**, the Robinson Center for Appalachian Resource Sustainability is the location of research on fruits and vegetables, ornamentals, forages, grain crops, tobacco, and wood utilization. Quicksand is also the headquarters of Robinson Forest, which spreads over parts of Breathitt, Perry, and Knott counties and is the site of forestry and watershed management research.

Map Position 4

- At the **Eden Shale Farm**, located in Owen County near Owenton, experimental and demonstration studies are conducted on forage crops, tobacco, fruits and vegetables, and beef management.

Equine Initiative

In March 2005, UK's College of Agriculture set out to better serve Kentucky's multi-breed horse industry by building on the university's strong tradition of excellence in equine research, instruction, and service and to enhance the state's well-deserved status as the "Horse Capital of the World." UK President Lee T. Todd Jr. named the Equine Initiative as one of UK's "Commonwealth Collaboratives," a term encompassing projects aimed at improving Kentucky's schools, business climate, environment, health care, and lifestyles.

The mission of the Equine Initiative is to discover, share, and apply new knowledge that will enhance the health, performance, and management of horses commensurate with the signature status of Kentucky's horse industry. It is an overarching framework for all equine programs at UK and employs a cross-departmental and cross-disciplinary approach within the College of Agriculture.

The Equine Initiative is reflective of UK's Top 20 vision and since its inception has attracted new students, new faculty, and new research and outreach opportunities for the state. Its ultimate goal will be realized when UK becomes the world leader in equine teaching, research, and outreach/extension. Currently, the College of Agriculture has an equine focus that includes a team of more than 50 faculty and staff working from eight different departments. Eight new horse-oriented faculty have been hired since the Equine Initiative's inception.

One of the most tangible of the Equine Initiative's enhancements was the formation of an undergraduate degree program. There are now 110 students in the program, with just over 50 percent from outside Kentucky. While a lot of other schools have an equine major of some type, only two other land-grant universities in the United States—Colorado State and Arizona State—have stand-alone equine degree programs.

Noteworthy Developments in 2009

Some of the notable programs and partnerships undertaken or continued by the Equine Initiative include:

- The launch of a free monthly equine research e-newsletter in conjunction with TheHorse.com called the "Bluegrass Equine Digest." This publication features equine research happening at UK. It has 18,000 monthly subscribers as well as one of the highest click-through rates for stories appearing in TheHorse.com's newsletters.
- Recognition as the official equine program for the 2010 Alltech FEI World Equestrian Games. The Equine Initiative will be part of the UK Village at the games.
- A partnership with UKHealthCare called "Saddle Up Safely." With a goal of making a great sport safer, the campaign aims to help riders more safely engage in their passion. The five-year program is designed to be a lasting legacy of the 2010 Alltech FEI World Equestrian Games. The campaign includes brochures, continuing medical education opportunities, education-based programs, a volunteer-based speakers

auxiliary, a Web site featuring safety tips and stories from injured riders, and a Web log hosted by Fernanda Camargo, an assistant professor in the College of Agriculture and head of Kentucky's 4-H horse program.

- Working with top reproductive scientists and veterinarians at Hagyard Equine Medical Institute and Rood and Riddle Equine Hospital to help plan for the next International Equine Symposium on Reproduction. It is to take place in Kentucky in 2010 and will attract scientists from across the world to UK's campus.
- Partnering with the University of Louisville on hosting a biennial Kentucky International Equine Summit in 2010. The focus of the program will be to help volunteer leaders of equine organizations discover and implement practical solutions to the challenges facing their diverse industry through enhanced communication, scientific research, and expansive cooperation.
- Design of a consortium booth themed "Where else for an equine education?" by UK and eight other equine higher-education programs recognized by the Council of Postsecondary Education. The booth will promote Kentucky as *the* place for students to look to for an equine higher education. This booth will be part of the 2010 Alltech FEI World Equestrian Games in the Equine Village and will also serve as a legacy effort, enabling representatives from the schools to travel to events around the country and promote horse programs in Kentucky in the years ahead. The Equine Initiative worked with these schools throughout most of 2009 to implement a shared vision.
- A first-ever equine-focused field day held June 1 that attracted more than 150 attendees to UK's Maine Chance Equine Campus to learn about topics spanning pasture management, weed control, reproductive research, and environmental compliance.
- Partnering with Rood and Riddle Equine Hospital on Hats Off to Kentucky's Horse Industry Day, a free day at the Kentucky Horse Park that educates the general public about the importance of Kentucky's horse industry and raises money for important equine charities.
- Sponsoring a Distinguished Lecture Series to showcase prominent equine industry leaders and provide students and the general public the opportunity to listen to an interview conducted with these industry leaders and interact with them. The inaugural speaker in November was Nick Nicholson, president of Keeneland.
- Naming Dan Rosenberg a Friend of the Equine Initiative for his support and guidance since the Equine Initiative's inception.
- Hosting a student career fair through the Equine Initiative's Student Working Group. The fair attracted more than 30 area businesses and featured talks about careers and job hunting for equine students at UK as well as many other area university

and college equine programs. The success of this fair has led to plans for yearly career fairs hosted by UK.

Program areas of excellence for equine science in the College of Agriculture include:

- **Maxwell H. Gluck Equine Research Center:** Developed vaccines against six of the 10 most common equine infectious diseases.
- **Livestock Disease Diagnostic Center:** Serves as an animal health sentinel and has the highest equine caseload in the world.
- **Department of Animal and Food Sciences:** Has a notable legacy in nutrition research.
- **4-H and Youth Programs:** Reach more than 6,000 youth.
- **Horse College,** an adult education program: Reaches more than 1,500 people.
- **Pasture Evaluation Program:** Has evaluated more than 50 horse farms and 3,700 acres in central Kentucky.
- **Economic Cluster:** Concept expansion.
- **Horse Environments:** Research on mud, pervious concrete, stream crossings, and more.
- **HorseQuest:** Central Web-based source for information.

Kentucky Tobacco Research and Development Center

The Kentucky Tobacco Research and Development Center (KTRDC) conducts and supports unique research programs that examine new agricultural crop opportunities based on tobacco and other plants.

The KTRDC program emphasizes applications-oriented research specifically designed to facilitate the development of new crop-based businesses and technologies for Kentucky agriculture. KTRDC-funded projects explore the development and use of tobacco as a production system for plant-made pharmaceuticals and industrial products and the discovery and development of new plant natural products having potential for commercialization.

Located in its own building on the University of Kentucky campus in Lexington, the Center is funded by a dedicated tax on cigarette sales in Kentucky.

Tobacco/PM(I)P Research

Agriculture is realizing huge benefits from improved crops developed through application of plant biotechnology. These new crop varieties exhibit such useful qualities as remarkable resistance to insect damage, markedly reduced dependence on herbicides, etc. Following these advances in crop-performance traits, there is increasing interest in engineering plants to make new products, thereby enabling agricultural crops to be used as renewable resources supplying such valuable materials as medical drugs, industrial enzymes, specialty plastics, and novel food ingredients. These new applications for plants, including tobacco, have the potential to generate entirely new markets for farmers and growers. Such new opportunities are constantly in demand as traditional tobacco agriculture declines and the family farm seeks new agricultural markets. And while the production of protein-based medical drugs in plants might be regarded as competitive with traditional methods of manufacturing them (fermentation using cultured microbes and animal cells), the use of plants to make industrial materials that are conventionally obtained from petroleum will obviously be of immense benefit in a future of rising and fluctuating oil prices.

The primary goal of KTRDC research is to facilitate and encourage the use of tobacco in Kentucky as a production system for plant-made pharmaceuticals (PMPs) and plant-made industrial products (PMIPs).

Research on Plant Natural Products

The Center is also developing new technologies to expand the discovery and use of non-protein substances that are made naturally by tobacco and other plants, collectively referred to as “plant natural products.” Many plant natural products are familiar as flavors and fragrances, medicinals, and natural insecticides. Moreover, as mentioned above, many chemicals and consumer-products companies are now taking a serious look at plants as alternatives to petroleum as sources of industrial “feedstocks” for manufacturing plastics, adhesives, and other familiar materials. This application for plants, which is developing in parallel with the more familiar biofuels opportunities, is poised for very rapid expansion and development.

The Center’s research on plant natural products encompasses several approaches and aspects, including metabolic engineering of the plant to diversify and customize the natural products themselves, development of novel detection and screening methods to facilitate natural-product discovery, manipulation of the plant genome to increase yields of biomass and specific natural products, “domestication” of uncultivated species to make them viable as new crops, etc.

Research and Services

The overall objective of KTRDC research is to encourage and facilitate the development of new crop opportunities for Kentucky agriculture based on new applications for the tobacco plant and new plant-derived “natural products.” KTRDC-funded projects address this objective in several different ways:

- Optimizing the tobacco plant, and tobacco production, for PM(I)P applications;
- Devising new “support” technologies for PM(I)P commercialization, addressing bioprocessing, harvesting, identity preservation, and regulatory compliance, etc.;
- Developing new technologies for enhanced gene expression, metabolic engineering, and discovery of novel natural products in plants;
- Discovering and developing new plant-product concepts having potential to create new markets;
- Assisting companies to explore the use of plants as manufacturing systems for new products.

KTRDC research is conducted by a team of scientists and faculty at the Center's facilities and also through grants to university faculty in Kentucky. KTRDC grants enable investigators to initiate new lines of research having relevance to the KTRDC program, such as improved gene-vector systems for high-level expression of proteins in tobacco and new strategies for extraction and purification of protein products from plants. In addition, KTRDC in-house research emphasizes longer-term projects and ongoing services, as illustrated by the following examples:

Developing prototype tobacco plants to explore the potential of newly discovered genes to enhance plant performance: Dr. Indu Maiti's research group uses promoter technology proprietary to the University of Kentucky to prepare transgenic plants for collaborators in the commercial and academic environments.

Economic modeling of new applications for tobacco: Dr. Orlando Chambers' research includes detailed analysis of tobacco production strategies as well as in-depth surveys of markets and the commercial potential for diverse product types that might be derived through tobacco farming. This research is used in the design of new tobacco varieties for PMP applications and to assist companies that may become future customers of the tobacco farmer.

Manipulation of "plant natural products": The enormous variety of medicinal substances, food ingredients, and structural materials obtained routinely from plants attests to their vast potential to produce useful chemical compounds.

Dr. George Wagner's research explores novel materials produced on the surface of the tobacco leaf, which have potential use as pesticides, industrial chemicals, and pharmaceuticals.

Dr. Ling Yuan is exploring the genetic regulation underlying the production of natural products in plant cells and aims to apply this knowledge to develop novel plants that make useful new substances.

Dr. Guiliang Tang investigates plant natural product pathways using gene silencing technology.

Development of a new tobacco variety and optimized tobacco production system for PMP applications: KTRDC research conducted by Drs. David Zaitlin, Orlando Chambers, and Rich Mundell is focused on the development of a new tobacco type that will be more economical to produce and better suited to the new applications of the plant as a protein-manufacturing system. The desired new "vehicle" variety for field-based production will exhibit such characteristics as disease resistance (blue mold, black shank), more economical production through multiple (mechanized) harvesting, compatibility with all appropriate gene expression systems, and several features that will obviate any possibility of commingling with conventional tobacco (i.e., providing "identity preservation"). A separate line of research is aimed at developing an equivalent "vehicle" variety for production exclusively in a contained environment such as greenhouses. This variety-development research has resulted in considerable collaboration and contract-funded work with industry as companies developing the gene-expression technologies and products for PM(I)P applications of tobacco have

sought help from KTRDC in regard to the agricultural aspects of implementing scaled-up production. KTRDC's support has, in turn, helped showcase Kentucky as a possible location for the companies' future operations.

Facilities and Equipment

The KTRDC building provides approximately 66,000 square feet of laboratory and office space. State-of-the-art growth rooms provide controlled, round-the-clock, monitored environments for propagation and maintenance of plants and cultured plant tissues. Greenhouse space is available nearby, and KTRDC has its own greenhouses at the university's Spindletop Farm in Lexington.

KTRDC houses equipment for DNA sequencing and analysis, DNA microarray technology, automated liquid handling, most forms of chromatography, and basic mass spectrometry. All KTRDC offices and laboratories are equipped with high-speed data ports and a wireless Internet system for computer networking.

Noteworthy Developments in 2009

Full details of the research progress made by KTRDC-funded scientists in 2009 can be found in a separate KTRDC Annual Report for 2008-09 available directly from the Center. The following highlights serve to illustrate some of this work.

KTRDC research in support of tobacco-based production of pharmaceuticals and industrial products has continued productively on several fronts. Thorough review of the history of commercial development of the plant-made pharmaceuticals (PMPs) concept suggests that today's PMP focus on production of vaccines and off-patent pharmaceuticals has a much better chance of success than the industry's former emphasis on high-value, on-patent proteins. Progressive improvements and advances in the technologies employed in the PMP strategy, including methods and techniques currently in use at KTRDC, also contribute to these improved prospects. Consistent with these developments and with the current industry trend toward indoor greenhouse production for the medical products, the KTRDC farm team has been engaged in developing tobacco types and cultivation methods that are optimally suited to this very different way of producing tobacco. This work, managed by Dr. Maelor Davies and Dr. Chambers, is largely supported by a commercial research contract from a company that is relatively new to the PMP opportunity.

Through the provision of a new KTRDC research grant to a UK research team led by Dr. Yuan, in collaboration with Kentucky Bioprocessing (KBP) in Owensboro, Kentucky, the Center is also continuing to support work aimed at making industrial products in tobacco. In this particular project, the intended commercial product will be a novel enzyme for use in the manufacturing of biofuels. Industrial products are likely to be made using field-produced plants. The Center has also collaborated with KBP on methods for efficient harvesting of field-grown tobacco for these new purposes.

As these projected new tobacco uses continue to progress, interest in the enhancement of traditional tobacco production

using transgenics is also increasing. Dr. Davies is conducting a grant-supported study of the feasibility and potential value of transgenic enhancements to traditional tobacco. For any transgenic production, it will be necessary to evaluate and develop improved containment measures to ensure adequate segregation of genetically engineered tobacco from the conventional crop. At KTRDC, the results from Dr. Mundell's six-year study on tobacco seed's persistence in the environment indicate that transgenic tobacco seed could remain viable longer than the currently mandated monitoring period. Results from a plant-topping and flower-removal study also indicate that improvements may be necessary in the generally approved methods for containment of transgenic tobacco, as under appropriate conditions, removed flowers will continue to develop, dehisce pollen, and potentially produce viable seeds. We anticipate that these findings will prove useful in the future development of improved containment measures. Collectively, the above projects illustrate KTRDC's continued commitment and progress in support of new prospects for Kentucky's tobacco agriculture.

Research conducted at KTRDC has continued to advance the development of strategies to combat blue mold, a disease of tobacco that continues to pose a threat to efficient production for both traditional and new uses of the crop. Dr. Zaitlin has measured the genome size of the blue mold pathogen, *Peronospora tabacina*, and found it to be 60 million base pairs. This size compares favorably with the genome sizes of other, closely related plant pathogens. In a collaboration with the UK Advanced Genetic Technologies Center, the nucleotide sequence of the blue mold genome was determined using a Roche/454 Genome Sequencer, an instrument that employs the very latest in massively parallel, high-throughput DNA sequencing chemistries. Dr. Zaitlin anticipates that analysis of the genome sequence (gene prediction and annotation) will allow him to identify genes involved in establishment of blue mold disease on susceptible tobacco. Preliminary results from Dr. Wagner's research with leaf-surface substances called phylloplanins suggest that over-expression of these native substances in the tobacco plant may reduce its susceptibility to the disease. This pioneering work has been conducted in collaboration with the Plant Genetic Engineering Service directed by Dr. Maiti at KTRDC. The service, which uses proprietary gene-expression technologies developed by Dr. Maiti, also initiated an exciting new collaborative project in 2009 aimed at customization of plants for more efficient production of biofuels.

In KTRDC research on plant natural products, Dr. John Littleton reports that during 2009 his team made excellent progress in developing selection procedures that enable the team to identify mutant plant cell cultures that overproduce substances having potential value as pharmaceuticals. One of

the best examples concerns the medicinal plant *Catharanthus roseus* (Madagascar periwinkle). This plant is used to produce the extremely expensive vinca alkaloids, which are used in the chemotherapy-based treatment of leukemias and lymphomas. The researchers were able to show that a selected population of cultures contained higher levels of substances resembling the vinca alkaloids than the nonselected population. This technology makes it possible to direct the cellular evolution of plant cells toward greater production of these economically and therapeutically valuable natural products. Dr. Yuan's group reports the isolation of a tobacco gene that plays a key regulatory role in governing the plant's production of the class of natural products called anthocyanins. Research into this and other "transcription factor" genes is expected to yield new technologies for enhancing the plant's production of useful materials in the future. Also in the field of plant natural products, Dr. Tang has continued to make progress in harnessing the latest "microRNA" technology to develop a special genetic "tool" that can be used to switch off the operation of several genes in the plant at the same time. This invention should also prove useful in the design of plants that will make novel products.

In KTRDC research into new agricultural biotechnologies, Dr. Jan Smalle highlights his identification of a new mechanism that controls plant size. This mechanism involves control of protein degradation, and it regulates the equilibrium between cell division and cell expansion in plant shoot organs. KTRDC has provided research funding for this project as part of the Center's continuing interest in promoting research relevant to plant productivity for future production of biofuels and other biomaterials. Dr. Hongyan Zhu has continued to advance the use of plant genomics technologies to improve the important forage crop, alfalfa. Significant progress was made with a KTRDC-funded project toward cloning a gene that may confer resistance to powdery mildew disease. Dr. Zhu also reports an exciting advancement in our understanding of how legume plants such as soybeans and alfalfa utilize atmospheric nitrogen; intriguingly, the plant's mechanism for associating with bacteria that conduct the nitrogen "fixation" process may be related genetically to its mechanisms for recognizing bacteria that cause disease.

It is also a pleasure to report as a highlight of 2009 that KTRDC was again able to fund a grants program. The one-year pilot-project grants are intended to enable the recipients to generate preliminary research data that will then be used in applications to other funding sources. The new program attracted many proposals, and the successful applicants will conduct research in many fields relevant to the Center's mission. It is especially pleasing to note the inclusion of some topics that we have not supported in previous years, such as applications of nanotechnology to plants.

Livestock Disease Diagnostic Center

Administration

Craig N. Carter

The Livestock Disease Diagnostic Center (LDDC) strives to be one of the premier veterinary diagnostic laboratories in the United States, providing the very best and most timely services in support of the practicing veterinary profession, Kentucky animal agriculture, the signature equine industries, companion animals, and public health. As the state's flagship veterinary diagnostic laboratory, the LDDC's primary goal is to develop, apply, and utilize state-of-the-art veterinary diagnostic testing methods and scientific knowledge to improve animal health and marketability, preserve the human-animal bond, and help protect and improve public health through the early and accurate identification of zoonotic diseases.

In addition to its clinical diagnostic role, the LDDC provides surveillance for emerging and endemic diseases such as West Nile virus, chronic wasting disease of deer, contagious equine metritis, bovine spongiform encephalitis (mad cow disease), and avian influenza. Furthermore, the laboratory is always on the watch for the emergence of foreign animal diseases such as foot and mouth disease and classical swine fever.

Animal owners use the LDDC's services through their practicing veterinarians who have expertise in selecting, preparing, shipping, and submitting the proper specimens for testing when necessary. Laboratory findings are reported back to the submitting veterinarian who then consults with his or her clients to implement a treatment protocol or a preventative solution to disease problems on the farm.

The LDDC faculty, scientists, and technical staff are specialists in essential scientific disciplines directly related to animal health including bacteriology, clinical pathology, epidemiology, extension, molecular biology, pathology, serology, toxicology, virology, and informatics. Disease diagnostic efforts are coordinated and handled by specialists in the appropriate disciplines. Complex clinical cases involving multiple sections are monitored by highly qualified case coordinators. The LDDC is organized into sections so that specialized workload/activities can be handled efficiently.

2009 HIGHLIGHTS:

The American Association of Veterinary Laboratory Diagnosticians (AAVLD) is the national accrediting agency for state and university veterinary diagnostic laboratories. After two years of intense preparation, the AAVLD Accreditation Team inspected the LDDC in May 2009. In July 2009, the LDDC director was notified that the laboratory had achieved full accreditation for the first time in history. This achievement inspires confidence in LDDC clients and Kentucky's animal agricultural trading partners.

Soon after receiving AAVLD accreditation, the LDDC applied for membership status in the National Animal Health Laboratory Network. This network provides surge capacity for

the National Veterinary Services Laboratory in the face of serious disease outbreaks. Based on its credentials, the LDDC was approved as a full member in October 2009. Laboratory staff are now being trained to conduct specialized testing in response to an outbreak. The LDDC will receive a minimum grant in the amount of \$50,000 per year from the USDA to purchase equipment/reagents and to conduct any necessary training.

In September 2008, a groundbreaking ceremony was held to signify the start of a \$28.5 million renovation/expansion construction project that will nearly double the square footage of the facility. During 2009, all foundation work, structural steel, and much of the mechanical, electrical, and plumbing work was completed. The current schedule for occupancy of the new/renovated facilities is as follows:

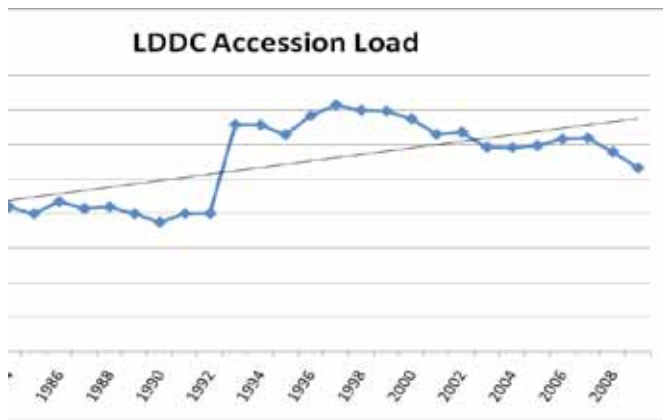
- New necropsy facility—occupancy by January 2010.
- New administration/education wing—occupancy by August 2010.
- New pathology offices and serology and histology laboratories—occupancy by June 2010.
- Balance of renovation—completed by January 2010.

The LDDC received roughly 3,268 cases in 2009 (down roughly 8% from 2008), including almost 3,000 complete necropsies. The caseload decrease correlates with the general economic downturn for 2009. Total tests run in each laboratory section will be listed in the individual section reports.

The LDDC implemented a new fee/test schedule in 2009 that charges per test for all equine accessions. This and other adjustments to the schedule resulted in a \$219,390 increase in fee income for 2009 (increase of 21.1%). These funds will be used to replace aging instrumentation and equipment in various laboratory sections.

The LDDC successfully implemented a new Laboratory Information Management System (LIMS) and a new billing system on Aug. 1, 2009. This state-of-the-art system is part of a statewide animal health network that will soon be complete. The new system offers new services to clients such as emailing of laboratory reports and Web access to client data. Support for handheld devices is in the planning stages.

The LDDC continues to build its outreach programs around Kentucky. The LDDC staffed an exhibit in Lexington for the Kentucky Cattlemen's Association annual meeting in January 2009 and also in Louisville for the Kentucky Veterinary Medical Association (KVMA) annual meeting in October 2009. The Kentucky VetLabNet listserv continues to distribute animal health bulletins and has grown to a list of over 550 LDDC clients. Over 200 field investigations were conducted by the epidemiology section on Kentucky farms, mostly in support of a research project to quantify exposure of foals to *Rhodococcus equi*. The LDDC still contributes articles quarterly to the KVMA journal and the Kentucky Cattlemen's Association *Cow Country News*. The LDDC director, faculty, and staff continue to deliver lectures at scientific and lay meetings and participate in the monthly Equine Diagnostic Research Seminar Series at the LDDC.



The LDDC has been fortunate to recruit some topnotch faculty and staff in 2009. Many thanks to Deans Scott Smith and Nancy Cox for their assistance in making this recruitment possible. The following positions have been filled:

- Dr. Michelle Bilderback, Ruminant Extension Veterinarian
- Bonnie Decker, Clinical Pathology Section Chief.

Some research projects in progress during 2009 at LDDC were as follows:

- Kentucky Horse Racing Commission race horse breakdown project, Dr. Laura Kennedy
- Wobbler syndrome, Dr. Jennifer Janes
- Contracted foal syndrome, Dr. Craig Carter
- Continuous health monitoring of cattle, Dr. Craig Carter, Jackie Smith
- Animal disease cluster detection, Dr. Craig Carter
- Contagious equine metritis trial, Dr. Mike Donahue
- Enhanced herpes PCR screening, Steve Sells
- *Rhodococcus equi* pneumonia in foals, Dr. Craig Carter, Jackie Smith
- Nocardioform placentitis study, Dr. Neil Williams, Steve Sells
- Equine uterine rupture study, Dr. Cindy Gaskill, Dr. Lori Smith, Dr. Neil Williams.

Dr. (Lt. Col.) Carney Jackson, LDDC veterinary pathologist and member of the Kentucky Air National Guard, deployed to Afghanistan with an agricultural development team in June 2009 for a period of one year. On this deployment, he is assisting the Afghan Ministry of Agriculture, two veterinary schools, and farmers by providing animal health training. His team is also involved in capacity building for animal agricultural operations in and around Kabul, Afghanistan. Dr. Jackson is scheduled to be back in his position at LDDC sometime around July 2010.

Dr. Craig Carter, LDDC director, assumed the role of president-elect of the American Association of Veterinary Laboratory Diagnosticians. In this role, Dr. Carter is program chair for the annual meeting that will be held in Minneapolis in November 2010. Dr. Carter is also executive director of the World Association of Veterinary Laboratory Diagnosticians. In this role, he oversaw the planning for a scientific symposium on diagnostic veterinary medicine in Madrid, Spain, in June 2009.

Bacteriology/Mycology

Mike Donahue

The primary mission of the Bacteriology/Mycology Section of the LDDC is to detect or isolate and identify pathogenic bacteria or fungi present in animals. The section also determines the antibiotics that might be used for the treatment of specific bacterial infections. The section is also responsible for culture of *Taylorella equigenitalis* and *T. asinigenitalis* for the federal/state CEM regulatory program in equine.

2009 HIGHLIGHTS:

- Approximately 11,500 aerobic cultures were performed on samples submitted to the LDDC; significant bacterial pathogens were found in about 50% of the samples.
- Approximately 1,100 milk samples from dairy cows were tested for microorganisms that cause mastitis; over 50% were positive for pathogenic microorganisms.
- Approximately 2,500 different bacterial isolates were tested to determine the antibiotics that could be used for their treatment in exposed animals.
- Approximately 9,350 samples from equines in Kentucky were cultured for the contagious equine metritis organisms. All horses tested were negative for *T. asinigenitalis* and *T. equigenitalis*. Because of the detection of four positive stallions by this section in late 2008, the number of samples received was about 33% higher than in 2008. Nationwide, 22 stallions and five mares were confirmed to be infected. Early detection of this infection in the Quarter Horse population by this laboratory prevented this disease from becoming more widespread in the U.S. equine population.
- In cooperation with researchers at Michigan State University, the normal flora of the genital tract of male donkeys is being determined. An important preliminary finding of this study is that *Taylorella asinigenitalis*, one of the bacteria causing contagious equine metritis, is sometimes a part of the normal flora of male donkeys and that it can persist for at least 12 months in these animals.
- An investigation was undertaken with researchers at UK's Maxwell H. Gluck Equine Research Center to determine if the treatment of semen with antibiotics will prevent the transmission of *T. equigenitalis* to mares bred by artificial insemination. Preliminary results indicated that the antibiotics did prevent the transmission of the disease.
- Approximately 1,750 samples from horses were tested for the presence of leptospirae and tissues from 24 fetuses and/or placentas were positive.
- In conjunction with the Molecular Biology Section of the LDDC, we are continuing to evaluate a PCR method for detecting *Crossiella equi* and *Amycolatopsis* spp. in equine placentas. These bacteria are the primary cause of nocardioform placentitis in equine.
- Determined that the serovars of salmonellae involved in equine salmonellosis belong to either serogroup B or serogroup C. This information is being used to help in the formulation of a salmonella bacterin that can be used in central Kentucky.

Clinical Pathology

Bonnie L. Decker

The primary mission of the Clinical Pathology Section of the LDDC is to provide chemistry, hematology, urinalysis, fluid analysis, fecal parasite exams, and other testing to animal owners, veterinarians, and the agricultural community. The section also provides support and testing to the LDDC's pathologists and testing related to necropsy as well as University of Kentucky equine and animal science researchers who can submit specimens to the section for monitoring various chemistry and hematology levels in their research animals. The section is experiencing growth with the plan to add endocrine tests and a new hematology analyzer that will allow additional animal species to be tested. Computer interface for the ACE Alera chemistry analyzer is in the works for more efficient results entry and reduction of human transcription errors. The section is dedicated to meeting the current and future needs of the agricultural community, companion animal community, and veterinarians.

2009 HIGHLIGHTS:

- Approximately 614 chemistry test panels were performed on equine, bovine, caprine, ovine, feline, canine, and other species. This represented over 10,548 individual chemistry tests.
- Approximately 502 complete blood counts and 505 manual differentials were performed.
- Approximately 1,211 fecal specimens were submitted for fecal flotation and examination for ova and parasites. In addition, 124 specimens were submitted for cryptosporidia.
- Approximately 361 stones were submitted for chemical stone analysis. A wide variety of stones were identified, with triple phosphate (struvite) and calcium oxalate being the most common.

Fluid analysis, protein electrophoresis, urinalysis, cytology prep, and vitreous eye fluids (necropsy) were other tests performed, bringing the total tests performed in the section for 2009 to 13,929.

The section completes its testing on the same day as receipt with a few exceptions. Cryptosporidia and protein electrophoresis tests require more time and are reported within five working days of receipt.

The section personnel consists of 1.25 FTE. A section chief with a B.S., M.T. (ASCP) and over 30 years experience in veterinary and human diagnostic laboratory testing works full time. A part-time technician with a B.S. degree and four years' experience completes the section. Other qualified LDDC personnel are available for backup and consultation.

Epidemiology

Jacqueline L. Smith

The primary mission of the Epidemiology Section of the LDDC is to provide animal disease surveillance and early detection of animal disease outbreaks, assist veterinarians in the investigation of serious and unusual disease problems, and conduct

relevant infectious disease research. The epidemiology program is driven by state-of-the-art electronic data-gathering systems that allow for near-real time analysis and distribution of diagnostic case information that will be useful to practitioners in treatment, prevention, and management of animal disease problems.

We also provide in-depth field investigations to better characterize disease outbreaks by identifying causative etiology. At the request of any farm or producer in the state, and with the approval of the LDDC administration, collection of diagnostic specimens and recommended diagnostic testing are provided free of charge to Kentucky clientele.

2009 HIGHLIGHTS:

- Total research visits—321/215.5 hours:
 - Research farm visits: for *R. equi*—180 (30 farms, 6 x each), approximately 30 minutes per farm plus drive time (90 hours of visits, 47 hours drive time logged)—137 hours.
 - Research farm visits (Crestwood) for *R. equi*—141 (47 foals, 3 x each) each approximately 30 minutes plus drive time (70.5 hours of visits, 8 hours drive time logged)—78.5 hours.
- Two surveys requiring 30 to 40 hours each for preparation, distribution, analysis, and follow-up on *R. equi* and customer satisfaction.
- Phone calls involving questions, suggestions, recommendations—112.
- Requests for statistics: (from LDDC faculty; UK faculty; state or federal officials; and local veterinarians)—19 (1 to 10 hours each).
- Requests for graphics: 8 (2 to 10 hours each).
- Reportable disease reports sent: 51 weekly reports (approximately 1 hour each week).

Molecular Diagnostics

Stephen F. Sells

Diagnostic PCR assays are being increasingly utilized because of their speed and specificity. Nucleic acid-based tests are now used so that unknown organisms can be identified, closely related organisms can be differentiated, and small numbers of pathogens can be detected in complex samples. Specimens such as blood, swabs, feces, etc. are accepted directly from clinicians and also from the pathology, virology, and bacteriology sections of this and other diagnostic facilities.

2009 HIGHLIGHTS:

- Approximately 4,750 specimens submitted for PCR testing.
- The most requested tests included equine herpesvirus type 1 and EHV1 pathotyping (over 1,250), EHV4 (125), *Streptococcus equi* subsp. *equi* (over 1,150), *Crossiella equi* (1,200), and *Amycolatopsis* species (1,200), *Clostridium perfringens* (55), *Lawsonia intracellularis* (190), *Neorickettsia risticii* Potomac horse fever (120), BVDV (170), *Moraxella bovis* (50), and *Mycoplasma bovis* (65).
- This section continues to be responsible for providing the majority of Kentucky's arbovirus (mosquito-borne virus) testing for an environmental risk analysis program with the Kentucky Department for Human Health.

- In cooperation with researchers at Michigan State University, the normal flora of the genital tract of male donkeys is being determined. An important preliminary finding of this study is that *Taylorella asinigenitalis*, one of the bacteria causing contagious equine metritis, is sometimes a part of the normal flora of male donkeys and that it can persist for at least 12 months in these animals.
- An investigation was undertaken with researchers at the Gluck Equine Research Center to determine if the treatment of semen with antibiotics will prevent the transmission of *T. equigenitalis* to mares bred by artificial insemination. Preliminary results indicated that the antibiotics did prevent the transmission of the disease.
- In conjunction with the bacteriology section, we are using PCR methods for detecting *Crossiella equi* and *Amycolatopsis* spp. in equine placentas. These bacteria are the primary cause of nocardioform placentitis in equine.

Pathology

Neil M. Williams

The Pathology Section of the LDDC is composed of eight faculty pathologists, three post-doctoral scholars (pathology residents), four full-time necropsy technicians, four part-time necropsy student workers, and five histology technicians. The section performs complete necropsy examinations on submitted animals, histopathology on necropsy cases and surgical biopsies, and cytological examinations. As part of the comprehensive necropsy examination, additional laboratory tests are ordered by the pathologist case coordinator to aid in confirming a diagnosis. The abnormal findings on necropsy are correlated with other laboratory tests, including microscopic examination of the tissues, and a comprehensive report is prepared for every pathology case.

Necropsy: A postmortem examination (necropsy) is conducted to identify any pathologic changes in the tissues that would indicate disease, injury, or any other abnormal process resulting in illness.

Total Necropsy Cases	3,152
Avian	37
Bovine	829
Caprine	52
Equine	1,670
Ovine	49
Porcine	8
Small animal	464
Miscellaneous	43

Histopathology: Tissues are prepared and processed to produce glass slides for microscopic examination conducted by the pathologists. Tissues from the necropsy and surgical biopsy cases were processed and 32,771 microscopic slides produced. In addition to the routine hematoxylin and eosin stained tissue sections, special and immunohistochemical stains were done, resulting in 3,375 slides produced for the purpose of identifying microscopic

organisms/agents that may cause disease or tissue antigens that define or identify cell structures.

Biopsy: Abnormal areas or lesions are often removed surgically or biopsied from live animals and sent to the laboratory for determination of the type of process and recommended treatment and potential prognosis. These tissue specimens are processed, and microscopic slides are prepared for the pathologists to examine by microscopy. Tissue specimens representing 3,151 cases were processed and examined. A report with diagnosis was produced for each case.

Cytology: Preparations of cells harvested from abnormal lesions or abnormal fluids are placed on microscopic slides and stained for examination under the microscope by the pathologists. Cytopathological examinations were performed, a diagnosis made, and a report generated for 141 cases.

Quality Assurance/Quality Control

Mary Harbour

The goal of LDDC's Quality Assurance Program is continuous improvement of service to clients to ensure quality results. The design of the program is based on American Association of Veterinary Laboratory Diagnosticians (AAVLD) requirements, International Standards Organization (ISO) guidelines, and Organization of International Epizootics (OIE) standards. The Livestock Disease Diagnostic Center Quality Program also helps fulfill the university's mission of improving service delivery while achieving excellent human relations (internally and externally), sound leadership, and effective communications.

Besides the continuous improvement of service, the quality assurance section prepared the laboratory for AAVLD accreditation. The accreditation site visit occurred in May 2009, and, as noted earlier, for the first time the LDDC was given full AAVLD accreditation. The section will continue to monitor and update policies and procedures to meet the AAVLD requirements. The laboratory also became a part of the National Animal Health Laboratory Network (NAHLN), and the section will assist in implementing all policies and procedures involved.

Serology

Meg Steinman

The Serology Section of the LDDC provides accurate and timely results for both diagnostic and regulatory testing. The results generated provide veterinarians and regulatory personnel with data upon which to base their decisions. The section also performs numerous tests for movement of animals within the United States and for international export purposes. The section utilizes a variety of testing methodologies.

In 2009, the section started screening for avian influenza by ELISA, allowing for a quicker turnaround time. The section continues to see the number of specimens from the poultry industry increase. Below is a sampling of the higher volume tests that are performed in this section.

2009 HIGHLIGHTS:

Tests done on multiple species:

- Leptospirosis—8,899
- Brucella antibody—6,437 (includes testing on dairy milk)
- Toxoplasmosis—64

Equine:

- Contagious equine metritis—1,128
- Equine infectious anemia—39,224
- Leptospirosis panel—3,056

Poultry:

- *Mycoplasma gallisepticum* plate agglutination—56,197
- *Mycoplasma synoviae* plate agglutination—56,223
- *Salmonella pullorum* plate agglutination—19,425
- Avian influenza antibody testing—5,371

Bovine:

- Anaplasmosis antibody—198
- Bovine leukemia virus antibody—452
- Bluetongue antibody—215
- Neospora—195
- Johnes antibody—1,170

Canine and feline:

- Fungal serology:
 - Histoplasma—262
 - Blastomyces—297
 - FeLV/FIV—17/16

Swine:

- Pseudorabies—84
- PRRS—9

Toxicology

Cynthia L. Gaskill

The primary mission of the Toxicology Section of the LDDC is to provide toxicological diagnostic testing capabilities and consultations to Kentucky veterinarians, LDDC pathologists and pathology residents, county extension agents, livestock producers, and pet owners. A large variety of toxicological tests are available through the toxicology section, including assays for metals and minerals in tissues, feed, water, and soil; organic compounds including a multitude of pesticides, drugs, and other chemicals; biological toxins such as plant toxins, toxic insects, and bacterial and fungal toxins; and numerous other toxins. Consultation services include assistance with appropriate sample collection and submission recommendations, determination of appropriate tests to be performed, interpretation of analytical results, therapeutic advice, differential diagnoses, residue considerations, and other general toxicological information.

2009 HIGHLIGHTS:

- A student internship program was initiated between the section and the Eastern Kentucky University Forensic Sciences program. Our first intern completed her internship and remains employed as a part-time technician supported in

part by the Kentucky Higher Education Assistance Authority (KHEAA) work-study program.

- Installation of new, state-of-the-art analytical instrumentation was completed. Instrumentation includes an inductively coupled plasma mass spectrometer, a gas chromatograph/mass spectrometer, a high-performance liquid chromatograph, and an ion chromatograph, among other updates and improvements.
- Method development and validation for all new analytical test procedures has been initiated and is progressing smoothly.
- New quality control measures have been instituted to ensure results are accurate, reproducible, and meaningful.
- Several toxicological research projects are in progress in collaboration with internal and external researchers.

In 2009, the section received samples from more than 1,000 cases, with most cases involving multiple samples such as various tissues, forages, or other samples, often involving multiple animals and with multiple test requests per case. Due to the lack of unique test codes in the old LIMS system for many of the tests performed in the section, actual numbers of each test performed cannot be obtained by a computer data search. This problem has been corrected with the institution of the new LIMS system, and data retrieval will be dramatically improved in 2010. The most common tests requested include metal and mineral quantifications in tissues such as liver and kidney; screening of rumen and stomach contents for organic compounds and drugs; analysis of tissues for pesticides; and evaluation of forages and feeds for nitrate content, mycotoxins, ionophores, cyanide, and other feed-related toxins.

Virology

Neil Williams

The Virology Section of the LDDC provides diagnostic virology support to the laboratory pathologists, the Commonwealth and USDA veterinarians, and the livestock producers and pet owners of Kentucky and other states.

2009 HIGHLIGHTS:

- This section provides 40 different tests, including fluorescent antibody tests; serologic tests for detection of antibodies to viruses; virus isolation tests for cattle, horses, sheep, pigs, goats, cats, dogs, and birds; and tests for the detection of viral antigens. The section maintains 11 tissue culture cell lines that are used routinely.
- The section performed 29,170 tests during 2009. Of this total, 14,239 were virus neutralization tests for the detection of viral antibodies to meet regulatory requirements for the equine industry.
- Cattle producers have continued to utilize the screening test to detect animals persistently infected with bovine viral diarrhea virus in their herds. The laboratory tested 8,632 animals this year. Identification and removal of affected animals help producers reduce illness, loss of production, and death of their herd animals and add value to one of our most important commodities.

Regulatory Services

Mission

The Division of Regulatory Services is committed to service and consumer protection of Kentucky citizens, businesses, and industries. Our programs monitor and analyze feed, fertilizer, milk, seed, and soil and are administered using a cooperative, science-based approach.

The Division of Regulatory Services administers four state laws pertaining to the manufacturing, processing, labeling, and marketing of commercial feed, fertilizer, seed, and raw milk. The Division's primary objectives are to protect producers and other consumers from poor-quality, mislabeled, or misrepresented products and to protect agricultural and other businesses from unfair competition.

Feed, fertilizer, and seed are monitored through manufacturing and retail channels for compliance. Label review and product and facility inspections as well as product sampling and analysis are important parts of this process. Raw milk is monitored during marketing to ensure an accurate and equitable exchange between dairy producers and processors and to ensure the integrity of milk from farm to processor.

Regulatory inspectors and one auditor cover the state collecting samples, inspecting facilities, and auditing records. Audits of sales and fee payments were conducted on 319 of 382 feed, fertilizer, seed, and milk firms in Kentucky to verify reports, records, and fee payments. Two specialty product inspectors are dedicated to monitoring and sampling small package and specialty pet food, fertilizer, and seed products. One inspector is dedicated to the milk regulatory program: auditing records and monitoring activities of sampler-weighers, handlers, testers, and lab facilities.

In addition to regulatory programs, service testing is provided through the seed, soil, and milk laboratories. These and other activities in the Division are performed by a dedicated and professional staff who conduct laboratory analyses, provide computer support, process data, and compile reports in addition to various other duties necessary to carry out and administer effective programs.

Feed Regulatory Program

The feed regulatory program provides consumer protection for livestock feed and pet food according to provisions of the Kentucky Commercial Feed Law. The program ensures safety and suitability of animal feed in producing meat, milk, and eggs for human consumption and pet food products for adequately maintaining companion animals. The program monitors the marketplace environment and provides standards of quality, safety, efficacy, and labeling for feed products. A statewide inspection, sampling, and laboratory testing program monitors feed products and reviews labels. Labels are evaluated to identify purpose of feed, guaranteed composition, ingredient list, feeding directions, and the need for any warning or caution statements.

The feed program participates in a nationwide food safety effort that promotes consumer confidence in the nation's food

supply. We inspect facilities that manufacture, store, and retail feeds. We worked cooperatively with the Food and Drug Administration (FDA) in providing compliance with the ruminant-to-ruminant feeding ban to prevent the establishment and amplification of bovine spongiform encephalopathy (BSE, or "mad cow disease").

2009 HIGHLIGHTS:

- The inspectors collected 2,393 official samples, and others provided 57 unofficial samples to the laboratory that performed 15,714 analyses representing more than 2 million tons. These samples included 661 specialty pet food samples analyzed by the laboratory.
- The laboratory provided analysis for crude protein and fat on 230 research samples.
- The laboratory monitored the 2009 grain crops for mycotoxins, including analysis for aflatoxin, fumonisin, and vomitoxin in 46 corn, six barley, seven wheat, and five oat samples—part of the more than 300 samples analyzed by the laboratory for mycotoxins.
- The laboratory conducted 75 BSE inspections for compliance with rules and inspected four feed mills that mix restricted drugs in feed for compliance of use and adequate records.
- The laboratory maintained registration on more than 18,000 products from almost 1,200 companies and conducted label reviews on more than 1,000 new products.
- Laboratory check samples for AOCS mycotoxins, AAFCO, AOCS microscopy, USDA grain, aflatoxin share sample program, and PCS phosphate were analyzed and reported. The laboratory provided feed program support using 43 different analytical methods.
- Cash receivables were substantiated on 2,995 feed reports.

The income from fees and licenses received from July 1, 2008, to June 30, 2009, was \$1,156,537. Feed products are assessed at 35 cents/ton.

Fertilizer Regulatory Program

The Kentucky Fertilizer Law ensures that fertilizers sold in Kentucky are clearly and accurately labeled so that consumers can make informed purchases of fertilizer with confidence in its quality. The law also protects the legitimate fertilizer industry from unfair competition.

2009 HIGHLIGHTS:

- Administered actions on 2,475 official and 34 unofficial samples of fertilizer involving 7,890 chemical tests.
- The official samples represented about 44,412 tons out of the approximately 587,283 tons of fertilizer distributed in Kentucky during 2009, or about 7.5%.
- Reviewed labels and registered 3,152 products from 587 firms and issued licenses to 210 companies that manufactured custom-blended fertilizers.

- Analyzed laboratory check sample materials from Magruder®, UAN, AFPC phosphate rock, AFPC phosphate, and AFPC specials for the fertilizer regulatory program.
- Provided support for 30 different analytical methods.
- Substantiated cash receivables on 1,020 fertilizer reports.

The income from fees and licenses received from July 1, 2008, to June 30, 2009, was \$543,994. Fertilizer products are assessed at 50 cents/ton.

Milk Regulatory Program

The mission of the milk regulatory program is to ensure raw farm milk produced and marketed in Kentucky is bought and sold using accurate weights and tests. The program's primary function is to monitor milk handling systems from the time a producer's milk is sampled and weighed through delivery and laboratory testing until producer payments are calculated. The program provides support to the producers and processors of Kentucky's \$238 million/year dairy industry. Industry participants are trained, licensed, and subsequently monitored to maintain compliance with the law.

In addition to regulatory functions, the milk program cooperates with other agencies in educational projects to provide a variety of services to Kentucky dairy producers, processors, and allied industries. The milk program also operates a laboratory that is available for Kentucky producer, processor, and handler service testing.

2009 HIGHLIGHTS:

- Reviewed and issued licenses to three transfer stations, 23 milk handlers, 19 laboratories, 69 testers, and 348 sampler-weighers (milk-haulers, receivers, and samplers).
- Analyzed and administered action on 2,903 official samples.
- Administered a monthly milk lab quality control check sample program through the distribution of 2,508 check samples to the 19 licensed laboratories to ensure accurate component testing procedures.
- Conducted 16 pay-record and 16 raw milk receiving manifest audits.
- Conducted 31 milk laboratory inspections.
- Collaborated with the Kentucky Cabinet for Health Services Milk Safety Branch to train sampler-weighers and processor receiving personnel.
- Trained and examined 40 new sampler-weighers and 14 new testers.
- Conducted 13 inspections of raw milk transfer stations.
- Conducted 363 sampler-weigher inspections.
- Participated with the Department of Biosystems and Agricultural Engineering (BAE) in two projects funded by the Department of Homeland Security (DHS) to develop and optimize an electronic security system for securing bulk milk during transport.
- Substantiated cash receivables on 92 milk reports.

The income from fees and licenses received from July 1, 2008, to June 30, 2009, was \$194,403. Milk handlers and producers are assessed at 0.5 cents per 100 pounds.

Seed Testing Laboratory

The Division maintains the only seed testing facility in Kentucky. This laboratory conducts all official testing in the state and provides service testing for producers, dealers, retailers, researchers, and homeowners. In 2009, 95% of service samples accepted into the laboratory were submitted by Kentucky firms or individuals. Services to customers in 2009 included electronic notification of sample activity and reporting of test results as well as real-time online access to service sample test results.

Laboratory capabilities include purity testing, weed and crop seed identification, seed counts, accelerated aging, test weight, fluorescence testing for ryegrass, moisture content, tetrazolium, herbicide tolerance, endophyte, germination, and many other tests. In 2009, seed treatment and trait testing capabilities offered by the laboratory were expanded.

Laboratory analysts participated in regional and national referee testing through the Association of Official Seed Analysts (AOSA) and the USDA Federal Seed Laboratory to ensure inter-laboratory and intra-laboratory quality of test results. All analysts are AOSA-certified in their respective areas of analysis. More than 20,000 individual tests were performed by laboratory personnel on more than 175 different crops in 2009. The program received \$71,604 in income for service testing during the period July 1, 2008, to June 30, 2009.

Seed Regulatory Program

The seed regulatory program ensures Kentucky farmers and urban consumers of quality seed while promoting fair and equitable competition among seed dealers and seedsmen through inspection and analysis of products found in the marketplace. The Division, which administers and implements the Kentucky Seed Law, promotes compliance through facility inspections, sampling, and analysis of seed offered for sale. The law requires proper labeling of seed, which includes kind, variety, and lot designation; purity percentages; noxious weeds; origin; test date; and a germination guarantee. The Division is also responsible for maintaining registration of seed labelers, seed conditioners, and seed dealers in the state.

2009 HIGHLIGHTS:

- Performed inspections and sampled agricultural, lawn, turf, and garden seeds at more than 500 wholesale and retail locations.
- Collected and tested 1,969 official seed samples.
- Issued stop-sale orders on 260 official seed samples and 338 violative seed lots at seed dealer and seed processor locations.
- Cooperated with the USDA seed branch regarding shipments of seed into the state that were in violation of the Federal Seed Act.
- Reviewed and issued 195 agricultural permits and 41 vegetable and flower permits to label seed.

- Registered 480 seed dealers and 24 noncertified custom conditioners.
- Provided training to firms on labeling requirements, retail sales procedures, stop-sale release procedures, and record-keeping requirements.
- Substantiated cash receivables on 794 seed reports.

The income from fees, permits, and licenses received from July 1, 2008, to June 30, 2009, was \$369,960. Seed products are assessed at 4 to 24 cents per unit.

Soil Testing Laboratory

Soil testing provides farmers, homeowners, greenhouse operators, and others with scientific information about the fertility status of their soils or greenhouse media. In partnership with the Cooperative Extension Service, it also provides them with lime and fertilizer recommendations based on laboratory results. We also offer analyses of animal wastes, nutrient solutions, and special research solutions.

The program received \$217,978 in income for service testing during the period July 1, 2008, to June 30, 2009.

The soil test Web site is at <http://soils.rs.uky.edu>. The number of samples analyzed in 2009 were:

2009 HIGHLIGHTS:

Type	Number	% Change
Agriculture	40,335	-4
Home lawn and garden	10,652	33
Commercial horticulture	841	18
Greenhouse media	85	18
Research	7,173	-21
Atrazine residue in soil	31	72
Animal waste	334	-10
Nutrient solution	75	-10
Special research solutions	194	-82
Total	59,720	-3

Robinson Center for Appalachian Resource Sustainability

At Quicksand in Breathitt County, Kentucky, the Robinson Center for Appalachian Resource Sustainability (RCARS) is the east region location for research on fruits and vegetables, ornamentals, livestock forages, grain crops, tobacco, and wood utilization. The Robinson Center is also the administrative headquarters of the Robinson Forest, which spreads over parts of Breathitt, Perry, and Knott counties and is the site of forestry, wildlife, surface mine reclamation, and watershed management research.

In 2009, the RCARS was assigned responsibility for managing the research facilities at Quicksand, the Wood Utilization Center, and the Robinson Forest. The new mission of this reorganized unit is to increase the long-term value-added, sustainable income, and sustainable flow of economic, ecological, and social goods and services from the lands, natural resources, and people of eastern Kentucky and the Appalachian Region.

2009 Research Activities

ROBINSON CENTER

- RCARS is the east-region location for livestock forage variety and corn hybrid testing programs conducted by the Department of Plant and Soil Sciences. Results from these trials are published annually.
- RCARS is one of three sites devoted to soil fertility research in a no-tillage corn and soybean rotation involving comparisons of poultry litter and inorganic fertilizer, located at Quicksand.
- Extension faculty in the Department of Plant and Soil Sciences are studying nitrogen volatilization losses in no-till corn production on an eastern Kentucky alluvial soil.
- The environmental conditions resulting from the mountainous terrain in this region offer a unique opportunity for the

study of plant disease issues in tobacco, fruit, and vegetable crops at this facility by faculty in the Department of Plant Pathology.

- Variety testing for fall tomato crops, ornamental corn, sweet corn, and sweet sorghum was conducted by extension horticulture faculty. Results of these trials are published annually.

ROBINSON FOREST

Research includes the following projects:

Department of Entomology

- Evaluation of the micromechanical properties of the hemlock woolly adelgid feeding site, focusing on the point of adelgid stylet insertion and the evaluation of whether toughness or elasticity affects hemlock susceptibility.

Department of Biosystems and Agricultural Engineering

- Design of a headwater stream system for a head-of-hollow fill.

Department of Forestry

- Avian and herpetological response to differing intensities of forest harvest in the Cumberland Plateau.
- Do post-mining constructed channels replace structural and functional characteristics of headwater streams in the eastern coalfields of Kentucky?
- Effect of crown release on tree grade and DBH growth of white oak sawtimber in eastern Kentucky.
- Effect of riparian zone width and disturbance on water quality and stream communities following forest harvest in eastern Kentucky watersheds.
- Evaluating spoil amendment use and mycorrhizal inoculation on reforestation success in the eastern and western Kentucky coalfields.

- GPS and GIS analysis of mobile harvesting equipment and sediment delivery to streams during forest harvest operations on steep terrain.
- Landscape predictors of SVAP scores in Robinson Forest: A pilot study.
- Long-term effects of forestry best management practices on hydrology, water chemistry, and woody debris in three Appalachian headwater catchments.
- Temporary log skidder stream crossing.
- Timber harvesting analysis using GPS and GIS.
- Tree-of-heaven (*Ailanthus altissima*) control.

2009 Extension Activities

- Forestry Extension organized and conducted a two-day workshop in Jasper, Indiana, titled “Wood Moisture and Stresses: Effects on Machining and Gluing.”
- Forestry Extension organized and conducted three Shaker Box Workshops at the Wood Utilization Center in Jackson, Kentucky, to provide information and skills to 27 people in-

- terested in the history and craft of oval Shaker box making.
- “Win with Wood” is an annual youth program focused on forestry and the forest industry.
- A tooling design program was developed to train Kentucky manufacturers and entrepreneurs in the secondary wood industry on value-added moulder technology and use.
- A training program was designed to teach hands-on methods for moulder set-up and operations and profile knife grinding. This program teaches the secondary wood industry how to become more efficient in order to be able to compete nationally and globally.

2009 Teaching Activities Conducted at Robinson Forest

NRC 320 – Field Experience in Data Collection Techniques
 FOR 375 – Taxonomy of Forest Vegetation
 FOR 376 – Silvicultural Practices
 FOR 377 – Forest Surveying
 FOR 378 – Forest Mensuration
 FOR 379 – Harvest and Utilization of Wood

Sustainable Agriculture and Food Systems Working Group

The Sustainable Agriculture and Food Systems Working Group’s mission is to create new knowledge to improve the sustainability of the food system in Kentucky and beyond, to help Kentucky citizens and students understand sustainable agriculture and food systems, and to promote UK’s activities as they relate to sustainable agriculture and food systems within the land-grant mission. Inside the College of Agriculture, the group works across all departments to develop synergy between them, and its membership includes a member from every department within the College.

Research Support and Activities

UK DINING SERVICES

Dr. Gregg Rentfrow and Bob Perry worked with UK Dining Services to develop a “Values-Based Value Chain” to purchase whole cattle for use in the university dining halls and catering operations. The cattle are purchased directly from farmers who deliver them to a processor. After processing to the chef’s specifications, the beef is delivered by another vendor directly to the food warehouse on campus. With this “value chain,” the producer, processor, and transportation provider are each paid separately, based on a fair profit margin for their individual operations. Each link in the chain agrees to work with the other links and hold prices steady and reasonable, based on their own operational needs. Dining Services obtains very high-quality 100% Kentucky beef, custom cut to its specifications, for a cost very near commodity beef costs. It is a win-win-win-win relationship that has the potential to directly impact the Kentucky farm and general economy at almost \$2 million per year. Values-based value chains are also being researched for pork and other Kentucky agricultural products and are the cutting-edge vehicle in the food chain between direct and commodity sales.

SMALL FARM DAIRY

UK Dining Services continues to utilize the all-natural and small-farm-produced milk from the Willis Schrock family at J.D. Country Milk. The working group, and especially Dr. Melissa Newman and Dr. Joe O’Leary of the Department of Animal and Food Sciences, have continued to work with this small family dairy as it has scaled up to meet increasing demand and develop new products such as fresh butter and buttermilk.

TASTE PANELS

Through the working group, taste panels continue to be very popular with some of Kentucky’s and the nation’s best chefs to taste new varieties of produce grown at the UK Horticulture Research Farm. The group also took part in the annual Horticulture Field Day and has arranged tours for growers interested in starting organic production.

GRASSFED BEEF

The working group hosted the annual “Grazing America” conference of the American Grassfed Association and provided many of the speakers for the event. Dr. Gregg Rentfrow conducted carcass demonstrations with beef, pork, and lamb that were the highest-rated portion of the conference.

MEAT CUTTING 101

Based on the success of the demonstrations during the “Grazing America” conference, another carcass demonstration by Dr. Gregg Rentfrow was held for chefs and producers to great acclaim. Attendees were from Kentucky and surrounding states and included farmers, chefs, and food retailers. Due to the many requests to offer this demonstration again, there are two new programs in development. One will be specifically developed

for farmers who direct-market their animals and aims to educate them on working with a processor. The second is a hands-on cutting program specifically for chefs who purchase whole lamb and pork carcasses for use in their restaurants.

MARKETMAKER

Members of the working group continue to be an integral part of the team developing Kentucky MarketMaker, an online searchable directory of all food products available in Kentucky. In direct response to the many questions fielded by the group from producers, Dr. Tim Woods and Bob Perry developed "Retail and Restaurant Ready," an educational program for producers to overcome many of the challenges when selling directly to restaurants and retail operations.

LOCAL FOOD USAGE

The trend of buying food directly from a farm, whether at a farmer's market or through a CSA subscription, continues to grow despite the economy of recent years. Members of the

working group have fielded many questions on a wide range of topics in this area from producers, consumers, and processors. Members of the group are also called upon to serve as speakers and panelists at numerous conferences locally, nationally, and internationally.

LOCAL FOOD NETWORK HUB

The working group continues to serve as a network hub between UK researchers, specialists, and Cooperative Extension agents; other universities and colleges nationally and internationally; the Governor's Office of Agricultural Policy; the Kentucky Department of Agriculture; advocacy groups such as Chefs Collaborative, Slow Food USA, Partners for Family Farms, Community Farm Alliance, Sierra Club, the American Grassfed Association, and the Community Food Security Coalition; and, most important, the farmers/producers themselves. By facilitating communication among these various organizations, research opportunities are found, information to help producers is distributed, and UK's work in this area is highlighted in local, national, and international publications and media.

Tracy Farmer Institute for Sustainability and the Environment

The Tracy Farmer Institute for Sustainability and the Environment (TFISE) was officially established on July 1, 2009. Dr. Paul Bertsch, director of the Institute, and Dr. Carol Hanley, associate director, provide primary leadership for the Institute, which is administratively housed under the UK Office of the Vice President for Research, Dr. Jim Tracy. Prior to July 1, the Tracy Farmer Center for the Environment was under the stewardship of the College of Agriculture, which remains a key player in the TFISE.

The integrated research agenda of the Institute is supported, developed, and implemented by the Faculty of the Environment (FoTE), a group of faculty from across campus representing 12 colleges and over 150 faculty members. Membership in the FoTE is open and voluntary with faculty self-selecting to become members. Individuals with interest in issues pertaining to sustainability, energy, and the environment from a science or policy perspective have joined the FoTE, regardless of their active participation in ongoing TFISE activities.

The FoTE is supported by three communication tools: a faculty database, listserv, and Web site. The faculty database is linked to the Web site, and the listserv is used to distribute important information in a timely manner. The majority of the faculty who are on the listserv are in the expertise database.

2009 Research Activities

- Major accomplishments of the TFISE for 2009 include:
- Awarded \$40,000 for Ph.D. Fellowships in Sustainable Systems.
 - Hosted numerous seminars on topics related to sustainability and the environment across campus.
 - Co-hosted the Spotlight Conversation on Climate Change and the Green Breakfast with the Lexington/Fayette Urban County Government.
 - Spring Symposium with the Center for Ecology, Evolution, and Behavior.
 - Forum on Sustainable Manufacturing.
 - Participated in the campuswide Big Blue Goes Green events.
 - Sustainability in Marketing Colloquium.
 - Kentucky Science and Technology Corporation Climate Change Conference.
 - Submitted over \$5 million in proposals for federal funding, resulting in a pending \$2 million award for the U.S. Environmental Protection Agency.

UK Research and Education Center at Princeton

The University of Kentucky Research and Education Center (UKREC) at Princeton, Kentucky, holds a unique position as part of the Kentucky Agricultural Experiment Station and the Kentucky Cooperative Extension Service. The UKREC remains dedicated to sustaining the heritage of impact and achievement by these great institutions and the rapidly changing issues and challenges associated with them. Its vision is to be recognized at the local, state, and national level for excellence in agricultural research, education, leadership, and service to the Commonwealth.

Established in 1925, the West Kentucky Substation at Princeton has functioned as a center of agricultural activities in western Kentucky. Great advancements have been made in Kentucky's leading industry—agriculture—with considerable progress being made in improving utilization and conservation of resources, increasing yields of crops and livestock, better management of capital and labor, expanding markets, and finding solutions for problems facing rural people and communities. Increased returns to Kentucky farmers total millions of dollars annually just from the use of new production technologies resulting from research findings and educational programs of the College of Agriculture.

The UKREC is fundamentally interdisciplinary, applying the biological and social sciences to challenges in agricultural, food, and environmental systems. Our scholarship encompasses human and natural resources and their interaction. As part of the University of Kentucky, the UKREC:

- Facilitates lifelong learning, informed by scholarship and research.
- Expands knowledge through creative research and discovery.
- Serves Kentucky communities by distributing, sharing, and applying knowledge.

The UKREC is the headquarters for more than 50 faculty and staff members representing eight different departments in the College. Its faculty and staff conduct research, provide diagnostic testing services, and develop educational programs on topics of concern to Kentucky farmers, agribusinesses, and families.

The UKREC's Experiment Station Farm consists of almost 1,300 acres, including soils of both sandstone and limestone origin, characteristic of soil types throughout the state. Researchers conduct approximately 100 different research/demonstration projects each year at the Experiment Station Farm or on farms

in western Kentucky. Information derived from these projects or research conducted elsewhere is delivered to farmers and the general public through county offices of the Cooperative Extension Service. Extension specialists located at the UKREC have expertise in a broad spectrum of food and agriculture topics.

Service laboratories located at the UKREC provide information needed to make management decisions in the following areas:

- Soil testing enables farmers to develop nutrient management plans for growing crops.
- The Plant Disease Diagnostic Laboratory helps identify plant health problems and provides recommendations for disease prevention and control. Once insect and plant pests are identified, specialists can give advice on integrated pest management strategies to control them.
- The UKREC provides the Rottering-Kuegel Agricultural Research and Extension Building, which is available to large and small groups for classes and meetings in agriculture, family and consumer sciences, and 4-H. It is also used for a wide variety of meetings by government agencies, industry, and the general public. Each year there are approximately 450 different meetings held in this building, attended by about 14,000 people. Many of these visitors come from other states and foreign countries.
- Crops such as corn, wheat, soybeans, tobacco, fruits, vegetables, and ornamentals are studied for ways to increase yields and income, improve handling and storage, protect the environment, and address other problems farmers may have.
- Research and education programs are also conducted in beef production. A beef herd consisting of 400 animals is involved in many different experiments and demonstrations.
- Agricultural engineering specialists conduct research and education programs related to both crop and livestock production.
- An aquaculture program is conducted in cooperation with Kentucky State University.
- A biennial field day and other commodity field days, attracting about 3,000 people, showcase the work of the Center. Visitors observe research, educational displays, and demonstrations representing work conducted at the Center and throughout the Commonwealth.
- Individuals and small groups are welcome to visit throughout the year to observe specific projects and talk with specialists.

2009 Research Activities

GRAIN CROPS

- Soybean planting date
- Wheat row spacing
- Canola management
- No-till wheat management
- Soybean management verification program

HORTICULTURE

Nursery/Landscape

- Landscape plant evaluations
- Landscape plant establishment based on production container
- Nursery crop production systems
 - Container-type evaluation for sustainable production
 - Efficient fertilization of nursery crops
 - Maintaining water quality and efficient irrigation of nursery crops
- Kentucky native plant evaluation, production protocols, and utilization
 - Development and maintenance of Kentucky provenance stock plants.
- Integrated pest management (IPM) monitoring

Fruit

- Apple rootstock trials
- Peach rootstock trials
- Peach cultivar trials
- Wine grape cultivar trials
- Blackberry cultivar trials
- Small fruit demonstration plots
- Strawberry production systems
- Pawpaw germplasm orchard
- Pecan germplasm orchard

Vegetables

- IPM cucurbits downy mildew sentinel plot
- Cole crop fall cropping evaluation/demonstration

MANURE MANAGEMENT AND UTILIZATION

- Development and implementation of within-production facility (under-slat) manure composting for swine

PLANT PATHOLOGY

- Soybean foliar fungicide tests
- Soybean variety evaluations for soybean cyst nematode (SCN)
- Impact of foliar fungicides on reducing yield loss in soybean caused by SCN
- Soybean seed treatments tests for SCN and soil-borne diseases
- Wheat foliar fungicide tests
- Wheat seed treatment tests
- National uniform test for integrated control of wheat fusarium head blight
- Impact of fungicide class and timing on deoxynivalenol accumulation in wheat grain

SOILS

- Variable rate nitrogen fertilizer applications using remote sensing
- Efficient use of nitrogen on corn and wheat
- Canola fertilization
- No-till wheat management
- Soil compaction

TOBACCO

- Dark tobacco variety development
- Burley tobacco variety development
- Tobacco transplant production management
- Insecticide performance for tobacco hornworm and budworm control
- Mechanical harvest for tobacco
- Tobacco fertility management
- Dark fire-curing systems

WEED SCIENCE

- Managing Italian ryegrass and other problem weeds in wheat
- Interaction of topdressing nitrogen fertilizer with herbicides
- Managing glyphosate-tolerant marestail in no-till soybean
- Crabgrass control in corn with foliar-applied herbicides
- Managing cool-season weeds in canola

Kentucky Agricultural Experiment Station Projects

Hatch, McIntire-Stennis, and Animal Health Projects

Hatch, McIntire-Stennis, and Animal Health projects for calendar year 2009, as reported in the USDA Current Research Information System (CRIS) database, follow.

Agricultural Economics

Agricultural and Rural Finance Markets in Transition—*Katchova, A.*
Benefits and Costs of Natural Resources Policies Affecting Public and Private Lands—*Schieffer, J.K.*
Consumer Choice regarding Food and Health—*Maynard, L.J.*
Economic Impacts of International Trade and Domestic Policies on Southern Agriculture—*Reed, M.R.*
Economics of Precision Agricultural Machinery Management—*Dillon, C.*
Effects of Policy and Product Changes on the International Demand for U.S. Agricultural Products—*Reed, M.R.*
Environmental Impacts of Equine Operations—*Stowe, C.E.*
Estimation of Demand for Equestrian Trail Recreational Activities in Kentucky—*Pagoulatos, A.; Hu, W.; Stowe, J.*
Ex-Post Evaluations of Environmental Projects That Affect Kentucky Agriculture and Rural Communities—*Pagoulatos, A.*
Family Firms and Policy—*Pushkarskaya, H.N.*
Impact of Food Safety Scares on the Food Supply Chain in an Environment of Highly Integrated Monopolistically Competitive Agriculture and Food Industries—*Saghayan, S.H.*
Impacts of Social Capital on the Economic Development and Well-Being of Rural Areas—*Debertin, D.L.*
Nanotechnology and Biosensors—*Hu, W.*
Rural Change: Markets, Governance, and Quality of Life—*Freshwater, D.; Debertin, D.; Davis, A.*

Animal and Food Sciences

Antioxidative Properties of Hydrolyzed Protein in Muscle Foods—*Xiong, Y.L.*
Characterization of Carbon-Centered Free Radicals in Food Proteins—*Boatright, W.L.*
Characterization of Enzyme(s) Associated with Sulfur Assimilation Type Reactions in Soy Protein Products—*Boatright, W.L.*
Control of Food-Borne Pathogens in Pre- and Post-Harvest Environments—*Newman, M.*
Development of Peptides to Enhance Cheese Production and Bio-Active Probes—*Hicks, C.L.*
Diet and Vascular Endothelial Cell Function—*Hennig, B.*
Elucidating Aldehyde-Induced Redox Instability in Carboxymyoglobin—*Suman, S.*
Enteric Diseases of Swine and Cattle: Prevention, Control, and Food Safety—*Newman, M.C.*
Factors Affecting Forage Intake and Utilization by Horses—*Lawrence, L.M.*
Factors Affecting Small Intestinal Carbohydrate Assimilation in Beef Cattle—*Harmon, D.L.; McLeod, K.R.*

Factors Regulating Muscle Protein Synthesis and Accretion in Horses—*Urschel, K.L.*
Genetic (Co) Variance of Parasite Resistance, Temperament, and Production Traits of Traditional and Non-*Bos indicus* Tropically Adapted Breeds—*Thrift, F.A.*
Genetic Considerations for Beef Cattle Production in Challenging Environments—*Thrift, F.A.*
Genetic Selection and Crossbreeding to Enhance Reproduction and Survival of Dairy Cattle—*McAllister, A.J.*
Grading Up to Hair Sheep Genetics in a Low-Input Production System—*Aaron, D.K.; Ely, D.G.*
Improving the Sustainability of Livestock and Poultry Production in the United States—*Cromwell, G.L.; Grove, J.*
Management Systems to Improve the Economic and Environmental Sustainability of Dairy Enterprises—*Bewley, J.M.*
Metabolic Relationships in Supply of Nutrients for Lactating Cows—*McLeod, K.R.*
Methods to Increase Reproductive Efficiency in Cattle—*Silvia, W.J.*
Nitrogen Cycling, Loading, and Use Efficiency in Forage-Based Livestock Production Systems—*VanZant, E.S.*
Nutritional and Management Abatement Strategies for Improvement of Poultry Air and Water Quality—*Cantor, A.H.; Pescatore, A.J.*
Nutritional Systems for Swine to Increase Reproductive Efficiency—*Lindemann, M.D.*
Regulated Expression of Genes/Proteins Critical to Anionic Amino Acid N Metabolism by Developing and Aging Beef Cattle—*Matthews, J.C.; Boling, J.A.*

Biosystems and Agricultural Engineering

Development of an Algae-Based System for CO₂ Mitigation—*Crofcheck, C.L.; Montross, M.D.*
Improvement of Thermal and Alternative Processes for Foods—*Payne, F.A.*
Marketing and Delivery of Quality Grains and Bio-Process Coproducts—*Montross, M.D.*
Modeling for TMDL Development and Watershed-Based Planning, Management, and Assessment—*Edwards, D.R.*
Precision Placement of Crop Production Inputs via Distributed Control—*Shearer, S.A.; Stombaugh, T.S.; Dillon, C.R.*
Soil Productivity as Affected by Mechanical Influence—*Wells, L.G.; Murdock, L.; Stombaugh, T.*
Standardized Testing of Global Navigation Satellite System Technology—*Stombaugh, T.S.; Sama, M.P.; Shearer, S.A.*
Stream/Aquifer Interface: Understanding the Riparian Corridor—*Workman, S.R.*
Systems for Controlling Air Pollutant Emissions and Indoor Environments of Poultry, Swine, and Dairy Facilities—*Overhults, D.G.; Pescatore, A.J.; Fehr, R.E.*
The Science and Engineering for a Biobased Industry and Economy—*Nokes, S.E.; Lee, C.; Crofcheck, C.; Montross, M.*
Wood Utilization Research on U.S. Biofuels, Bioproducts, Hybrid Biomaterials Composites Production, and Traditional Forest Products—*Nokes, S.E.*

Community and Leadership Development

Interactions of Individual, Family, Community, and Policy Contexts on the Mental and Physical Health of Diverse Rural Low-Income Families—*Dyk, P.*
Research and Education Support for the Renewal of an Agriculture of the Middle—*Tanaka, K.*

Entomology

A National Agricultural Program to Clear Pest Control Agents for Minor Uses—*Bessin, R.T.*
Bed Bug Biology and Behavior—*Haynes, K.*
Biological Control in Pest Management Systems of Plants—*Harwood, J.D.*
Biological Control of Arthropod Pests and Weeds—*Yeagan, K.V.*
Biological Improvement of Chestnut through Technologies That Address Management of the Species, Its Pathogens, and Pests—*Rieske-Kinney, L.K.*
Biology and Management of Insects Attacking Turf and Woody Landscape Plants—*Potter, D.A.; Redmond, C.T.*
Biology, Ecology, and Management of Emerging Disease Vectors—*Dobson, S.L.*
Biology, Impact, and Management of Soybean Insect Pests in Soybean Production Systems—*Yeagan, K.*
Ecology and Management of European Corn Borer and Other Lepidopteran Pests of Corn—*White, J.*
Effects of Prey Biodiversity on Pest Regulation by Generalist Predators—*Harwood, J.D.*
Exotic Organisms Interact to Influence Persistence of a Native Species: Potential Interplay between the Asian Chestnut Gall Wasp and Its Chestnut Hosts—*Rieske-Kinney, L.K.*
Genomic and Metagenomic Analyses of a Wood-Feeding Cockroach, *Cryptocercus punctulatus*—*Zhou, X.*
Genomic Approaches to Analyses of Immune-Suppressive Genes of the *Campoletis sonorensis* Polydnavirus—*Webb, B.A.*
Inbreeding and the Fitness Consequences of Colonizing Novel Environments in Herbivorous Insects—*Fox, C.W.*
Interactions among Bark Beetles, Pathogens, and Conifers in North American Forests—*Rieske-Kinney, L.K.; Stephen, F.; Jacobi, W.; Bernier, L.; Bonello, P.; Shaw, D.; Baker, F.; Raffa, K.*
Interactions of Emerging Threats and Bark Beetle-Microbial Dynamics in Forest Ecosystems—*Rieske-Kinney, L.*
Invasive Species and Biological Control: The Role of Facultative Inherited Bacterial Symbionts—*White, J.A.*
Molecular Analysis of Juvenile Hormone Action in the Red Flour Beetle, *Tribolium cataneum*—*Palli, S.S.*
Molecular Analysis of Pest Development and Resistance to Insecticides—*Palli, S.R.*
Mosquitoes, Disease, and Public Health—*Dobson, S.L.*
Phylogeny and Biodiversity of Hymenopteran Biological Control Agents—*Sharkey, M.*
Research and Development Leading to an Integrated Mosquito Management Program for Kentucky—*Brown, G.C.*

Forestry

- Assessing the Invasion Pattern of Exotic Plants in Forest Ecosystems in Kentucky—*Fei, S.*
Distribution and Ecology of the North American River Otter (*Lontra canadensis*) in Kentucky—*Lacki, M.J.*
Evaluating Streamside Management Zone Effectiveness in Forested Headwater Catchments of Central Appalachia—*Barton, C.*
Prescribed Fire in the Southern Appalachians: Stand Structure, Oak Seedlings, and Fuel—*Arthur, M.A.*
RREA Program—*Stringer, J.W.*
The Ecological Role of Large Mammals in the Forests of Kentucky and the Eastern United States: Implications for Conservation—*Cox, J.*
Use of Underplanting to Enhance the Health and Sustainability of Oak-Dominated Ecosystems in Kentucky and the Central Hardwood Region—*Lhotka, J.*

Horticulture

- Chemical Genetic Dissection of Plant Cellulose Synthesis—*DeBolt, S.*
Chloroplast-Localized Co- and Post-Translational Processing Enzymes: Essential Determinants of Protein Maturation—*Houtz, R.L.*
Developing Optimized Organic Production Systems for Cucurbits and Apples—*Williams, M.*
Environmental and Genetic Determinants of Seed Quality and Performance—*Downie, A.B.; Geneve, R.L.; Perry, S.; Baskin, C.*
Identifying the Biophysical, Biochemical, Environmental, and Genetic Factors Associated with Seed Development, Dormancy, Germination, and Establishment of Eastern Gamagrass—*Geneve, R.L.*
Improving Economic and Environmental Sustainability in Tree-Fruit Production through Changes in Rootstock Use—*Archbold, D.D.*
Marketing, Managing, and Producing Environmental Plants in a Technical and Economically Efficient Manner—*Ingram, D.*
Mechanism and Significance of Post-Translational Modifications in the Large (LS) and Small (SS) Subunits of Rubisco—*Houtz, R.L.*
Multi-State Evaluation of Wine Grape Cultivars and Clones—*Archbold, D.*
New Horticultural and Grain Crop Opportunities for Kentucky—*Ingram, D.; Van Sanford, D.; Dillon, C.*
Optimizing the Water and Air Relationship and Nutrient Concentration in a Controlled Water Table Irrigated Container Growing Medium—*Buxton, J.W.*
Regulation of Expression and Activity of Sorbitol Dehydrogenase in Apple—*Archbold, D.*
Spider Mite Resistance Mechanisms in *Lycopersicon hirsutum* Accession LA2329—*Snyder, J.*
The Role of Ethylene and Polyamine Interaction in the Time to Radicle Protrusion during Seed Germination—*Geneve, R.L.*

Human Environmental Sciences

- Antioxidant Nutrients, Reactive Oxygen Species, and Oxidative Stress—*Chow, C.K.*
Dietary Selenium and Carcinogenesis by Environmental Agents—*Glauert, H.*
EFNEP Related Research, Program Evaluation, and Outreach—*Forsythe, H.E.*

Landscape Architecture

- An Evaluation of Postmining Land Use in Kentucky—*Nieman, T.J.*

Plant and Soil Sciences

- Breeding and Genetics of Forage Crops to Improve Productivity, Quality, and Industrial Uses—*Phillips, T.D.*
Breeding Sweet Sorghum for Syrup Production—*Pfeiffer, T.W.*
Characterizing Active Soil Organic Matter Pools Controlling Soil N Availability in Maize-Based Cropping Systems—*Grove, J.H.*
Characterizing Mass and Energy Transport at Different Scales—*Wendroth, O.O.*
Determining Impact of Lower Soybean Plant Populations on Other Practices within the Soybean Production System—*Lee, C.*
Development of Weed Management Strategies in Agronomic Crops—*Witt, W.W.*
Effect of Urease Inhibitors on Volatile N Loss from Soil and Other N Transformations—*Coyne, M.S.*
Endophyte Effects on the Structure and Function of Tall Fescue Pasture—*McCulley, R.L.*
Evaluation of Soybean Varieties for Use in Kentucky—*Pfeiffer, T.W.; Lacefield, E.L.*
Fate and Ecological Effects of Livestock Antibiotics in Soils—*D'Angelo, E.*
Fate, Transport, and Ecological Effects of Livestock Antibiotics in Manure-Amended Agroecosystems—*D'Angelo, E.M.*
Hydropedology: Genesis, Properties, and Distribution of Hydromorphic Soils—*Karathanasis, A.D.*
Identification of Soybean Flowering Pathway Genes Using E Gene near Isogenic Lines—*Kumudini, S.*
Messenger RNA 3 Prime End Formation in Plants—*Hunt, A.G.*
Metabolic Studies and Bioengineering of Plant Trichomes towards Enhancing Pest/Disease Resistance and Facilitating Molecular Farming—*Wagner, G.J.*
Performance of Small Grain Varieties in Kentucky—*Van Sanford, D.A.; Bruening, W.P.*
Plant Genetic Resources Conservation and Utilization—*Phillips, T.D.*
Positional Cloning and Characterization of RCT1, an Anthracnose Resistance Gene in Medicago—*Zhu, H.*
Precision Conservation with Geospatial Technologies—*Mueller, T.G.*
Regulation of Gene Expression during Plant Embryogenesis—*Perry, S.E.*
Regulation of Reproductive Sink Size in Soybean (*Glycine max* L. Merrill)—*Egli, D.B.*
Roles of MicroRNA Structures in Plant RNA Silencing—*Tang, G.*
Seed Germination Ecology of Hawaiian Montane Species—*Baskin, C.*
Soil Survey Characterizations and Interpretations for Kentucky Soils—*Karathanasis, A.D.*
Spatial and Temporal Characteristics of Grassland Agroecosystems—*Dougherty, C.T.*
Triacylglycerol Biosynthesis in Soybeans—*Hildebrand, D.*
Turfgrass Management Practices in Kentucky—*Williams, D.W.; Powell, A.J.*
Unraveling the Catalytic Specificity of Terpene Hydroxylases and Engineering Sesquiterpene Hydroxylation in Plants—*Chappell, J.*
Weed Management Strategies for Sustainable Cropping Systems—*Grabau, L.J.*

Plant Pathology

- Cellular and Molecular Biology of Plant Rhabdoviruses—*Goodin, M.M.*
Characterization of Resistance Gene-Mediated Signaling and Role of Oleic Acid and Glycerol 3-Phosphate in Plant Defense—*Kachroo, P.*
Defining RNA and Protein Factors Affecting Tombusvirus Replication—*Nagy, P.D.*
Dissecting Defense Signaling Pathways in Soybean and Arabidopsis—*Kachroo, A.*
Ecological and Genetic Diversity of Soilborne Pathogens and Indigenous Microflora—*Seebold, K.W.; Elliot, M.; Canaday, C.; Rothrock, C.; Westphal, A.; Keinath, T.; Ownley, B.; Jimenez-Gasco, M.; Padgett, G.B.; Benson, D.M.; Cubeta, M.*
Genes Controlling Invasive Growth in the Rice Blast Fungus *Magnaporthe oryzae*—*Farman, M.L.*
Genomics of Fungal Endophytes and Their Host Grasses—*Schardl, C.L.*
Genomics, Molecular Biology, and Cell Biology of Sonchus Yellow Net Virus, a Plant Rhabdovirus—*Goodin, M.M.*
Molecular Genetics of the Interaction between Corn and Corn Stalk Rot Fungi (*Colletotrichum graminicola* and *Fusarium graminearum*)—*Vaillancourt, L.J.*
Mycotoxins: Biosecurity and Food Safety—*Vaillancourt, L.J.*

Veterinary Science

- Cartilage-Specific Fibronectin Isoform—*MacLeod, J.N.*
Computational Methods for mRNA Transcriptome from RNA-Seq Data—*MacLeod, J.N.*
Control of Equine Infectious Anemia (EIA)—*Issel, C.J.; Cook, R.F.; Cook, S.J.*
Control, Transmission, and Prevalence of Natural Infections of Internal Parasites of Equids and Ruminants—*Lyons, E.T.*
Evaluation of Bacterial Endophytes of Grass and Legume Forages as Emerging Causes of Reproductive Loss—*Swercek, T.W.*
High Sensitivity Analytical/Toxicological Approaches to Problems in Equine Medicine—*Tobin, T.*
Immunologic Requirements for Vaccine Mediated Prevention of Equine Herpesvirus Neurologic Disease—*Horohov, D.W.P.*
Innate Immune Responses to Influenza Virus Infection—*Chambers, T.*
Insulin Resistance in the Horse: Induction, Duration, and Effects on the Estrous Cycle of the Mare—*Fitzgerald, B.P.*
Interferon Gamma Regulation in the Foal—*Horohov, D.W.*
Investigation of the SnSAG Gene Family of Surface Antigens in the Coccidian Parasite *Sarcocystis neurona*—*Howe, D.K.*
Molecular Basis of Attenuation of the Modified Live Virus Vaccine Strain of Equine Arteritis—*Balasuriya, U.*
National Animal Genome Research Program—*Bailey, E.*
Novel, Protectively Immunogenic, Surface-Exposed, and Secreted Proteins of *Streptococcus equi*—*Timoney, J.F.*
Vasomodulatory Effects of Endophyte-Infected Tall Fescue in Horses—*McDowell, K.; Lawrence, L.; Bush, L.*

Collegewide Extramural Funding

This information, generated from the Office of Sponsored Projects Administration database, includes any award with a start date within the reporting period (January 1, 2009–December 31, 2009) and any budgetary addition or reduction to existing projects processed within the reporting period. The grant is listed under the department of the Principal Investigator.

Agricultural Economics

Total—\$ 1,449,061

- 2008 Farm Bill Training, Texas A&M University, \$1,000—*Walters, C.*
- A Common Field: A Whole Farm Management Education Program for Beginning Farmers, Cooperative State Research, Education, and Extension Service, \$749,883—*Meyer, A.; Halich, G.; Hunter, J.; Isaacs, S.; Katchova, A.*
- Analysis of Current Market Demand for Ahi Poke and Consumer Trend Analysis, University of Hawaii, \$19,907—*Hu, W.*
- Assessment of a Market-Based Water Quality Trading System for Kentucky River Watersheds, Environmental Protection Agency, \$196,865—*Hu, W.; Lee, B.; Pagoulatos, A.; Workman, S.*
- Borlaug International Science Program for Africa, Foreign Agricultural Service, \$70,008—*Reed, M.*
- Borlaug International Science Program for Central America on Postharvest Technology, Foreign Agricultural Service, \$13,393—*Reed, M.*
- Building Commercial Readiness of, and Market Access for, Small and Mid-Sized Farmers through MarketMaker, University of Illinois, \$30,000—*Woods, T.*
- Coordination with Center for Tobacco Grower Research, University of Tennessee, \$12,500—*Snell, W.*
- Farmers Market Technology and Food Safety, Kentucky Farmers Market Association Inc., \$33,000—*Woods, T.*
- Integrating ACRE and Crop Insurance: A Comprehensive Risk Management Strategy, Texas A&M University, \$11,157—*Walters, C.; Halich, G.*
- Kentucky 2009 SARE Model State Plan—Program Assistant, University of Georgia, \$20,000—*Meyer, A.*
- Kentucky 2009 SARE Model State Plan—Training, University of Georgia, \$10,000—*Meyer, A.*
- Kentucky Agriculture in Transition: Ensuring Sustainability, Security, and Profitability, Texas A&M University, \$41,034—*Meyer, A.; Katchova, A.*
- Kentucky Annie's Project and Beyond: Risk Management Education for Farm Women, Texas A&M University, \$38,648—*Meyer, A.; Hunter, J.*
- Local Sourcing as a Differentiation and Recruitment Strategy for Food Consumer Cooperatives, USDA Rural Development, \$62,654—*Katchova, A.; Woods, T.*
- Pilot Farm Management Cost-Share Program, Kentucky Governor's Office of Agricultural Policy, \$620—*Robbins, L.*
- Supporting and Enhancing the Role of SARE in Extension and Other Land-Grant University Programs in the South, University of Georgia, \$52,911—*Meyer, A.*

- Technical Assistance to the Extension System in Serbia, Foreign Agricultural Service, \$12,100—*Reed, M.*
- Transitioning to a Forage-Finished Beef Enterprise in the Upper South, Texas A&M University, \$43,381—*Halich, G.; Meyer, A.*
- Value-Added Targeted Marketing of Feeder Cattle, Kentucky Beef Network, \$30,000—*Meyer, A.; Johns, J.*

Agriculture Programs

Total—\$ 285,000

- AgrAbility UT-KY Agreement, University of Tennessee, \$6,000—*Hancock, J.*
- Development of an Animal Emergency/Biosecurity Management Course, Purdue University, \$135,000—*Yeagan, R.; Burris, W.; Coffey, R.; Crist, W.; Dwyer, R.; Husband, A.; Maurer, R.; McMurry, S.; Newman, M.; Scharko, P.; Thompson, C.; Wilkerson, E.*
- Enhancing the EDEN—Strengthening Community Agrosecurity Planning (S-CAP) Project, Cooperative State Research, Education, and Extension Service, \$90,000—*Husband, A.; Dwyer, R.; Newman, M.; Yeagan, R.*
- University of Kentucky Cooperative Extension Service Liaison, Kentucky Energy and Environment Cabinet, \$54,000—*Palmer, G.*

Animal and Food Sciences

Total—\$ 4,603,574

- DAIReXNET: A National Dairy Information and Communications Resource, University of Nebraska, \$15,000—*Amaral-Phillips, D.; McAllister, A.*
- Development and Implementation of a High-Rise Swine Manure Composting Production Facility, Kentucky Governor's Office of Agricultural Policy, \$25,000—*Coffey, R.; Overhults, D.*
- Elanco Animal Health Clinical Research Study Agreements—UKYDH0802 and UKYDH0803, Elanco Animal Health, \$34,191—*Harmon, D.; McLeod, K.*
- Essential Amino Acid and Fatty Acid Studies in Cats, Hills Pet Nutrition Inc., \$224,614—*McLeod, K.*
- Methods of Restoring Carcass Firmness and Other Post-Harvest Traits in Finishing Pigs Fed a High Level of Distillers Dried Grains with Solubles (DDGS), National Pork Board, \$70,116—*Cromwell, G.; Lindemann, M.; Rentfrow, G.*
- National Beef Cattle Evaluation Consortium, Cornell University, \$47,500—*Bullock, K.*
- Nutrient Utilization in the Dog, Hills Pet Nutrition Inc., \$299,750—*Harmon, D.; McLeod, K.*
- Nutrition and Superfund Chemical Toxicity Administrative Supplement, National Institute of Environmental Health Sciences, \$221,038—*Hennig, B.*
- Nutrition and Superfund Chemical Toxicity, National Institute of Environmental Health Sciences, \$1,999,906—*Hennig, B.; Gaetke, L.*

- Nutrition and Superfund Chemical Toxicity Summer Supplement, National Institute of Environmental Health Sciences, \$153,110—*Hennig, B.*
- Past, Present, and Future: The Nutritional Value of Oats in Horse Feeds, Prairie Oat Growers Association, \$29,554—*Lawrence, L.*
- Student Sponsorship, Alltech Biotechnology Inc., \$57,466—*Cantor, A.*
- Student Sponsorship, Alltech Biotechnology Inc., \$30,000—*Harmon, D.*
- Student Sponsorship, Alltech Biotechnology Inc., \$30,000—*Lawrence, L.*
- Student Sponsorship, Alltech Biotechnology Inc., \$32,400—*Pescatore, A.; Quant, A.*
- The Use of Natural Antimicrobials to Mitigate Biological Threat Agents in High-Risk Foods, National Institute for Hometown Security, \$1,333,929—*Newman, M.; O'Leary, J.; Rentfrow, G.; Xiong, Y.*

Associate Dean/Director

Total—\$ 898,129

- Acquisition of Goods and Services for USDA Offices in Ag North—2009-2010, Agricultural Research Service, \$38,075—*Cox, N.*
- ARS/SCA Cooperative Agreement, Agricultural Research Service, \$30,000—*Cox, N.*
- Equine Trust Fund, Kentucky Council on Postsecondary Education, \$5,259—*Cox, N.*
- Improving Sustainability of Forage-Based Production, Agricultural Research Service, \$819,795—*Cox, N.*
- Local Food Systems Initiative, Kentucky Department of Agriculture, \$5,000—*Cox, N.*

Biosystems and Agricultural Engineering

Total—\$ 1,994,244

- 2008 Southern Regional Water Resource Project, Texas A&M University, \$20,000—*Workman, S.; Gumbert, A.; Higgins, S.*
- Cane Run and Royal Spring Watershed-Based Plan Implementation Project, Kentucky Energy and Environment Cabinet, \$454,343—*Higgins, S.; Agouridis, C.; Gumbert, A.; Stringer, J.*
- Commodity Storage and Handling Assessment Mission (Nigeria), Foreign Agricultural Service, \$6,006—*McNeill, S.*
- Energy—A Cooperative Extension Program for Kentucky's Building Systems Energy Needs 2009-2010, Kentucky Energy and Environment Cabinet, \$128,000—*Fehr, R.*
- Evaluation of Pallet Rack Systems as an Economical Option for Tobacco Curing Capacity Expansion, Burley Tobacco Growers Cooperative Association Inc., \$25,000—*Wilhoit, J.*
- Food and Energy Production: Internationalized Agricultural and Engineering Programs, Department of Education, \$37,563—*Stombaugh, T.; Workman, S.*
- Harvested Crop Sensing Suite: Obj 1 and 2, John Deere Dubuque Works of Deere and Company, \$25,748—*Shearer, S.*

Incidence and Spread of Insects from Bucket Elevator Leg Boots, Ohio State University, \$22,000—*McNeill, S.; Johnson, D.; Montross, M.*

Laboratory and Field Data for Establishing New Grain Packing Factors, Agricultural Research Service, \$370,000—*Montross, M.; McNeill, S.*

Optimal Energy Usage Control for Residential Solar Photovoltaic Systems (Smart PV Houses), University of Louisville, \$50,000—*Colliver, D.*

Precision Agriculture: Precision Resource Management—Phase V, Cooperative State Research, Education, and Extension Service, \$439,107—*Stombaugh, T.; Agouridis, C.; Arthur, M.; Barton, C.; Fei, S.; Grove, J.; Lee, B.; Luck, J.; Mueller, T.; Murdock, L.; Pitla, S.; Sama, M.; Schwab, G.; Shearer, S.; Zandonadi, R.*

Pre-Wilting Burley Tobacco to Enhance Manual and Mechanical Harvesting and Housing, Tobacco Education and Research Council Inc., \$75,000—*Wilhoit, J.; Bailey, W.; Pearce, R.*

Quantification and Mitigation of Pesticide Application Errors on Kentucky Soybean Farms, Kentucky Soybean Promotion Board, \$31,116—*Shearer, S.*

Radon—Cooperative Extension Radon and Indoor Air Quality Education, Kentucky Cabinet for Health and Family Services, \$126,198—*Fehr, R.*

Soil Moisture-Based Automatic Pulse Irrigation System for Water Conservation, Natural Resources Conservation Service, \$94,123—*Warner, R.; Coolong, T.; Strang, J.; Woods, T.*

Technology Optimization of a Milk Transport Security System, National Institute for Hometown Security, \$90,040—*Payne, F.; Thompson, C.*

Community and Leadership Development

Total—\$ 499,500

Building the Capacity of Kentucky's Nonprofit Organizations, Administration for Children and Families, \$250,000—*Clore, D.*

Campus Connects Student Philanthropy Project, Greater Cincinnati Foundation, \$4,500—*Clore, D.*

Eastside Technical Center's Secondary Veterinary Science Program, Fayette County Public Schools, \$15,000—*Hains, B.*

Engaging Youth, Serving Community 7 (EYSC7) Initiative, National 4-H Council, \$25,000—*Jones, K.*

The Kentucky Citizen Media Project: The Lexington Commons (via New Voices), American University, \$5,000—*Nah, S.*

Youth E-Discovery Challenge, Appalachian Regional Commission, \$200,000—*Hustedde, R.; Furby, M.*

Entomology

Total—\$ 2,074,630

An Integrated Pest Management Program for Kentucky, Cooperative State Research, Education, and Extension Service, \$108,169—*Johnson, D.; Lucas, P.*

Biological Control of the Hemlock Woolly Adelgid, Department of Agriculture, \$10,076—*Obrycki, J.; Lensing, J.*

Cooperative Agricultural Pest Survey, Animal and Plant Health Inspection Service, \$223,933—*Obrycki, J.; Lensing, J.*

Ecological Ramifications of Defensive Symbiosis in an Invasive Aphid Pest, University of Minnesota, \$46,148—*White, J.*

Emerald Ash Borer Survey and Outreach in Kentucky, Animal and Plant Health Inspection Service, \$708,602—*Obrycki, J.; Lensing, J.*

Eradication of a Primary Filariasis Vector Population at an Endemic Field Site, National Institute of Allergy and Infectious Diseases, \$310,665—*Dobson, S.*

Evaluation of Fall Armyworm and Corn Earworm Efficacy of Smartstax Corn Hybrids and Related Biotech Stacks, Monsanto Co., \$7,500—*Bessin, R.*

Evaluation of Transgenic Turfgrasses for Resistance to Root-Feeding White Grubs, Dow AgroSciences, \$26,530—*Potter, D.*

Hemlock Woolly Adelgid Sampling Surveys, Kentucky Energy and Environment Cabinet, \$10,000—*Obrycki, J.*

Insect Molecular Physiology: Basic Science to Applications, Cooperative State Research, Education, and Extension Service, \$10,000—*Palli, S.*

Integration of Double Stranded RNA into Baiting System: A Novel Genetic Control Strategy for Termites, Kentucky Science and Technology Co. Inc., \$50,270—*Zhou, X.; Potter, M.*

Interactions between the Asian Chestnut Gall Wasp and Potential Natural Enemies, Northern Nut Growers Association, \$6,574—*Rieske-Kimney, L.*

Light Brown Apple Moth (LBAM) National Survey, Animal and Plant Health Inspection Service, \$44,935—*Obrycki, J.; Lensing, J.*

Migration Patterns for Soybean Aphid as Indexed by Capture in an Aphid Suction Trap, Kentucky Soybean Promotion Board, \$2,404—*Johnson, D.*

Molecular Analysis of Juvenile Hormone Action, National Institute of General Medical Sciences, \$193,429—*Palli, S.*

Molecular Characterization of the Microbial Community of Invasive Arthropods, Kentucky Science and Technology Co. Inc., \$99,341—*White, J.*

Monitor Gypsy Moth Populations for Slow-the-Spread Program, Slow-the-Spread Foundation, \$50,000—*Obrycki, J.; Harper, C.*

Reducing Organophosphate Insecticide Use in Kentucky Apple Orchards, Environmental Protection Agency, \$90,354—*Bessin, R.; Hartman, J.; Strang, J.*

Southern Region Program to Clear Pest Control Agents for Minor Use, University of Florida, \$10,700—*Bessin, R.; Fulcher, A.; Seebold, K.*

State Contact and IPM Documents for Kentucky, North Carolina State University, \$25,000—*Lucas, P.*

Washington State Potato Commission: Who's Eating Who? Molecular Detection of Predator Diets in Washington Potatoes, Washington State Potato Commission, \$40,000—*Harwood, J.*

eXtension

Total—\$ 502,384

ECOP/CSREES eXtension—Supplement, University of Nebraska, \$115,740—*Wood, C.; Craycraft, C.*

HorseQuest—National Equine Resource Team, University of Nebraska, \$10,000—*Griffin, A.*

The Development, Evaluation, and Implementation of an Online Safety Course for Youth Working on Equine Facilities, Michigan State University, \$38,750—*Griffin, A.*

The Transformation of Cooperative Extension, University of Nebraska, \$337,894—*Wood, C.*

Family and Consumer Sciences

Total—\$ 1,308,976

Health Education Leadership, Kentucky, Cooperative State Research, Education, and Extension Service, \$566,400—*Vail, A.; Scutchfield, F.*

Investor Education for College Students, University of Tennessee, \$90,890—*Stephenson, L.*

Kentucky Healthy Homes and Communities, Auburn University, \$4,000—*Stephenson, L.*

Kentucky Operation: Military Kids, Kansas State University, \$100,000—*Ashurst, K.*

Kentucky Proud Healthy Habits, Kentucky Department of Agriculture, \$10,000—*Stephenson, L.*

Operation Military Kids: Camp Initiative/ Joint Family Support Assistance Program Supplement, Kansas State University, \$85,000—*Ashurst, K.*

Rural Health Care Services Outreach and Rural Health Network Development Program, Morehead State University, \$10,000—*Murray, D.*

Supplemental Nutrition Assistance Program—Education (SNAP-Ed), Kentucky Cabinet for Health and Family Services, \$442,686—*Vail, A.; Stephenson, L.*

Family Studies

Total—\$ 70,867

Healthy Marriage Child Support Community Demonstration Project, Kentucky Cabinet for Health and Family Services, \$60,867—*Werner-Wilson, R.; Parker, T.; Wood, N.*

Teacher Educators' Professional Development Grant—FY10, Kentucky Department of Education, \$10,000—*Johnson, C.; Ellington, V.; Hains, B.; Horstmeier, R.; Kitchel, T.*

Forestry

Total—\$ 916,469

Characterization of Headwater Seeps in the Frances Polk State Nature Preserve, Kentucky Nature Preserves Commission, \$8,000—*Barton, C.*

Collaborative Efforts in Southern Forestry Recruiting, U.S. Forest Service, \$10,000—*Lhotka, J.*

Dispersal and Population Expansion of the Black Bear in Eastern Kentucky, Kentucky Department of Fish and Wildlife, \$205,000—*Cox, J.*

Economic Impact of Fire on Forest Product Values in the Appalachian Regions of Kentucky and Tennessee, Kentucky Energy and Environment Cabinet, \$294,000—*Stringer, J.*

Enhancement of Disturbed Upper Coastal Plain Stream Systems: Establishing Restoration Criteria and Strategies for a Stream Mitigation Bank, U.S. Forest Service, \$61,237—*Barton, C.*

Evaluating Seedling Development, Stand Structure, and Understory Microenvironment Six Growing Seasons Following Midstory Removal, U.S. Forest Service, (\$495)—*Lhotka, J.; Stringer, J.*

- Forest Management Assistance on State Wildlife Management Areas and Private Lands Technical Assistance, Kentucky Department of Fish and Wildlife, \$15,000—*Stringer, J.*
- Fostering Environmental Stewardship of the Gulf of Mexico: A Trans-Boundary Network of Water Education and Monitoring for Animal Producers, Classrooms, and Community Volunteers, Auburn University, \$10,500—*Lhotka, L.*
- Kentucky Woodlands Magazine—Degraded Stand Revitalization and Small Woodland Management Issue, Kentucky Energy and Environment Cabinet, \$30,000—*Stringer, J.; Thomas, W.*
- Long-Lived Wood Products: Carbon and Competitive Advantages for Hardwood Mills, U.S. Forest Service, \$79,566—*Stringer, J.; Ammerman, B.; Conners, T.; Fackler, F.*
- Long-Term Effects of Forestry Best Management Practices on Hydrology, Water Chemistry, and Woody Debris in Three Appalachian Headwater Catchments, U.S. Forest Service, \$14,000—*Barton, C.*
- Prescribed Fire Research in the Daniel Boone National Forest, U.S. Forest Service, \$10,000—*Arthur, M.*
- Roosting and Foraging Behavior of Rafinesque's Big-Eared Bat near the Northern Limits of the Species Range, Kentucky Department of Fish and Wildlife, \$51,305—*Lacki, M.*
- Silvicultural Approaches for Regenerating Upland Stands in the Northern Cumberland Plateau, U.S. Forest Service, \$14,435—*Lhotka, J.; Stringer, J.*
- Silvicultural Prescriptions for Degraded Hardwood Stands, U.S. Forest Service, \$7,500—*Stringer, J.*
- Status, Distribution, and Reproductive Characteristics of River Otters in Kentucky, Kentucky Department of Fish and Wildlife, \$13,897—*Lacki, M.*
- Stream System Field Condition Assessment—Phase II, University of Georgia, \$56,024—*Barton, C.*
- The Appalachian Trail MEGA-Transect Project: A Citizen Science Approach to Studying Distribution of American Chestnut, American Chestnut Foundation, \$6,500—*Fei, S.*
- The Common Raven in Cliff Habitat: Detection and Occupancy, Kentucky Department of Fish and Wildlife, \$30,000—*Cox, J.*
- Horticulture**
Total—\$ 2,023,272
- An F-Box Protein Targeting PIF1 and PIF3, National Science Foundation, \$153,310—*Downie, A.*
- Coordinate Wine Grape Variety Evaluations in the Eastern USA, Cornell University, \$2,270—*Archbold, D.*
- eXtension Consumer Horticulture Community of Practice Leadership Funds 2008, University of Nebraska, \$15,000—*Durham, R.*
- From Small Molecule to Gene: Using Chemical Genetics to Understand Cell Wall Sensing and Advance Molecular Resources, National Science Foundation, \$300,000—*DeBolt, S.*
- Ginseng Monitoring and Research Project, Kentucky Department of Agriculture, \$10,000—*Jones, R.*
- Kentucky Horticulture Council, Grant 4-FY10, Kentucky Horticulture Council, \$692,110—*Ingram, D.; Woods, T.*
- Mechanism and Significance of Post-Translational Modifications in the Large Subunit of Ribulose Biphosphate Carboxylase/Oxygenase, Energy Research, (\$14,665)—*Houtz, R.*
- Multi-State Crop Profile and Pest Management Strategic Plan for Nursery Crops, North Carolina State University, \$18,744—*Fulcher, A.*
- New Crop Opportunities, Kentucky, Phase VII, U.S. Department of Agriculture, \$23,813—*Ingram, D.; Archbold, D.; Bastin, S.; Bruening, W.; Buxton, J.; Coyne, M.; Dillon, C.; Geneve, R.; Grove, J.; Harwood, J.; Hildebrand, D.; Jones, R.; Lee, C.; Norikane, J.; Obrycki, J.; Pearce, W.; Pfeiffer, T.; Phillips, T.; Rowell, A.; Schwab, G.; Strang, J.; Van Sanford, D.; Williams, M.; Woods, T.*
- New Crop Opportunities, Phase IX, Cooperative State Research, Education, and Extension Service, \$42,000—*Ingram, D.; Bale, S.; Bastin, S.; Bessin, R.; Coolong, T.; Crofcheck, C.; Dillon, C.; Grabau, L.; Hildebrand, D.; Hu, W.; Jones, R.; Kurtural, S.; Lacefield, E.; Lee, C.; Montross, M.; Pearce, W.; Pfeiffer, T.; Phillips, T.; Potter, D.; Smith, S.; Snyder, J.; Stombaugh, T.; Strang, J.; Van Sanford, D.; Vincelli, P.; Warner, R.; Wilhoit, J.; Williams, M.; Woods, T.*
- New Crop Opportunities, Phase X, Cooperative State Research, Education, and Extension Service, \$489,451—*Ingram, D.; Archbold, D.; Bruening, W.; Coolong, T.; DeBolt, S.; Dillon, C.; Grabau, L.; Halich, G.; Hu, W.; Montross, M.; Pfeiffer, T.; Schnelle, R.; Seebold, K.; Smith, S.; Strang, J.; Van Sanford, D.; Vincelli, P.; Warner, R.; Williams, M.; Woods, T.*
- Sustainable Systems for Cucurbit Crops on Organic Farms, Iowa State University, \$276,448—*Williams, M.; Bessin, R.; Coolong, T.*
- Sweet Potatoes: A Profitable Crop for Small Farms in Rural Eastern Kentucky, University of Georgia, \$14,791—*Coolong, T.*
- Kentucky Tobacco Research and Development Center**
Total—\$ 642,620
- A Survey of "GM" Technologies Appropriate to Tobacco Production for Its Traditional Markets, Tobacco Education and Research Council Inc., \$31,800—*Davies, H.; Chambers, O.*
- Hypericum Extracts as Potential Anti-Relapse Medications in Alcoholism, Naprogenix, \$243,406—*Littleton, J.*
- Industrial Product Field Test, Metabolix Inc., \$12,461—*Chambers, O.; Mundell, R.*
- Potential Anti-Relapse Drugs: A Plant Genomics Approach, Naprogenix, \$150,960—*Littleton, J.*
- Transgenic Plant Cells as a Source of Hepatoprotective Drugs, Naprogenix, \$203,993—*Littleton, J.*
- Livestock Disease Diagnostic Center**
Total—\$ 741,713
- Bovine Spongiform Encephalopathy (BSE) Testing and Related Services, Kentucky Department of Agriculture, \$22,004—*Carter, C.*
- Diagnostic Laboratory Services for Farmers and Agribusinesses, Kentucky Department of Agriculture, \$400,000—*Carter, C.*
- Diagnostic Services, Kentucky Department of Fish and Wildlife, \$5,000—*Carter, C.*
- OIE Disease Reporting (Afghanistan), Foreign Agricultural Service, \$27,477—*Carter, C.*
- Regional Animal Health Data Warehousing and Data Mining System, Cooperative State Research, Education, and Extension Service, \$254,514—*Carter, C.*
- Rhodococcus equi* Pneumonia: Airborne Exposure and Foal Immunity/*Rhodococcus equi* Airborne Environmental Study, Texas A&M University, \$32,718—*Carter, C.*
- Merchandising, Apparel, and Textiles**
Total—\$ 74,498
- Marketing Potential of Fresh Food Products to Hispanic Consumers: Exploring a New Market Opportunity, Kentucky Department of Agriculture, \$35,890—*Wesley, S.; Hutchens, T.; Meyer, A.; Roseman, M.*
- Quality Control Laboratory for NAILM, National Association of Institutional Linen Management, \$38,608—*Easter, E.*
- Nutrition and Food Science**
Total—\$ 1,125,614
- Bluegrass/Aspendale HOPE VI Revitalization, Lexington-Fayette Urban County Government, \$30,114—*Forsythe, H.; Ham, S.*
- Children, Youth, and Families at Risk Capacity Building Program, Cooperative State Research, Education, and Extension Service, \$700,000—*Kurzynske, J.; Stivers, W.*
- Children, Youth, and Families at Risk Liaison, U.S. Department of Agriculture, \$37,500—*Kurzynske, J.*
- Children, Youth, and Families Education and Research Network—Program Component, Cooperative State Research, Education, and Extension Service, \$218,000—*Kurzynske, J.; Stivers, W.*
- Promoting Life Skills in Middle School Youth, Cooperative State Research, Education, and Extension Service, \$140,000—*Kurzynske, J.; Jones, K.*
- Plant and Soil Sciences**
Total—\$ 6,085,590
- 2008 PLM and Chemical Analysis, Savannah River National Laboratory and Washington Savannah River Company, University of Georgia, \$12,858—*Bertsch, P.*
- 2008 Southern Regional Water Resource Project, Texas A&M University, \$45,181—*Lee, B.; Workman, S.; Gumbert, A.; Higgins, S.*
- A Regional Grain Sorghum Management Guide for Mid-South States, United Sorghum Checkoff Program, \$4,000—*Lee, C.*
- Accelerating the Development of Fusarium Head Blight-Resistant Soft Red Winter Wheat Varieties, U.S. Department of Agriculture, \$58,215—*Van Sanford, D.*
- Advancing Drug Development in Medicinal Plants Using Transcriptomics and Metabolomics, National Institute of General Medical Sciences, \$3,027,575—*Chappell, J.*
- Agronomic Limitations of Soybean Yield and Seed Quality in the U.S., Iowa State University, \$75,630—*Lee, C.*
- Bioavailability, Toxicity, and Trophic Transfer of Manufactured ZnO Nanoparticles: A View from the Bottom, U.S. Environmental Protection Agency, (\$931)—*Bertsch, P.*
- Breeding for Reduced Nicotine Content in Burley Tobacco, Burley Tobacco Growers Cooperative Association Inc., \$50,000—*Miller, R.*

- Center for the Environmental Implications of Nanotechnology (CEIN), Duke University, \$110,000—*Bertsch, P., Unrine, J.*
- CPSF30 at the Convergence of RNA Processing, Cellular Signaling and Development in Plants, National Science Foundation, \$3,000—*Hunt, A.*
- Decomposition in Drylands: Soil Erosion and UV Interactions, National Science Foundation, \$50,419—*McCulley, R.*
- Defense versus Symbiosis: Host Genetic Control of Nodulation Specificity in Soybean, Department of Agriculture, \$150,000—*Zhu, H.*
- Development of a Method to Confirm the Country of Origin of Tobacco Samples, Burley Tobacco Growers Cooperative Association Inc., \$20,000—*Pearce, R.*
- Dicamba-Tolerant Soybean: Weed Control, Monsanto Co., \$6,800—*Slack, C.*
- Effects of Warming and Altered Precipitation Regime on Managed Grassland Structure and Function, Duke University, \$96,061—*McCulley, R.*
- Encapsulated Acetochlor in Soybeans—EUP Academic, Monsanto Co., \$5,440—*Slack, C.*
- Enhancement of Soybean Somatic Embryo Development to Improve Regeneration and Transformation Efficiency (Year 1 of 2), United Soybean Board, \$74,284—*Perry, S.*
- Evaluation of Early Flowering Chia (*Salvia hispanica*) Lines as a New Small Grain Crop for Kentucky, Kentucky Small Grain Growers Association, \$5,000—*Hildebrand, D.*
- Evolving Catalytic Specificities within Triterpene Synthase Scaffolds, Sapphire Energy Inc., \$301,308—*Chappell, J.*
- Final Development of a Yield Loss Prediction Tool for Soybean Rust, Kentucky Soybean Promotion Board, \$15,550—*Van Doren, S.*
- Formulation Testing of Encapsulated Acetochlor in Soybeans, Monsanto Co., \$1,360—*Slack, C.*
- Function of Non-Legume Orthologs of Legume Genes Required for Nodulation and Arbuscular Mycorrhizal Symbiosis, National Science Foundation, \$160,000—*Zhu, H.*
- Further Development of Soybeans with Higher Levels of Improved Oil and Enhanced Fungal Resistance, United Soybean Board, \$119,384—*Hildebrand, D.*
- GAT[®] Corn/Soy—PRE No-Till, Pioneer Hi-Bred International Inc., \$5,700—*Slack, C.*
- Improved Methods for the Application of Contact and Local Systemic Suckercides to Burley Tobacco, Burley Tobacco Growers Cooperative Association Inc., \$20,000—*Pearce, R.; Bailey, W.; Wilhoit, J.*
- Improving Nitrogen Application Technology under Kentucky Conditions, Kentucky Small Grain Growers Association, \$5,000—*Murdock, L.; Call, D.; James, J.; Schwab, G.*
- Increasing Epoxy Fatty Acid Accumulation in Oilseeds, Ashland Inc., \$10,000—*Hildebrand, D.*
- Management of Troublesome Weeds in Highway Rights of Way, Kentucky Transportation Cabinet, \$178,099—*Witt, W.*
- Managing Giant Ragweed and Marehail in Wheat, Kentucky Small Grain Growers Association, \$6,000—*Martin, J.; Call, D.; Tutt, C.*
- Molecular Genetic Analysis of a Novel Feedback Inhibition Mechanism in the Cytokinin Response Pathway, National Science Foundation, \$400,000—*Smalle, J.*
- Optimum[®] GAT[®] Corn University, Pioneer Hi-Bred International Inc., \$9,000—*Slack, C.*
- Optimum Planting Date for Soybean, Kentucky Soybean Promotion Board, \$3,000—*Herbek, J.*
- Performance of Small Grain Varieties in Kentucky, Kentucky Small Grain Growers Association, \$6,000—*Bruening, W.*
- Performance of Soybean Varieties in Kentucky, Kentucky Soybean Promotion Board, \$50,000—*Bruening, W.*
- Plot Combine, Kentucky Small Grain Growers Association, \$60,000—*Bruening, W.*
- Regional Biomass Feedstock Partnership, Herbaceous Bioenergy Crop Field Trials, South Dakota State University, \$32,000—*Pfeiffer, T.*
- Regional Biomass Feedstock Partnership, South Dakota State University, \$17,000—*Williams, D.*
- Sensing Soybean Canopy Development and Crop Stress: Understanding the Relationship to Grain Yield, Kentucky Soybean Promotion Board, \$21,000—*Grove, J.; Schwab, G.*
- Soft Red Winter Wheat Breeding and Variety Development, Kentucky Small Grain Growers Association, \$45,188—*Van Sanford, D.*
- Soil Morphology Training for On-Site Sewage Disposal Systems, Kentucky Cabinet for Health and Family Services, \$30,000—*Karathanasis, A.*
- Soil Morphology Training for On-Site Sewage Disposal Systems, Kentucky Health Services Cabinet, \$21,398—*Karathanasis, A.*
- Soy MVP: Soybean Management Verification Program, Year 2, Kentucky Soybean Promotion Board, \$81,793—*Lee, C.; Herbek, J.; Murdock, L.; Schwab, G.*
- Soybean Fertilization: Is Hidden Hunger Reducing Yield?, Kentucky Soybean Promotion Board, \$3,000—*Schwab, G.*
- Soybean Yield Response to Soil P and K Availability: Optimizing Fertilization Expenses, Kentucky Soybean Promotion Board, \$10,000—*Grove, J.; Murdock, L.; Schwab, G.*
- Support for Innovative Tobacco Growers Program, Burley Tobacco Growers Cooperative Association Inc., \$5,000—*Pearce, R.*
- Synchrotron X-Ray Microprobe and Microspectroscopy Research in Low Temperature Geochemistry, University of Chicago, \$41,500—*Bertsch, P.; Unrine, J.*
- Transcriptional Regulatory Networks Controlling Higher Plant Embryogenesis, National Science Foundation, \$300,000—*Perry, S.*
- Unraveling the Catalytic Specificity of Terpene Hydroxylases and Engineering Sesquiterpene Hydroxylation into Plants, National Science Foundation, \$176,478—*Chappell, J.*
- U.S. Wheat and Barley Scab Initiative's Networking and Facilitation Office and Web Site, Agricultural Research Service, \$131,300—*Van Sanford, D.*
- Wheat Response to Old Corn Rows: Phase 2, Kentucky Small Grain Growers Association, \$14,000—*Lee, C.; Schwab, G.; Wendroth, O.*
- Wheat Yield in 15-Inch Rows, Year 2, Kentucky Small Grain Promotion Council, \$6,000—*Lee, C.; Herbek, J.*
- Winter Wheat Development, Grain Yield, and Soil Water and Nitrogen Dynamics in a Farmer's Field in Western Kentucky, Kentucky Small Grain Growers Association, \$6,000—*Wendroth, O.; Egli, D.; Murdock, L.; Schwab, G.*
- ## Plant Pathology
- Total—\$2,336,296
- 2009 Kentucky Soybean Rust Monitoring and Early Warning Systems, Kentucky Soybean Promotion Board, \$31,246—*Hershman, D.*
- A Host Protein Interaction and Localization Map for a Plant, National Science Foundation, \$150,000—*Goodin, M.*
- Advanced Genetic Technologies, Kentucky, Cooperative State Research, Education, and Extension Service, \$448,178—*Schardl, C.*
- Biochemical and Genetic Basis of Ergot Alkaloid Diversification, West Virginia University, \$144,000—*Schardl, C.*
- Biofumigation for Soil Health in Organic High Tunnel and Conventional Field Vegetable Production Systems, Kentucky State University, \$7,200—*Vincelli, P.*
- Can Foliar-Applied Fungicides Reduce Yield Loss in Soybean Caused by Soybean Cyst Nematode?, Kentucky Soybean Promotion Board, \$9,061—*Hershman, D.*
- Construction of DNA-Based Virus-Induced Gene Silencing Tools for Functional Genomics of Soybeans, University of Illinois, \$36,380—*Ghabrial, S.*
- Development and Deployment of a Non-Toxic Endophyte in Tall Fescue for Forage, Kentucky Science and Technology Co. Inc., \$98,663—*Schardl, C.; Phillips, T.*
- Enhancing Soybean Yield by Manipulating the Expression of Seed Trait-Determining Genes, United Soybean Board, \$130,617—*Kachroo, A.; Ghabrial, S.*
- Expanding IPM PIPE for Cucurbit Downy Mildew Forecasting, North Carolina State University, \$6,000—*Seebold, K.*
- Functional Role of a Host Metabolic Enzyme in Viral Replication, National Institute of Allergy and Infectious Diseases, \$170,000—*Nagy, P.*
- Genetic, Molecular, and Biochemical Basis of Resistance to Turnip Crinkle Virus in Arabidopsis, Boyce Thompson Institute for Plant Research, \$88,572—*Kachroo, P.*
- Glycerol Metabolism and Its Role in Biotrophy versus Necrotrophy in an Arabidopsis/Fungal Hemibiotroph Model System, National Science Foundation, \$312,000—*Kachroo, P.; Kachroo, A.; Vaillancourt, L.*
- Investigating the Role of the Cuticle in Resistance to Foliar Plant Pathogens, Kentucky Science and Technology Co. Inc., \$80,000—*Seebold, K.; Kachroo, P.*
- IPM PIPE 2008: University of Kentucky Component, North Carolina State University, \$11,223—*Hershman, D.*
- Managing *Phytophthora capsici* on Pepper and Summer Squash with Combinations of Bioten and Conventional Fungicides, University of Florida, \$10,000—*Seebold, K.*
- Sentinel Plots to Monitor the Spread of Soybean Rust in U.S. Soybean Production Regions, North Central Soybean Research Program, \$30,000—*Hershman, D.*
- Southern Region Plant Diagnostic Network, IPM PIPE 2007, Kentucky Component, University of Florida, \$39,000—*Vincelli, P.*
- Telomere Hypervariability in the Fungus *Magnaporthe oryzae*—A Model Plant Pathogen, National Science Foundation, \$111,017—*Farman, M.*
- The Role of a Host Ion Pump in RNA Virus Recombination, National Science Foundation, \$162,000—*Nagy, P.*

The Role of the Host Ca/Mn Pump in Emergence of Novel Viral RNA Recombinants, National Institute of Allergy and Infectious Diseases, \$170,970—*Nagy, P.*
 Towards Developing Rust-Resistant Soybeans: Identifying Genes for Rust Resistance, University of Illinois, \$54,484—*Ghabrial, S.*
 Uniform Trial on Integrated Management of Fusarium Head Blight: Kentucky, Agricultural Research Service, \$5,122—*Hershman, D.; Lee, C.*
 Use of a Novel Virus-Based Vector in the Search for Resistance to the Soybean Cyst Nematode and Other Important Soybean Pathogens, Kentucky Soybean Promotion Board, \$30,563—*Ghabrial, S.; Hershman, D.*

Regulatory Services

Total—\$ 34,131

Medicated Feed Mill and BSE Rule Inspections, Food and Drug Administration, \$34,131—*Thom, W.; Davis, M.*

Tracy Farmer Institute for Sustainability and the Environment

Total—\$ 181,250

Kentucky Green and Healthy Schools, Kentucky Department of Education, \$21,250—*Hanley, C.; Rudder, N.*
 Mill Creek Elementary Stream and Wetland Restoration Project, National Association of Counties, \$20,000—*Hanley, C.; Goodwin, K.*
 Science Literacy Project for Middle School Teachers, Kentucky Council on Postsecondary Education, \$140,000—*Hanley, C.; Davies, H.*

Veterinary Science

Total—\$ 1,082,618

Continuation of SNP Gene Mapping Projects (Phase 3), University of Minnesota, \$28,125—*Bailey, E.; Lear, T.*
 Does Vaccination of Very Young Foals with FluAvert in the Presence of Maternal Antibodies Protect Them from Infection?, Intervet Inc., \$41,520—*Chambers, T.; Horohov, D.*
 EIAV Envelope Variation and Vaccine Efficacy, University of Pittsburgh, \$347,500—*Issel, C.; Cook, R.; Horohov, D.*
 Genes and Genetic Mechanisms Modulating Maturation and Repair of Articular Cartilage and Responses to Intra-Articular Glucocorticoid Therapy, University of Minnesota, \$33,333—*MacLeod, J.*
 Genome Sequence for the Apicomplexan *Sarcocystis neurona*, Cooperative State Research, Education, and Extension Service, \$500,000—*Howe, D.; Schardl, C.*
 Morris Animal Foundation (MAF) Pfizer Animal Health (PAH) Veterinary Fellowship, Morris Animal Foundation, \$40,000—*Troedsson, M.*
 Testing Methods for Influenza Infection in Equine Models, Science Applications International Co., \$92,140—*Chambers, T.*

Multidisciplinary Grants Led by Other Colleges*

Total—\$ 8,743,686

Development of an Algae-Based System for CO₂ Mitigation from Coal-Fired Power Plants, Kentucky Office of Energy Policy, \$895,749—*Crofcheck, C.; Montross, M.*
 EFRI-HyBI: Lignin Deconstruction for the Production of Liquid Fuels, National Science Foundation, \$1,984,322—*DeBolt, S.*

Exon Splice Pattern Characterization of the Whole mRNA Transcriptome, National Science Foundation, \$1,089,816—*MacLeod, J.*
 Hippocampal Neurotoxicity Induced by Ethanol Withdrawal, National Institute on Alcohol Abuse and Alcoholism, \$352,688—*Littleton, J.*
 Implications of Caveolae in Tat Signaling and Integrity of Brain Endothelium, National Institute of Mental Health, \$347,938—*Hennig, B.*
In vitro and *in vivo* Models for Ethanol Withdrawal and Antepartum Hypoxia, National Institute on Alcohol Abuse and Alcoholism, \$208,617—*Littleton, J.*
 Kentucky Girls STEM Collaborative Project, Puget Sound Center for Teaching, Learning, and Technology, \$18,000—*Burks, J.; Hanley, C.*
 Separation and Recovery of High-Value Pentose Derivatives from Cellulosic Biomass Using Molecular Imprinting, Cooperative State Research, Education, and Extension Service, \$999,964—*Nokes, S.*
 Separation and Recovery of High-Value Pentose Derivatives from Cellulosic Biomass Using Mol+, Kentucky Office of Energy Policy, \$83,044—*Nokes, S.*
 Southeast Center for Agricultural Health and Injury Prevention, National Institute of Occupational Safety and Health, \$6,247—*Purschwitz, M.*
 Tat-Mediated Brain Endothelial Cell Dysfunction, National Institute of Neurological Disorders and Stroke, \$265,301—*Hennig, B.*
 Transforming Kentucky's New Economy with EPSCoR, National Science Foundation, \$2,492,000—*Schardl, C.; Webb, B.*

*Only College of Agriculture co-investigators are listed.

Intellectual Property

Patents Issued

Entomology

Webb, B., and J. Kroemer. Vectors and methods for enhanced cell longevity and protein expression. U.S. Patent 7,629,160. Issued December 8, 2009.

Kentucky Tobacco Research and Development Center

Falcone, D.L., and J.M. Littleton. Methods to identify plant metabolites. U.S. Patent 7,547,520. Issued June 16, 2009.

Gan, S., and M. Xie. Genetic insulator for preventing influence by another genetic promoter. U.S. Patent 7,605,300. Issued October 20, 2009.

Plant and Soil Sciences

Hildebrand, D., and H. Fukushige. Recombinant watermelon (*Citrullus lanatus*) hydroperoxide lyase and uses thereof. U.S. Patent 7,517,679. Issued April 14, 2009.

Wagner, G., and R. Shepherd. Method of utilizing the tobacco phytoplanin promoter for expression of nucleic acids as gene products directed to aerial surfaces of plants. U.S. Patent 7,501,557. Issued March 10, 2009.

Wagner, G., and R. Shepherd. Utility of phytoplanins as antibiotics, selective fungicides and for enhancing microbial resistance in crop plants. U.S. Patent 7,528,232. Issued May 5, 2009.

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Ghabrial, S., C. Zhanag, and H. Gu. Viral vectors useful in soybean and methods of use. U.S. Patent 7,618,815. Issued November 17, 2009.

Veterinary Science

Howe, D. Nucleic acids encoding *Sarcocystis neurona* antigen and uses thereof. U.S. Patent 7,524,946. Issued April 28, 2009.

Genbank Register

Animal and Food Sciences

Liao, S.F., J.A. Boling, and J.C. Matthews. *Bos taurus* GLUT4 mRNA, Partial cds gi. Accession FJ490182.

Liao, S.F., J.A. Boling, and J.C. Matthews. *Bos taurus* PepT1 mRNA, Partial cds gi. Accession FJ490183.

Liao, S.F., J.A. Boling, and J.C. Matthews. *Bos taurus* PepT2 mRNA, Partial cds gi. Accession FJ490184.

Liao, S.F., J.A. Boling, and J.C. Matthews. *Ovis aries* glutamic-pyruvate transaminase mRNA, Partial cds gi. Accession FJ826619.

Entomology

Chapman, E.G., and J.D. Harwood. Seven accessions.

Livestock Disease Diagnostic Center

Labeda, D.P., N.P. Price, R.M. Kroppenstedt, J.M. Donahue, N.M. Williams, and S.F. Sells. *Streptomyces* sp. NRRL B-24676 16S ribosomal RNA gene, partial sequence. Accession FJ169330.

Labeda, D.P., N.P. Price, R.M. Kroppenstedt, J.M. Donahue, N.M. Williams, and S.F. Sells. *Streptomyces* sp. NRRL B-24679 16S ribosomal RNA gene, partial sequence. Accession FJ169329.

Labeda, D.P., N.P. Price, R.M. Kroppenstedt, J.M. Donahue, N.M. Williams, and S.F. Sells. *Streptomyces* sp. NRRL B-24165 16S ribosomal RNA gene, partial sequence. Accession EU812169.

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Plant and Soil Sciences

Perry, S.E. Global identification of targets of the Arabidopsis MADS-domain protein AGAMOUS-Like 15. Accession GSE17742.

Yuan, L., and S. Pattanaik. *Nicotiana tabacum* chalcone synthase (Chs) gene, promoter region. Accession FJ655994.

Yuan, L., and S. Pattanaik. *Nicotiana tomentosiformis* dihydroflavonol 4-reductase (Dfr1) mRNA, complete cds. Accession FJ969388.

Yuan, L., and S. Pattanaik. *Nicotiana glauca* dihydroflavonol 4-reductase (Dfr1) mRNA, complete cds. Accession FJ969389.

Yuan, L., and S. Pattanaik. *Nicotiana glauca* dihydroflavonol 4-reductase (Dfr) mRNA, complete cds. Accession FJ969390.

Yuan, L., and S. Pattanaik. *Nicotiana glauca* chalcone synthase (Chs) mRNA, complete cds. Accession FJ969391.

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Plant Pathology

Farman, M.L. *Magnaporthe oryzae* TLH3 gene. Accession FJ867915.1.

Farman, M.L. *Magnaporthe oryzae* TLH4 gene. Accession FJ867916.1.

Farman, M.L. *Magnaporthe oryzae* TLH5 gene. Accession FJ867917.1.

Farman, M.L. *Magnaporthe oryzae* TLH2 gene. Accession FJ867918.1.

Farman, M.L. *Neurospora crassa* OR74A clone Tel-VIIR telomere sequence. Accession FJ589764.1.

Mark Farman had 23 additional accessions.

Ghabrial, S.A. Complete nucleotide sequence of the gene encoding the antifungal protein victoriocin. Accession EF587239.

Kachroo, A.P. Four isoforms of soybean RIN4 GmRIN4a. Accession GU13285.

Kachroo, A.P. Four isoforms of soybean RIN4 GmRIN4b. Accession GU132852.

Kachroo, A.P. Four isoforms of soybean RIN4 GmRIN4c. Accession GU132853.

Kachroo, A.P. Four isoforms of soybean RIN4 GmRIN4d. Accession GU132854.

Kachroo, A.P. Two isoforms of soybean NDR1 GmNDR1a. Accession GU132855.

Aardra Kachroo had one additional accession.

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Christopher Schardl had approximately 139,995 additional accessions.

Veterinary Science

Graves, K.T., and P.J. Henney. TPA_exp: *Equus caballus* laminin alpha3 chain (LAMA3) gene, exons 23 through 28 and partial cds. LOCUS BK006617 13459 bp DNA linear MAM 22-JAN-2009.

Zhang, J., U.B.R. Balasuriya, and P.J. Timoney. Equine arteritis virus infectious cDNA clone pEAVrMLVf. Accession No. FJ798195.

Zhang, J., U.B.R. Balasuriya, and P.J. Timoney. Equine arteritis virus infectious cDNA clone pEAVrMLVBf. Accession No. FJ798196.

Zhang, J., U.B.R. Balasuriya, and P.J. Timoney. Equine arteritis virus isolate S3685*. Accession No. GQ903794.

Zhang, J., U.B.R. Balasuriya, and P.J. Timoney. Equine arteritis virus isolate S3861*. Accession No. GQ903795.

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Variety Releases

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Pfeiffer, T. KY 04-ns-309 soybean.

Miller, R. KT 209LC Hybrid burley tobacco.

Miller, R. KT 210LC Hybrid burley tobacco.

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All publication dates in this section are 2009 unless otherwise noted (*).

Annual Report

One Hundred and Twenty-First Annual Report of the Kentucky Agricultural Experiment Station for 2008. College of Agriculture, University of Kentucky, Nancy M. Cox, Director. June.

Books and Book Chapters

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Collier, B., B.J. Barnett, and J.R. Skees. *State of Knowledge Report—Data: Innovation in Catastrophic Weather Insurance to Improve the Livelihoods of Rural Households.* GlobalAgRisk report prepared for the Bill and Melinda Gates Foundation, Lexington, Ky. 51 pp.

Davis, Alison, and Thomas R. Harris. The application of a double hurdle firm location model: The example of Montana. Chapter 9, pp. 14-182. IN: Stephan J. Goetz, Steven C. Deller, and Thomas R. Harris, ed. *Targeting Regional Economic Development.* Routledge, New York.

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Freshwater, David, and Stephen Tomblin. Making sense of changing realities in the "uncharted fringe." pp. 19-46. IN: G. Baldachino, R. Greenwood, and L. Felt, ed. *Remote Control: Governance Lessons for and from Small, Insular, and Remote Regions.* Institute of Social Economic Research Books, Memorial University, St. John's of Newfoundland, Newfoundland and Labrador, Canada.

Freshwater, David. *Farmland Conversion: The Spatial Dimension of Agricultural and Land-Use Policies.* OECD, Paris. 75 pp. Available at <http://www.oecd.org/dataoecd/34/30/44111720.pdf>.

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Saghaian, S., L.J. Maynard, and M.R. Reed. The importance of context in determining consumer response to food safety events: The case of mad cow disease discovery in Canada, Japan, and the United States. pp. 235-265. IN: K.E. Carettas, ed. *Outsourcing, Teamwork and Business Management.* Nova Science Publishers Inc., Hauppauge, N.Y.

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Skees, J.R., J. Hartell, A.G. Murphy, and B. Collier. Handbook I: Challenges in developing agricultural insurance markets. IN: *Developing Agricultural Insurance in Vietnam: Four Educational Handbooks.* AgroInfo, Hanoi, Vietnam.

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Cassill, B., S. Hayes, J. Ringler, K. Janicki, and L. Lawrence. The effect of dietary calcium on indicators of bone turnover in broodmares. pp. 147-149. IN: J.D. Pagan, ed. *Advances in Equine Nutrition IV.* Nottingham University Press, Nottingham, United Kingdom.

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Xiong, Y.L. Dairy proteins. pp. 131-144. IN: R. Tarte, ed. *Ingredients in Meat Products.* Springer Science, New York.

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Nah, S. Journalism and social movements. pp. 1294-1297. IN: C.H. Sterling, ed. *Encyclopedia of Journalism.* Sage Reference, Thousand Oaks, Calif.

Weckman, R. Kansas City. pp. 821-823. IN: C.H. Sterling, ed. *Encyclopedia of Journalism.* Sage Reference, Thousand Oaks, Calif.

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Stringer, J. Intermediate hardwood stand management. pp. 161-182. IN: P. Hardin, ed. *Woodlands Management Course: A Guide to Improving Our Forests*. The Forest Landowner Foundation, Atlanta, Ga.

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Livestock Disease Diagnostic Center

Carter, C.N. *One Man, One Medicine, One Health: The James H. Steele Story*. Amazon Booksurge Press.

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M.S. Coyne contributed to one article in Biosystems and Agricultural Engineering.

D. Hildebrand contributed to one article in Plant Pathology.

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Graduate Degrees

Degrees listed are from the 2009 Spring Semester, 2009 Second Summer Session, and 2009 Fall Semester unless otherwise noted (*).

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- Tondel, Fabien.* International trade and industrial geography.

Animal and Food Sciences

- Edwards, Christina Charlene Taylor.* Identification and characterization of the glucagon-like peptide-2 hormonal system in ruminants.

Entomology

- Bai, Hua.* Functional genomics approaches to study hormone action in mosquito and beetle.
- Bitra, Kavita.* Functional characterization of nuclear receptors and basic helix-loop-helix transcription factors.
- Brelsfoard, Corey L.* Characterization of the Wolbachia and host interaction and the population genetic structure of the lymphatic filariasis vector *Aedes polynesiensis*.
- Fisher, Tonja W.* Identification and analysis of the single-copy predicted open reading frames in the *Campoletis sonorensis* Ichnovirus genome.
- Hladilek, Erin E.* The role of spiders in the detrital food web of an eastern deciduous forest.
- Moser, Susan E.* Alternative prey use and foraging tactics of coccinellid larvae.
- Nusawardani, Tyasning.* The regulation of host innate immune responses by *Campoletis sonorensis* parasitization and CSIV vankyrin gene expression.
- Sharanowski, Barbara J.* Hymenopteran molecular phylogenetics: From Apocrita to Braconidae (Ichneumonoidea).
- Zhang, Zhaoling.* Studies on hormone response elements and their binding proteins in *Drosophila melanogaster* and *Tribolium castaneum*.

Family Studies

- Cox, Megan E.* Explorations into early care and education providers' job dissatisfaction and mental well-being: Expanding the reach of emotional labor.
- **Gao, X.* (2008). Young children's accountability data on language, literacy, and pre-math areas: Validating authentic assessment.
- Reeser, C.S.* A birth cohort analysis of the baby boom generation.
- Thompson, S.G.* Promises we have kept: Using grounded theory methodology to understand the backgrounds, antecedents, and characteristics of Caucasian low-income parents' healthy marriages.

- Van De Venne, J.G.* Abuse factors, revictimization, disclosure, and depression in a national sample of abused women.

Horticulture

- Law, Audrey.* Evaluating the effects of organic and conventional inputs on soil chemical and biological properties in a four-year vegetable rotation and the investigation of soil microbial properties on plant gene expression.

Plant and Soil Sciences

- Jamboonsri, W.* Improvement of new oil crops for Kentucky.
- Kong, Que.* Functionally characterizing transcription factors Lc from *Zea mays* and NtAn2 from *Nicotiana tabacum* and exploring their roles in combinatorial regulation of anthocyanin biosynthesis.
- Nambuthiri, Susmitha S.* Soil water and crop growth processes in a farmer's field.
- Weand, Matthew P.* Tree species influences on coupled biogeochemical cycling of nitrogen and phosphorus and soil microbial communities.

Plant Pathology

- Florea, Simona.* Towards elimination and genetic manipulation of ergot alkaloid production in fungal endophytes.
- Jiang, Yi.* Identification and characterization of host factors involved in tomosvirus replication.
- Stork, Jozsef.* Role of p33 in tomosvirus replication.

Veterinary Science

- Boliar, S.* Pathogenesis of influenza A virus: Inhibition of monocyte differentiation into dendritic cells.
- Sturgill, T.* Vaccine responses and immune modulation in the neonatal foal.

M.S. Theses

Agricultural Economics

- Bayar, Emine.* The importance of nutritional label usage in the context of obesity: A cross-country study of the USA and Turkey.
- Davidson, Kelly Ann.* The impact of perceived barriers to export: An analysis of Kentucky agricultural and food processing firms.
- Hinkle-Rollins, Julia Louise.* The association between alcohol sales and county level economic growth in Kentucky.
- Shepherd, Jonathan David.* An interaction between risk perception and trust in response to food safety events across products and regions, and their implications for agribusiness firms.

In addition, two non-thesis master's degrees were awarded in calendar 2009.

Animal and Food Sciences

- Alman, Masa June.* Effect of site of starch infusion on nutrient utilization by growing beef steers consuming cubed alfalfa hay.
- Cannon, Julie Beth.* Addition of probiotics to the diet of pre-ruminant dairy calves and stressed receiving cattle: Effects on growth and health parameters.
- Koontz, Anne Fleming.* Effect of ractopamine on whole body and splanchnic energy balance in Holstein steers.
- Korthaus, Fran F.* Effects of modified distiller's grains plus solubles and direct fed microbials on growth performance and carcass traits of finishing beef steers.
- Lane, Eric Patrick.* The effect of dietary protein on growth and immunological response in receiving steers.
- Monegue, James Seth.* Evaluation of dietary alterations that have potential to affect feed intake and feed preference in swine.
- Parks, Alese Grey.* The effects of endophyte-infected tall fescue consumption on exercise response in horses.
- Tritsch, Crystal Alexandra.* The effect of progesterone on lutenizing hormone secretion in lactating dairy cows.

In addition, one non-thesis master's degree was awarded in calendar 2009.

Biosystems and Agricultural Engineering

- Lamb, Alisa Marchele.* Development of an optical backscatter method for determining β -LG denaturation during the thermal processing of milk.
- Luck, Brian David.* Development of a single nozzle, high pressure liquid pesticide metering and injection system.
- Peake, Jesse Matthew.* Streambank erosion rates for Thompson Creek.
- Pitla, Santosh.* Development of an electro-mechanical system to identify soil compaction.
- Routt, Oakes Keegan.* Determination of RUSLE parameters for mine spoils on steep, low-compacted slopes with grass cover in the Cumberland Plateau of Eastern Kentucky.

In addition, one non-thesis master's degree was awarded in calendar 2009.

Community and Leadership Development

- Castellano, Rebecca Som.* School lunch programs and the American diet: Exploring a contested food terrain.

In addition, four non-thesis master's degrees were awarded in calendar 2009.

Entomology

- Ayayee, Paul A.* Hemlock characteristics influence susceptibility to the invasive hemlock woolly adelgid.
- Fisher, J. Ray.* Systematics of Ichneutine parasitic wasps (Braconidae: Ichneutinae).

Hassell, Rebekah. The influence of heat and carbon dioxide on the host-finding behavior of the bed bug, *Cimex lectularius*.
Joseph, Andrew. Nutritional supplements and foraging behavior of *Bombus impatiens*: Effect on pollination of greenhouse tomatoes.
Spaulding, Heather. Modeling future forests in the wake of invasive species establishment.
Sun, Zhiyuan. Hormonal regulation of vitellogenesis in the red flour beetle, *Tribolium castaneum* (Coleoptera: Tenebrionidae).

Family Studies

Kimberly, C.E. Analyzing the educator and student relationship in a parent education program.
Martinez, L.K. How do female and male caregivers influence the development of their adolescent children's coping styles?
Palagyi, L. Equine assisted psychotherapy: Profiling characteristics of mental health clinicians.

In addition, one non-thesis master's degree was awarded in calendar 2009.

Forestry

Bowling, Will. Maternal antibody transfer and meningeal worm infection rates in Kentucky elk.
Cecil, Luke. Precommercial stand growth dynamics on reclaimed surface-mined lands in eastern Kentucky using high-value tree seedlings.
Jensen, Rebekah. The effects of roads on space use and movements of black bears in eastern Kentucky.
Moser, Lee. The effects of hardwood re-sprout control in hydrologically restored Carolina bay depression wetlands.
Ward, Kathryn. Influence of matrix geochemistry on Phytophthora detection on reforested mine lands in Appalachia. (Joint degree with Earth and Environmental Sciences.)
Whittle, Andrew. Florida panther and black bear: A road and urban avoidance/utilization analysis and impacts of land use and climate change on large carnivore habitat in Florida.

Horticulture

O'Daniel, Stephen Brandon. Optimizing the cropload potential of Traminette grape in Kentucky.

Merchandising, Apparel, and Textiles

Cotterill, Deena G. Post-use analysis of firefighter turnout gear.
Gupta, Megha. An assessment of the impact of product involvement on Generation Y decision-making styles.

Plant and Soil Sciences

Agostinelli, Andres. Phenotypic and genotypic selection for head scab resistance in wheat.
Bandyopadhyay, Amrita. Analysis of the Arabidopsis polyadenylation factors PAPI, CstF64, and CstF77 and their characteristic inter-relationship.
Cropper, Kenneth L. Investigations of the *Sclerotinia homoeocarpa*/*Agrostis stolonifera* pathosystem.
Deaton, Michael T. Trinexapac-ethyl and overseeding effects on tolerance to simulated traffic and shear strength of four bermudagrass cultivars grown on a sand-based system.
Fryman, Daisy M. Comparison of rope-wick and broadcast treatments for control of Canada thistle and tall ironweed.

Graduate Enrollment

Note: Data are from the UK Office of Institutional Research, Planning, and Effectiveness (<http://www.uky.edu/IRPE/student.html>).

	2008			2009			Net Change
	Master's	Doctorate	Total	Master's	Doctorate	Total	
Agricultural Economics	18	20	38	19	20	39	1
Animal and Food Sciences	25	21	46	21	25	46	0
Biosystems and Agricultural Engineering	16	10	26	18	11	29	3
Entomology	12	28	40	11	26	37	-3
Family Studies	20	21	41	21	18	39	-2
Forestry	17	*	17	14	*	14	-3
Merchandising, Apparel, and Textiles	7	*	7**	11	*	11	4
Nutrition and Food Science	23	*	23	29	*	29	6
Plant Pathology	4	21	25	0	25	25	0
Plant and Soil Sciences/Horticulture	29	37	66	20	42	62	-4
Rural Sociology/Career, Technology, and Leadership Education	35	18	53	37	12	49	-4
Veterinary Science	5	20	25	7	21	28	3
Grand Total			407			408	1

* Degree type not offered.

** Total not combined with Interior Design, Merchandising, and Textiles program starting in 2008.

Financial Statement

Statement of Current General Fund Income and Expenditures

Fiscal Year 2009

Income	
Federal Funds	
<i>Hatch</i>	\$ 4,144,050
<i>Hatch Multistate</i>	882,233
<i>McIntire-Stennis</i>	471,910
<i>Animal Health</i>	42,107
Total Federal Funds	\$ 5,540,300
Total State Funds	\$ 28,696,843
Total Funds	\$ 34,237,143

Expenditures	Federal	State	Total
Personal Services	\$ 4,419,198	\$ 22,590,528	\$ 27,009,726
Travel	95,142	462,212	557,354
Other Operating Expenses	855,506	5,409,470	6,264,976
Equipment	170,454	234,632	405,086
Total Expenditures	\$ 5,540,300	\$ 28,696,843	\$ 34,237,143

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C. Frank Shoop
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Everett McCorvey and Ernest J. Yanarella

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Agricultural Experiment Station

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Robert Brashear, Assistant Dean for Facilities Management

Departments

Following are departmental faculty and leadership lists for calendar year 2009. (R) denotes Experiment Station appointment.

Agricultural Communications

Skillman, L.M., Director
Wood, C.H., National Associate Director of eXtension

Agricultural Economics

Robbins, L.W., Professor and Chair (R)
Brown, R., Lecturer (R)
Dasgupta, S., Adjunct Assistant Professor
Davis, A., Assistant Extension Professor
Debertin, D.L., Professor (R)
Dillon, C., Associate Professor (R)
Freshwater, D., Professor (R)
Gorton, W.T., Adjunct Assistant Professor
Halich, G., Assistant Extension Professor
Hu, W., Assistant Professor (R)
Infanger, C.L., Extension Professor
Isaacs, S., Extension Professor
Jones, L.D., Extension Professor (R)
Katchova, A., Assistant Professor (R)
Maynard, L., Associate Professor (R)
Meyer, A.L., Extension Professor
Pagoulatos, A., Professor (R)
Pushkarskaya, H.N., Assistant Professor (R)
Reed, M.R., Professor (R)
Saghaian, S., Associate Professor (R)
Schieffer, J.K., Assistant Professor
Simon, M.E., Adjunct Assistant Professor
Skees, J.R., Professor (R)
Snell, W.M., Extension Professor
Stowe, C.J., Assistant Professor
Trimble, R.L., Extension Professor
Walters, C., Assistant Extension Professor
Williamson, L., Extension Professor
Woods, T., Extension Professor

Animal and Food Sciences

Harmon, R.J., Professor and Chair
Aaron, D.K., Professor (R)
Amaral-Phillips, D.M., Extension Professor
Anderson, L.H., Associate Extension Professor
Andries, K.M., Assistant Adjunct Professor
Bewley, J.M., Assistant Extension Professor
Boatright, W.L., Professor (R)
Boling, J.A., Professor (R)
Bullock, K.D., Extension Professor
Burris, R., Extension Professor
Camargo-Stutzman, F.C., Assistant Extension Professor
Cantor, A.H., Associate Professor (R)
Coffey, R.D., Associate Extension Professor
Coleman, R.J., Associate Extension Professor
Cox, N.M., Professor and Associate Dean for Research (R)
Cromwell, G.L., Professor (R)
Dawson, K.A., Adjunct Professor
Edgerton, L.A., Associate Professor (R)
Ely, D.G., Professor (R)

Flythe, M.D., Adjunct Assistant Professor
Harmon, D.L., Professor (R)
Heersche Jr., G., Extension Professor
Hennig, B., Professor (R)
Hicks, C.L., Professor (R)
Jackson Jr., J.A., Associate Professor (R)
Klotz, J.L., Adjunct Assistant Professor
Labonty, E.A., Lecturer
Lawrence, L.M., Professor (R)
Lehmkuhler, J.W., Assistant Extension Professor
Lindemann, M.D., Professor (R)
Matthews, J.C., Associate Professor (R)
McAllister, A.J., Extension Professor
McLeod, K.R., Associate Professor (R)
Newman, M.C., Associate Professor (R)
O'Leary, J., Associate Professor
Pescatore, A.J., Extension Professor
Pierce, J.L., Adjunct Assistant Professor
Rentfrow, G.K., Assistant Extension Professor
Rossano, M.G., Assistant Professor (R)
Silvia, W.J., Professor (R)
Strickland, J.R., Adjunct Associate Professor
Strobel, H.J., Adjunct Associate Professor
Suman, S.P., Assistant Professor (R)
Thrift, F.A., Professor (R)
Tidwell, J., Adjunct Assistant Professor
Tricarico, J.M., Adjunct Assistant Professor
Urschel, K.L., Assistant Professor (R)
Vanzant, E.S., Associate Professor (R)
Wang, C., Adjunct Assistant Professor
Webster, C., Adjunct Assistant Professor
Xiong, Y., Professor (R)

Biosystems and Agricultural Engineering

Shearer, S.A., Professor and Chair
Agouridis, C.T., Assistant Research Professor (R)
Colliver, D.G., Professor (R)
Crofcheck, C., Associate Professor (R)
Edwards, D.R., Professor (R)
Fehr, R., Extension Professor (R)
McNeill, S.G., Associate Extension Professor
Montross, M.D., Associate Professor (R)
Nokes, S.E., Professor (R)
Overhults, D.G., Associate Extension Professor (R)
Payne, F.A., Professor (R)
Purschwitz, M.A., Extension Professor (R)
Stombaugh, T.D., Associate Extension Professor (R)
Taraba, J., Extension Professor (R)
Warner, R.C., Extension Professor (R)
Wells, L.G., Professor (R)
Wheeler, E.F., Adjunct Assistant Professor
Wilhoit, J., Associate Extension Professor (R)
Wilkerson, E.G., Adjunct Assistant Professor
Workman, S., Professor and Assistant Dean for Research (R)

Community and Leadership Development

Hansen, G., Extension Professor and Chair (R)
Dyk, P., Associate Professor (R)
Garkovich, L., Professor (R)
Hains, B., Assistant Professor (R)
Harris, R., Associate Professor (R)
Hustedde, R., Extension Professor
Jackman, W.J., Adjunct Assistant Professor
Jones, K., Assistant Extension Professor (R)
Kitchel, T., Assistant Professor (R)
Maurer, R., Extension Professor
Nah, S., Assistant Professor (R)
Ricketts, K., Assistant Extension Professor
Tanaka, K., Associate Professor (R)
Warner, P., Extension Professor
Weckman, R., Associate Professor
Witham, D., Professor
Zimmerman, J., Associate Extension Professor (R)

Entomology

Obrzycki, J.J., Professor and Chair
Barney, R.J., Assistant Adjunct Professor
Bessin, R.T., Extension Professor
Brown, G.C., Professor (R)
Dobson, S.L., Professor (R)
Fox, C.W., Professor (R)
Harwood, J.D., Assistant Professor (R)
Haynes, K.F., Professor (R)
Johnson, D.W., Extension Professor
Palli, S.R., Professor (R)
Potter, D.A., Professor (R)
Potter, M.F., Extension Professor
Rieske-Kimney, L.K., Professor (R)
Sedlacek, J.D., Assistant Adjunct Professor
Sharkey, M.J., Professor (R)
Townsend, L.H., Extension Professor
Webb, B.A., Professor (R)
Webster, T.C., Assistant Adjunct Professor
White, J.A., Assistant Professor (R)
Yeargan, K.V., Professor (R)
Xuguo, Z., Assistant Professor (R)

Environment and Natural Resources Initiative

Workman, S.R., Director
Hanley, C., Director of Education and Communications

Equine Initiative

MacLeod, J., Director and Dickson Professor of Equine Science and Management
Coleman, R., Associate Director for Undergraduate Education in Equine Science and Management
Wiemers, H.F., Communications Director

Family Studies

Werner-Wilson, R.J., Professor and Chair (R)
Ellington, V., Lecturer
Flashman, R.H., Extension Professor (R)
Haleman, D., Lecturer
Hans, J.D., Assistant Professor (R)
Heath, C.J., Professor (R)
Hosier, A., Assistant Extension Professor (R)
Johnson, C.A., Assistant Professor
Kim, H., Associate Professor (R)
Parker, T.S., Assistant Professor
Scott, R.A., Lecturer
Smith, D.R., Associate Professor
Vail, A., Professor, Director of the School of Human Environmental Sciences and Assistant Director of Family and Consumer Sciences Extension (R)
Werner-Wilson, T., Lecturer
Wood, N., Assistant Professor (R)

Forestry

Lacki, M.J., Professor and Interim Chair
Arthur, M.A., Professor (R)
Barnes, T.G., Extension Professor
Barton, C., Associate Professor (R)
Conners, T.E., Associate Extension Professor
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Fei, S., Assistant Professor (R)
Gassette, J.W., Adjunct Assistant Professor
Hill, D.H., Extension Professor
Kalisz, P.J., Associate Professor
Lhotka, J.M., Assistant Professor (R)
Ringe, J.M., Professor
Stainback, G.A., Assistant Professor
Stringer, J.W., Extension Professor (R)
Wagner, D.B., Associate Professor

Horticulture

Houtz, R.L., Professor and Chair
Antonious, G., Adjunct Assistant Professor
Archbold, D.D., Professor (R)
Bomford, M., Adjunct Assistant Professor
Buxton, J.W., Associate Professor (R)
Cappiello, P., Adjunct Assistant Professor
Coolong, T.W., Assistant Extension Professor (R)
DeBolt, S., Assistant Professor (R)
Downie, A.B., Associate Professor (R)
Dunwell, W.C., Extension Professor
Durham, R.E., Associate Extension Professor
Fountain, W.M., Extension Professor
Geneve, R.L., Professor (R)
Ingram, D.L., Professor
Pomper, K., Adjunct Associate Professor
Rowell, A.B., Adjunct Professor
Schnelle, R.A., Assistant Extension Professor
Snyder, J.C., Associate Professor (R)
Strang, J.G., Extension Professor
Williams, M.A., Associate Professor (R)

Kentucky Tobacco Research and Development Center

Davies, H. M., Director
Chambers, O.D., Biotechnology Relations Director
Maiti, I.B., Scientist III
Zaitlin, D., Scientist III

Landscape Architecture

Schach, H., Professor and Chair
Crankshaw, N.M., Professor
Fields, L., Assistant Professor
Hargrove, R.A., Assistant Professor
Lee, B.D., Associate Professor
Nieman, T.J., Professor (R)

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Carter, C.N., Professor and Director (R)
Bolin, D.C., Associate Professor
Bryant, U.K., Assistant Professor
Cassone, L.M.C., Assistant Professor
Donahue, J.M., Professor
Gaskill, C.L., Associate Professor
Hong, C.B., Professor
Jackson, C.B., Associate Professor
Kennedy, L.A., Assistant Professor
Loynachan, A.T., Assistant Professor
Vickers, M.L., Associate Professor
Williams, N.M., Professor and Associate Director

Merchandising, Apparel, and Textiles

Vail, A., Interim Chair
Easter, E.P., Professor
Jackson, V.P., Associate Professor
Joshi, P.R., Lecturer
Lee, M.-Y., Assistant Professor
Michelman, S.O., Associate Professor
Spillman, K.M., Associate Professor
Wesley, S.C., Assistant Professor

Nutrition and Food Science

Kurzynske, J.S., Associate Extension Professor and Chair
Adams, I.R., Assistant Extension Professor
Addo, K., Associate Professor
Bastin, S.B., Associate Extension Professor
Brown, D.O., Associate Professor
Cook-Newell, M., Lecturer
Forsythe, H.W., Associate Professor (R)
Gaetke, L., Professor
Ham, S., Associate Professor
Perry, S.D., Lecturer
Roseman, M.G., Associate Professor
Stephenson, T.J., Lecturer
Tietyen, J., Associate Professor
Webber, K., Assistant Professor

Plant and Soil Sciences

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Aiken, G.E., Adjunct Professor
Bailey, W.A., Associate Extension Professor
Barrett, M., Professor
+*Baskin, C.*, Professor (R)
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Egli, D.B., Professor (R)
Grabau, L.J., Professor (R)
Green, J.D., Extension Professor
Grove, J.H., Associate Professor (R)
Henning, J.C., Extension Professor and Associate Dean for Extension
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Kagan, I., Assistant Adjunct Professor
Karathanasis, A.D., Professor (R)
Kumudini, S., Assistant Professor (R)
Lee, B.D., Associate Extension Professor
Lee, C.D., Associate Extension Professor (R)
Martin, J.R., Extension Professor
Matocha, C.J., Associate Professor (R)
McCulley, R.L., Assistant Professor (R)
McNear, D.H., Assistant Professor (R)
Miller, R.D., Professor (R)
Moe, L.A., Assistant Professor
Mueller, T.G., Associate Professor (R)
Mullen, M.D., Professor and Associate Provost for Undergraduate Education
Murdock, L.W., Extension Professor and Director, UKREC
Palmer, G.K., Extension Professor and Assistant Director of Agriculture and Natural Resources Extension
Pearce, R.C., Associate Extension Professor
Perry, S.E., Associate Professor (R)
Phillips, T.D., Associate Professor (R)
Schwab, G.J., Associate Extension Professor
Sikora, F., Associate Adjunct Professor
Smalle, J., Assistant Professor (R)
Smith, S.R., Associate Extension Professor
Tang, G., Assistant Professor (R)
Unrine, J., Assistant Research Professor (R)
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Wagner, G.J., Professor (R)
Wendroth, O., Associate Professor (R)
Williams, D.W., Associate Professor (R)
Witt, W.W., Professor (R)
Xu, D., Assistant Adjunct Professor
Yuan, L., Associate Professor (R)
Zhu, H., Associate Professor (R)

+ Joint with Biology.

Plant Pathology

Smith, D.A., Professor and Chair
Farnan, M.L., Professor (R)
Ghabrial, S.A., Professor (R)
Goodin, M.M., Associate Professor (R)
Hartman, J.R., Extension Professor
Hershman, D.E., Extension Professor
Kachroo, A.P., Assistant Professor (R)
Kachroo, P., Associate Professor (R)
Nagy, P.D., Professor (R)
Schardl, C.L., Professor (R)
Seebold Jr., K.W., Assistant Extension Professor
Vaillancourt, L.J., Professor (R)
Vincelli, P., Extension Professor

Regulatory Services

Thom, W.O., Director and Professor
Barrow, M.C., Inspector
Bryant, M., Feed/Fertilizer Laboratory
Coordinator
Buckingham, D.T., Seed Regulatory Coordinator
Coffey, D.S., Inspector
Finneseth, C.L.H., Seed Testing Coordinator
Flood, J.S., Inspector

Hickerson, R.R., Inspector
Johnston, C.B., Inspector
Mason, D.W., Inspector
McMurry, S.W., Fertilizer Coordinator
Pinkston, W.W., Inspector
Prather, T.G., Inspector
Sikora, F.J., Soil Testing Coordinator and
Professor
Spencer, H.S., Auditor
Thompson, C.D., Milk Coordinator
True, J.A., Field Inspector Coordinator
Webb, S.F., Analytical Laboratory Coordinator
Whitehouse, W.J., Inspector

Robinson Center for Appalachian Resources and Sustainability

Ditsch, D., Director

Sustainable Agriculture and Food Systems Working Group

Perry, R.R., Coordinator

Veterinary Science

Troedsson, M.H.T., Professor and Chair (R)
Artushin, S.C., Assistant Research Professor (R)
Bailey, E.F., Professor (R)
Balasuriya, U.B., Associate Professor (R)
Chambers, T.M., Associate Professor (R)
Cook, R.F., Assistant Research Professor (R)
Dwyer, R.M., Professor (R)
Fitzgerald, B.P., Associate Professor (R)
Graves, K.T., Assistant Research Professor (R)
Horohov, D.W., Professor (R)
Howe, D.K., Associate Professor (R)
Issel, C.J., Professor (R)
Lear, T.L., Associate Research Professor (R)
Lyons, E.T., Professor (R)
MacLeod, J.N., Professor (R)
McDowell, K.J., Associate Professor (R)
Squires, E.L., Professor and Executive Director,
Gluck Equine Research Foundation
Swerczek, T.W., Professor (R)
Timoney, J.F., Professor (R)
Timoney, P.J., Professor (R)
Tobin, T., Professor (R)

UK Research and Education Center at Princeton

Murdock, L., Director
Williams, J., Superintendent

*Editor—Linda R. Kiesel, Ph.D., Agricultural Communications Services
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