

*The Kentucky
Agricultural Experiment Station*

125th

Annual Report
2012

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

I herewith submit the one hundred and twenty-fifth annual report of the Kentucky Agricultural Experiment Station for the period ending December 31, 2012. 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, 2013

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Experiment Station–Affiliated Departments and Centers

Agricultural Economics
Animal and Food Sciences
Biosystems and Agricultural Engineering
Community and Leadership Development
Dietetics and Human Nutrition
Entomology
Environmental and Natural Resource Initiative
Family Sciences
Forestry
Horticulture
Kentucky Tobacco Research and Development Center
Landscape Architecture
Plant and Soil Sciences
Plant Pathology
Retailing and Tourism Management
Regulatory Services
Robinson Center for Appalachian Resource Sustainability
Sustainable Agriculture and Food Systems Working Group
UK Ag Equine Programs
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

The University of Kentucky, the state's flagship land-grant institution, 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.

As the research arm of the College of Agriculture, the Kentucky Agricultural Experiment Station has been providing research results to farmers and rural residents for more than 130 years. The continued progress of Kentucky agriculture attests to the benefits of applying new knowledge and technology. 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.

Experiment station research spans both basic and applied sciences. 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 2012. 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

In 2012, research activities of the Kentucky Agricultural Experiment Station were conducted at Lexington, Princeton, Quicksand, and Owenton and in counties throughout the state. 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
- **C. Oran Little Research Center** (Woodford County)—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.

Environmental and Natural Resource Initiative

The Environmental and Natural Resource Initiative (ENRI), a comprehensive program within the College of Agriculture, is in its third year. The initiative provides leadership and focus to interdisciplinary basic and applied research, interdepartmental graduate and undergraduate instruction, and highly collaborative extension and engagement services in environmental and natural resources. ENRI operates through a series of working groups chaired by College of Agriculture faculty members. These working groups allow faculty and staff to coalesce around a topic or project to discuss and work on agricultural issues. ENRI staff provides services to faculty, staff, and students to help them conduct outreach and research programs on campus and throughout

the community. Services provided include assistance with the logistics of workshops and conferences, creation and submission of proposals, grant management, and web site maintenance.

During 2012, ENRI moved into new areas of programming, including international education, partnerships, and natural resource grant opportunities. The climate change working group remained active, conducting research and education projects. The climate change working group partnered with the invasive species working groups to conduct an environmental issues event scheduled for April 2013. Ongoing programming includes geospatial education, water and stormwater education, and outreach to community groups, including Black Males Working

Kentucky Tobacco Research and Development Center

The Kentucky Tobacco Research and Development Center (KTRDC) mission is to utilize plant-based technology to benefit Kentucky agriculture. The focus is on the use of science—including molecular biology, genomics, plant genetic engineering, plant breeding/field research, and other advanced technologies—to improve agriculture. Research focuses on applied research in support of Kentucky tobacco production, the enhancement of tobacco and other *Nicotiana* species as a production system for plant-based products (including pharmaceuticals and industrial materials), and discovering new plant-derived natural products with potential for commercialization. Facilities include research laboratories, greenhouses, and contained growth facilities for plant disease and genetic engineering research. The goal is to utilize these resources to preserve and strengthen agriculture in Kentucky, in particular, tobacco agriculture.

Research Focus

It has been a productive year with significant change in research program emphasis and the development of new research collaborations. The transition of the tobacco analytical group from the Department of Plant and Soil Sciences to KTRDC has begun, and the Kentucky-Tennessee Tobacco Improvement Initiative will also be relocating into the KTRDC building. Combining the basic science research strength of KTRDC, the world class tobacco analytical capability of Dr. Lowell Bush's lab and the world class tobacco breeding program of Dr. Bob Miller positions KTRDC as one of the most comprehensive academic tobacco research facilities in the world. The University of Kentucky is well-positioned to conduct tobacco research for the maximum benefit of growers and to respond to the new FDA tobacco regulatory environment resulting from passage of the Family Smoking Prevention and Tobacco Control Act.

The FDA regulatory system continues to develop and is expected to have a major impact on Kentucky tobacco producers. KTRDC intends to contribute to the science of this impending tobacco regulation and to explore opportunities to be involved in and support research related to the major changes occurring

in tobacco production in Kentucky and throughout the world. It is important to engage the new regulatory environment and be a part of shaping the tobacco industry of the future. New opportunities for Kentucky tobacco growers may result from FDA regulations as tobacco products change and new products are brought to market. Those able to prepare and adjust will be in a better position to continue producing tobacco. KTRDC is focusing our tobacco research to help the Kentucky tobacco industry prepare for the evolving tobacco industry post-FDA regulation.

KTRDC is initiating innovative, cutting-edge research projects through a program called the Tobacco Summit. This is the second year of this very successful KTRDC special grants program directed toward the science of tobacco regulation and the impact it will have on Kentucky tobacco producers. The program emphasizes collaboration among basic research scientists (who may be less knowledgeable about the current state of the tobacco industry) and applied tobacco researchers (who are more familiar with current tobacco research needs). Funding decisions include input from both University of Kentucky scientific reviewers and representatives from tobacco grower organizations.

Several of the projects funded for 2012 will continue into 2013, including developing mutation populations and screening technologies to identify new tobacco lines having useful traits related to improved chemistry for FDA regulation or improved agronomic traits as well as strategies such as incorporating the FT gene into elite tobacco lines for faster breeding of new varieties. Other significant research areas focus on studying tobacco specific nitrosamines, which are very high on the FDA list of harmful or potentially harmful constituents.

Through the Tobacco Summit, KTRDC funded 14 pilot projects. The list of funded projects below suggests the wide range of research and its relevance to Kentucky tobacco producers. Research results from the first year of projects are included in the current KTRDC annual report; the results of the newly funded projects will be included in the 2012–2013 annual report.

2012–2013 Tobacco Summit Projects

- Field testing of tobacco phytoplanin overexpressing KY14 to assess its resistance to blue mold, frog-eye, and other fungal diseases
- Utilization of the *Arabidopsis FT* gene to facilitate tobacco variety development
- The effects of cytokinin application on the production of tobacco-specific nitrosamines
- TSNA accumulation in controlled curing environments
- An inducible tobacco sucker control system delivered by intragenic transformation
- Surveying populations of *Thanatephorus cucumeris* and *Cercospora nicotianae* for sensitivity to azoxystrobin
- Mutation populations for use in the development of tobacco varieties having novel chemical characteristics
- Development of gene-specific codominant molecular markers for *nic1*
- Topping height of high leaf potential hybrids
- Strategies for detecting deletion mutations in populations of fast neutron-irradiated *Nicotiana benthamiana* plants
- Feasibility study for Benzo[a]pyrene in smokeless tobacco
- Dark burley
- Evaluation of black shank resistance in dark tobacco
- Development of gene-specific codominant molecular markers for *nic2*

Highlights

- In addition to the Tobacco Summit grants, KTRDC supported 27 research projects in 2012. Progress reports for these projects can be found in the KTRDC annual report for 2011–2012.
- KTRDC is expanding and upgrading its analytical capability to include the analysis of tobacco smoke in addition to raw tobacco. The lab will provide support to University of Kentucky tobacco extension, breeding, and research personnel and will support new initiatives related to the Reference Cigarette program.
- The University of Kentucky has provided reference tobacco products for 45 years as a service to the tobacco research in-

- dustry both in the United States and globally. In 2012 KTRDC was on the program of a scientific workshop sponsored by the FDA to obtain input on and discuss the scientific issues related to tobacco reference products, including the analytical methods for measuring certain tobacco product and smoke constituents. The University of Kentucky hosted another workshop on reference cigarettes in an effort to plan for future reference tobacco product needs and to establish the Kentucky reference tobacco products as the standard for FDA regulation. Kentucky reference tobacco products have been the foundation of tobacco product scientific research and will play a significant role in FDA regulation and future tobacco research.
- The Kentucky-Tennessee Tobacco Improvement Initiative (KTTII) will be moving into the KTRDC building. This move will further strengthen the collaborative relationship between KTRDC and the tobacco breeding program. By combining research capabilities and sharing resources, we can enhance the development of tobacco varieties and more efficiently develop new technologies to benefit tobacco growers.
 - The FOLIUM project conducted in conjunction with the Lawrence Berkeley National Lab, the University of California Berkeley, the Joint Genome Institute and KTRDC is progressing. This \$5.3 million project is funded by the Department of Energy through their Plants Engineered to Replace Oil (PETRO) program. The goal of the project is to develop tobacco as a platform for foliar synthesis of high-density liquid fuels.
 - KTRDC researchers continue to participate in conferences, workshops, and other events worldwide. Of particular note, the University of Kentucky now has a seat on the Board of CORESTA, the international tobacco research organization as well as representation on the CORESTA Scientific Commission. We are also members of the U.S. Technical Advisory Group (US TAG) to the International Standards Organization (ISO) Technical Committee 126 (ISO/TC 126) on Tobacco and Tobacco Products. Through involvement in these organizations and others, we are engaging tobacco regulatory and research organizations around the world on issues relevant to Kentucky tobacco producers.

Regulatory Services

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

The division administers four state laws pertaining to ingredients, manufacturing, processing, labeling, and marketing of feed, fertilizer, seed, and raw milk. Our primary objectives are to protect consumers of these products from poor-quality, mislabeled, or misrepresented products and to protect businesses marketing these products from unfair competition.

Feed, fertilizer, and seed are monitored from ingredients through manufacturing and retail channels for compliance.

Label review and product and facility inspections as well as product sampling by our inspectors and analysis in our laboratories are important steps in the monitoring process. Raw milk is monitored during marketing to ensure (1) accurate and equitable exchange between dairy producers and processors, and (2) ensure integrity of milk from farm to processor.

Eight regulatory inspectors and one auditor cover the state collecting samples, inspecting facilities, reviewing labels, and auditing records. Audits of sales and fee payments are conducted on feed, fertilizer, seed, and milk firms in Kentucky to verify reports, records, and fee payments. One inspector is dedicated to the milk program for auditing payment records and monitoring activities of sampler-weighers, handlers, lab personnel, and lab facilities.

The activities in the division are performed by a dedicated and professional staff that conduct laboratory analyses, provide administrative and computer support, process data, and compile reports in addition to performing 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, suitability, and quality of animal feed in producing meat, milk, and eggs for human consumption and products for companion animals. The program provides standards of quality, safety, efficacy, and labeling for feed products. A statewide inspection, sampling, and laboratory analysis program monitors feed ingredients, and feed products. Feed 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 food safety efforts that promote consumer confidence in the nation's food supply. We work cooperatively with the U.S. Food and Drug Administration (FDA) in assessing compliance with the ruminant-to-ruminant feeding ban to prevent any establishment or amplification of bovine spongiform encephalopathy (BSE, or "mad cow disease").

Highlights

- Performed official inspections on 1,316 feed manufacturers and dealers
- Collected 2,582 official samples; inspectors and others provided 70 unofficial samples that resulted in 19,222 lab analyses for more than 2.2 million tons of feed marketed
- Collected 804 specialty pet food samples for analysis
- Monitored the 2012 corn crop for mycotoxins including aflatoxin, fumonisin, and vomitoxin. More than 400 mycotoxin analyses were conducted on various feed samples during the year
- Conducted 75 BSE inspections for compliance with the ruminant-to-ruminant feed ban and inspected 4 feed mills that mix restricted drugs in feed for compliance with current good manufacturing practices
- Maintained registration on more than 20,800 feed products from nearly 1,160 companies and conducted new product label reviews on more than 3,260 products
- Analyzed and reported 36 feed samples from quality control programs
- Used 47 different approved analytical methods in providing results
- Received income from inspection fees and product registration of \$1,167,803.79 during the period of July 1, 2011 to June 30, 2012. Inspection fees are assessed at \$0.35/ton, and annual registration of \$50.00 is collected for products sold exclusively in 10 lb or smaller packages.

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.

Highlights

- Conducted 1,337 visits to perform inspections and to sample agricultural, lawn, turf, and garden fertilizer at Kentucky processing, wholesale, and retail locations
- Administered actions on 2,526 official and 78 unofficial samples of fertilizer involving over 6,600 chemical tests. The official samples represented about 52,000 tons out of the approximately 972,000 tons of fertilizer distributed in Kentucky during 2012, or about 5.3%
- Reviewed labels and registered 5,036 products from 703 firms and issued licenses to 216 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 15 different analytical methods that yielded results for 28 analytes and contaminants
- Substantiated cash receivables from fertilizer reports. The income from registration fees, inspection fees, and licenses received from July 1, 2011, to June 30, 2012, was \$595,507. Fertilizer products are assessed an inspection fee of 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.

Highlights

- Reviewed applications and issued licenses to 2 transfer stations, 25 milk handlers, 17 laboratories, 75 technicians, and 348 sampler-weighers (milk-haulers, receivers, and samplers)
- Analyzed and administered action on 7,402 official samples
- Administered a monthly milk lab quality control check sample program through the distribution of 2,736 samples to the 17 licensed laboratories and 2 other labs to ensure accurate component-analysis procedures
- Conducted 8 pay-record and 13 raw milk receiving audits
- Conducted 28 milk laboratory inspections
- Collaborated with Kentucky Cabinet for Health Services

Milk Safety Branch to train sampler-weighers and processor receiving personnel

- Trained and examined 43 new sampler-weighers and 5 new technicians
- Conducted 4 inspections of raw milk transfer stations
- Conducted 390 sampler-weigher inspections
- Provided analyses for research projects pertaining to cow comfort, somatic cell testing, horse milk, and other research in the college
- Provided analyses for Kentucky small processor cheese makers
- Completed sample age study to determine if the time allowed for milk sample analysis after collection can be increased from 72 hours to 120 hours
- Substantiated cash receivables on 92 milk reports and income from fees and licenses received from July 1, 2011 to Jun 30, 2012 was \$175,633. Milk handlers and producers assessed at the rate of one-half cent (\$.005) per hundredweight of milk.

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, including kind, variety, and lot designation, seed purity percentages, presence of noxious weeds, seed origin, presence of inert matter, seed analysis date, and a seed germination guarantee. The division is also responsible for maintaining registration of the state's seed labelers, seed conditioners, and seed dealers.

Highlights

- Conducted 1,322 visits to perform inspections and to sample agricultural, lawn, turf, and garden seeds at Kentucky seed processing, wholesale, and retail locations
- Collected and tested 1,744 official seed samples
- Issued stop-sale orders on 235 official seed samples and 241 violative seed lots at seed dealer and seed processor locations
- Cooperated with the USDA Seed Regulatory and Testing Services regarding shipments of seed into the state that were in violation of the Federal Seed Act
- Reviewed and issued 233 permits to label agricultural seed and 53 permits to label vegetable and flower seed
- Registered 605 seed dealers and 26 non-certified custom seed conditioners
- Provided training to firms on labeling requirements, retail sales procedures, stop sale release procedures, and record-keeping requirements
- Substantiated cash receivables on over 800 seed reports, and the income from fees, permits and licenses received from July 1, 2011 to Jun 30, 2012 was \$367,694. Seed products are assessed at 4–24 cents per unit.

Seed Testing Laboratory

The division maintains the only certified seed testing facility in Kentucky. This facility handles all official samples collected by inspectors and provides service testing for seed producers, dealers, retailers, research projects, and homeowners for a fee. More than 90% of the service samples accepted into the laboratory were submitted by Kentucky firms or individuals.

The laboratory analyzes seed for purity, identifies weed and crop seed, conducts germination, counts seed, determines test weight, performs accelerated aging, conducts fluorescence testing on ryegrass, determines moisture content, conducts tetrazolium analysis, assesses herbicide tolerance, determines presence of endophyte, and conducts many other analyses. Our analysts keep abreast of changes through participation in regional and national referee testing with the Association of Official Seed Analysts (AOSA) and the USDA Federal Seed Laboratory and by attending special and regular workshops at the AOSA annual meeting. All analysts are AOSA-certified in areas of purity and germination.

Highlights

- Analyzed 5,210 service samples
- Collaborated with researchers to analyze 48 seed samples
- Supported the equine and livestock pasture management programs in analyzing 372 plant samples for endophytes
- Analyzed 37 seed samples under the provision that allows one free sample for testing each year from Kentucky residents
- Derived income from service samples from July 1, 2011 to June 30, 2012 of \$69,438.

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 \$240,109 in income for service testing during the period July 1, 2011 through June 30, 2012.

The soil test web site can be found at <http://soils.rs.uky.edu/index.php>.

Soil samples analyzed in 2012

Type	Number	Change from 2011 (%)
Agriculture	42,994	28
Home lawn and garden	10,300	6
Commercial horticulture	970	10
Greenhouse media	51	-26
Research	8,291	19
Atrazine residue in soil	28	115
Animal waste	447	22
Nutrient solution	100	-7
Soil nitrate	72	-49
TOTAL	63,253	22

Robinson Center for Appalachian Resource Sustainability

At Quicksand in Breathitt County, the Robinson Center for Appalachian Resource Sustainability (RCARS) is the east region location for research on fruits and vegetables, ornamentals, livestock forage and grazing systems, grain crops, bio-mass 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.

Established in 1925, the Robinson Center for Appalachian Resource Sustainability has the budgetary and physical responsibility for managing the research facilities at Quicksand, the Wood Utilization Center, and Robinson Forest. The mission of this 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.

Research Activities

Robinson Center

Department of Biosystems and Agricultural Engineering

- Conductivity Sensor Accuracy and Temporal Stability: A Laboratory and Field Study
- The Guy Cove Stream Restoration Project: Recreating a Headwater Stream System on a Head-of-Hollow Fill
- Biosystems and Agricultural Engineering, Horticulture, Plant and Soil Sciences, and the Center for Applied Energy Research continue investigating potential energy production from alternative crops on marginal agricultural land. Plots were established during 2010, and measurements will include changes in soil carbon, biomass production, and potential energy production (as a liquid or solid fuel) from Miscanthus, switchgrass, black locust, and cottonwood.

Department of Horticulture

- Tested varieties of asparagus, heirloom tomatoes, and green beans
- Collaborated with Kentucky State University to evaluate the production of hops and hybrid filberts in eastern Kentucky
- Evaluated persimmon germplasm
- Transplanted sweet corn plant spacing study

Department of Plant and Soil Sciences

- RCARS is the east region location for the livestock forage variety testing program. Results from these trials are published annually.
- In a corn-urea nitrogen (N) fertilizer trial, evaluated five urease/ammonia volatilization inhibitor products and found that only those containing NBPT were effective.
- In a corn-liquid N fertilizer trial, evaluated a microbial product for enhanced N use efficiency, and found no enhancement.
- Tested advanced lines of sweet sorghum being bred for sorghum syrup production for yield, disease resistance, and sugar content.

Department of Plant Pathology

- Blue mold variety evaluation was conducted in collaboration with Dr. Natalia Martinez (Department of Plant and Soil Sciences) and was initiated to evaluate 20 experimental tobacco lines for resistance to blue mold. The varieties in the trial were provided by CORESTA, an international working group for tobacco research.
- Cucurbit downy mildew sentinel plots were established in collaboration with Horticulture personnel at RCARS. Sentinel plots were established to allow for early detection of downy mildew and to determine which cucurbit crops (watermelon, cucumber, pumpkin, and melon) would be affected. Information gathered from the RCARS sentinel plots was shared with researchers across the country and was used in forecasting the predicted movement of downy mildew during the summer and fall of 2012.
- Experimental fungicides for foliar disease control on burley tobacco were evaluated to determine efficacy against two important diseases of burley tobacco, target spot, and frog-eye leaf spot.

Robinson Forest

Department of Entomology

- Research continues on the effects of the highly invasive hemlock woolly adelgid on headwater streams and associated riparian zones, including stream characteristics, terrestrial and benthic riparian macroinvertebrate communities, litter fall, and litter colonization.
- *Laricobius nigrinus*, a hemlock woolly adelgid predator native to the Pacific Northwest, was evaluated for its efficiency as a predator on low and high adelgid densities on eastern hemlock.
- A common garden of six hemlock species of varying geographic origins and representing a spectrum of resistance to the hemlock woolly adelgid is being evaluated for characteristics contributing to adelgid resistance.
- Artificial adelgid infestations are being used to evaluate the physiological effects of the hemlock woolly adelgid on six hemlock species of varying geographic origins, and representing a spectrum of adelgid resistance, growing in a common garden.

Department of Forestry

- Survivorship and cause-specific mortality of elk in southeastern Kentucky
- Elk social dynamics and implications for disease transmission
- Impacts of timber harvest on salamanders and breeding birds in a mixed-mesophytic forest
- Ecology of timber rattlesnakes in a forest-mineland interface
- Enhancement of *Quercus* species establishment through soil scarification
- Evaluation of sediment delivery from temporary skidder stream crossing technologies
- Relationship between the movement of timber harvesting equipment and sedimentation of perennial streams in eastern Kentucky

- Crop-tree release of white oak
- Appalachian Research Initiative for Environmental Science with UK Department of Biosystems and Agricultural Engineering and Virginia Tech
- Use of GIS and WATER model to identify and delineate stream types in eastern Kentucky. USDA National Institute of Food and Agriculture (NIFA), Precision Agriculture: Precision Resource Management
- Long-term effects of forestry best management practices on hydrology, water chemistry, and woody debris in three Appalachian headwater catchments. USDA Forest Service, Cooperative Research Grant
- Evaluating streamside management zone effectiveness in forested headwater catchments of central Appalachia. University of Kentucky Agricultural Experimental Station
- Headwater stream restoration project. University of Kentucky, Robinson Forest. Kentucky Mitigation Review Team: U.S. Army Corps of Engineers, U.S. Fish and Wildlife, U.S. Environmental Protection Agency, and Kentucky Department of Water
- Development of new methods for characterizing and predicting the potential release of constituent of concern from coal overburden and refuse materials with the Department of Biosystems and Agricultural Engineering.

Extension Activities

- Win with Wood Youth Event. Annual youth program focused on forestry and forest industry. October 18, 2012.
- Mountain Ag Week. Included Pumpkin Day for preschool children, Youth Natural Resource Day for middle and high

- school students, and Taste of the Mountains Field Day. More than 3,000 in total attendance. September 18–22.
- Kentucky Master Logger Program. Attended by 15 loggers at RCARS Taste of the Mountains Field Day. September 22.
- The University of Kentucky's Department of Forestry at RCARS has worked with the Kentucky Division of Forestry to create and maintain a wood industries directory listing the wood products companies in the state.
- Tooling design program for the secondary wood industry. Templates for 26 different products were developed, resulting in an estimated \$65,000 in earned or saved revenue to the secondary wood industry.
- UK Wood Utilization Center entrepreneur development program. Three entrepreneurs are currently participating in this program to develop new wood products businesses.
- Mountain Monday Series. Monthly extension programs on a variety of topics are held at the RCARS the second Monday of each month.
- 4-H Natural Resource and Environmental Sciences Academy. Seventh and eighth grade students are selected for this three-year program based on their academic achievements and teacher recommendations. Students study water, forestry, and wildlife resources at the Robinson Forest.

Teaching Activities Conducted at Robinson Forest

- NRE 320—Natural Resources and Environmental Analysis
- FOR 355—Forest Fire Control and Use
- FOR 356—Landscape Assessment
- FOR 357—Inventory and Measurements II
- FOR 358—Silviculture Practices
- FOR 359—Forest Operations and Utilization

Sustainable Agriculture and Food Systems Working Group

The Sustainable Agriculture and Food Systems working group (SAFSWG) was established in 2009 with the mission of supporting and challenging the college community to create new knowledge that improves the sustainability of the agriculture/food system in Kentucky and beyond. Membership includes faculty and staff from throughout the college community. Over the past few years, the SAFSWG has sponsored a convocation to help focus the College's sustainable agriculture work and to stimulate collaboration; hosted a series of sustainable agriculture forums, including a local foods breakfast; and supported an undergraduate major in sustainable agriculture.

The idea of a new climate change group emerged from the convocation. Now part of the Tracy Farmer Institute for Sustainability and the Environment, the climate change group has hosted scientific panels and conducted educational workshops for extension agents. The SAFSWG's First Friday Sustainable Agriculture forums have gained regional attention, drawing a monthly audience of more than 80 from the across the university and regional community to learn about topics as diverse as community gardens, GMOs, and how to measure sustainability. The SAFSWG also advises the leadership of the undergraduate Sustainable Agriculture program on policy and integration into the rest of the College.

UK Ag Equine Programs

UK Ag Equine Programs is a framework that encompasses everything equine in the College of Agriculture. The Equine Initiative was launched in 2005 when the College set out to radically change how it served Kentucky's signature equine industry and provide a suite of services appropriate for a land-grant university. The name UK Ag Equine Programs was adopted in early 2012

to better position UK's equine programs for continued success. UK Ag Equine Programs serves as the front door to equine in the College and represents the breadth of equine offerings at UK and the College's long-term commitment to serving the state's signature industry.

Student Opportunities

Now in its sixth year, the Equine Science and Management undergraduate degree program is going strong with almost 240 students. Approximately 60 percent of them come to Kentucky from other states to pursue their interests in equine undergraduate education and subsequent career opportunities.

- The undergraduate program immerses students in the study and application of science and business concepts to the horse industry through either an equine science option for those interested in vet school or research- or science-based careers, or an equine management option for students interested in business and management. There have been 61 official graduates of the program to date, and more than 127 interns have completed required internships in 28 states.
- UK also offers targeted graduate school opportunities. Master's or doctoral students can train under nationally and internationally recognized scientists and have access to world-class laboratories and applied courses at university farms.
- In addition, six equine-focused clubs and teams, several with national titles and recognition, offer students the chance to participate in equine endeavors outside their academic program. Those clubs and teams include the Dressage and Eventing Team, the Equestrian Team with both hunt seat and western components, Horse Racing Club, Polo Team, Research in Equine and Agricultural Disciplines Club, and Saddle Seat Team. UK also offers a Pre-Vet Club.
- The College of Agriculture offers scholarships and career preparation. Kristen Wilson was named new academic program coordinator at the end of 2012. She was previously with the University of Maryland as an extension horse specialist. Her role helps ensure that current and prospective students and alumni have the best experience possible. Her areas of focus will include the undergraduate experience, alumni involvement, evaluation/assessment, and communication.

Ground-breaking Research

UK is home to world-class research in equine nutrition, pasture and forages, economics, environmental compliance and many other topics.

- UK's Veterinary Science Department and the Maxwell H. Gluck Equine Research Center have long histories of important equine health research. The Gluck Center has a research focus in the areas of genetics and genomics, infectious diseases and immunology, musculoskeletal science, parasitology, pharmacology/toxicology, and reproductive health. Its mission is the scientific discovery, education, and dissemination of knowledge for the benefit of the health and well-being of horses. The Gluck Center is the only scientific institute in the United States with nearly all faculty conducting full-time research in equine health and diseases. The Gluck Center is a World Organisation for Animal Health (OIE)–designated world reference laboratory for equine rhinopneumonitis, equine influenza, and equine viral arteritis.

- Awareness of the relationship between diet and health has increased dramatically in the last 10 years. Not surprisingly, equine researchers at UK have increased their efforts in understanding the role of nutrition and feeding management on the health, growth, and longevity of horses. Many issues are being addressed by multidisciplinary teams that include nutritionists, plant scientists, agricultural engineers, microbiologists, and veterinary scientists.
- The vast majority of horses raised in Kentucky utilize pasture as an important nutrient source. Researchers in the departments of Animal and Food Sciences and Plant and Soil Sciences at UK are developing nutrition and pasture management practices that improve knowledge of optimal feeding programs and optimal production schemes for horses. Ongoing programs evaluate the suitability of new plant varieties for equine pastures, the chemical and nutrient profiles of pasture and hay plants, and appropriate feeding practices for all classes of horses.
- Because horses have the potential to impact the land, environmental stewardship is also an area of interest, and research is conducted through departments such as Biosystems and Agricultural Engineering. Projects aimed at protecting water quality while maintaining productive pastures and farms are important to the viability of horse farming in Kentucky. Dealing with equine waste and understanding the benefits of composting and other management practices will optimize horse health and minimize environmental impacts.
- The Kentucky equine industry is economically, geographically, and culturally diverse. Because of its diversity, relatively few economic decision-making tools exist that apply to equine production, sales, and finance. Research in UK's Department of Agricultural Economics is exploring the potential for model development that will enable horse businesses to make important financial decisions with a higher degree of confidence and less risk.
- Researchers are also documenting the economic and cultural value of the horse industry to Kentucky in the Department of Community and Leadership Development, among others. Ongoing discourse recognizes the extent of the equine economic cluster in Kentucky and the local, national, and global economic factors that affect its viability.
- The 2012 Kentucky Equine Survey, a comprehensive statewide survey of all breeds of horses, ponies, donkeys, and mules—the first such study since 1977—was conducted between June and October 2012 by the Kentucky field office of the National Agricultural Statistics Service, with support and assistance from the University of Kentucky College of Agriculture and the Kentucky Horse Council. The study found that Kentucky is home to 242,400 horses, and the total value of the state's equine and equine-related assets is estimated at \$23.4 billion. The survey's results identified 35,000 equine operations and 1.1 million acres devoted to equine use. The results are a snapshot of the 2011 calendar year. More information can be found at <http://www2.ca.uky.edu/equine/kyequinesurvey>.

Continued Excellence in Service and Outreach

UK has a long history of exceptional equine service, programs, educational materials, and other outreach.

- The University of Kentucky Veterinary Diagnostic Laboratory (UKVDL), located in Lexington, is one of the busiest state diagnostic laboratories in North America with more than 53,000 case submissions each year. The laboratory serves as sentinel for animal and human health and has the largest equine caseload in the world. The mission of the UKVDL is diagnosis of animal diseases and testing to safeguard and protect animal and human health through early and accurate identification of endemic, regulatory, emerging, and zoonotic diseases affecting Kentucky and beyond.
- The Kentucky 4-H Horse Program is a youth educational program that uses the horse as the tool to develop leadership, initiative, reliability, sportsmanship, and other desirable traits of character in program participants. The 4-H Horse Program in Kentucky is one of the largest 4-H horse programs in the nation and has an enrollment of more than 4,500 youth.
- The Horse Pasture Evaluation Program began in 2005 with the goals of understanding the composition of Kentucky horse pastures, assessing tall fescue toxicity risks, encouraging better pasture management practices on horse farms, and establishing a working relationship with the equine industry. To date, the program has completed more than 100 evaluations of more than 16,000 total farm acres. In 2012, the program completed 17 individual evaluations in seven counties, covering 1,638 actual acres and 3,882 farm acres.
- Horse College provides education for horse owners about basic horse care. Since its start in 2001, it has reached approximately 1,500 horse owners in more than 90 Kentucky counties. In 2012, seven programs reached participants from 28 counties.
- Education for horse owners is also offered during annual field days, horse grazing programs, HorseQuest, and eXtension. In addition, several publications by experts offer hands-on horse management information.
- The Department of Veterinary Science Diagnostic and Research Seminar Series is a monthly, one-hour seminar that provides equine health information to veterinarians in Central Kentucky, as well as horse owners, breeders, and students.

Extensive Facilities for Research and Teaching

UK's Maine Chance Equine Campus sits on what researchers in the College of Agriculture call "North Farm." The education and research cluster sits on the former site of the Maine Chance Farm, and the Health Research Cluster is located primarily on the former Spindletop Farm. The south side of the farm overlaps onto the Coldstream research campus. Maine Chance, Spindletop, and Coldstream farms are located along Newtown and Iron Works pikes in Lexington.

Communications

In addition to active news release disseminations (35 news releases on equine topics in 2012), presence at events with displays and materials, web site and social media presence (www.ca.uky.edu/equine or find us on Facebook), UK Ag Equine Programs also distributes several newsletters.

- The biggest and most visible of UK Ag Equine Programs's newsletters is the *Bluegrass Equine Digest*, a free, monthly online newsletter that covers equine research happening at UK. Launched in June 2009, it is distributed via TheHorse.com and sponsored by Pfizer Animal Health. January 2013 marked its 44th issue. It has grown to 60,000 monthly subscribers with readership in all 50 states and 101 countries. The digest was awarded second place in the online newsletter category for American Horse Publications in 2011. More information can be found online at <http://www2.ca.uky.edu/equine/bed>.
- Ag Equine Programs also publishes the *Wildcat Canter*, which began as a newsletter about student activities. It has evolved into a publication read widely by internal and external audiences. It focuses heavily on student activities and successes within the College's equine programs. It can be found online at <http://www2.ca.uky.edu/equine/wildcatcanter>.
- *Lloyds of London Equine Disease Quarterly* is an equine health, research-based publication produced by the Department of Veterinary Science. Global insurer Lloyd's of London provides support for the publication. The quarterly has been published since 1992 and provides timely, research-based reports on some of the most important issues facing the equine industry. The publication reaches more than 18,000 readers in 93 countries. It can be found online at http://www.ca.uky.edu/gluck/Q_issues.asp.
- In response to requests for merchandise featuring UK equine logos, UK Ag Equine Programs has launched an online store. Find UK Ag Equine or Gluck Equine Research Center logoed items from t-shirts to coats to tailgating gear at www.UKAgEquineStore.com.

Events and Partnerships

Besides equine-specific field days and workshops held each year, UK also has several notable and reoccurring events.

- The UK Equine Showcase and Kentucky Breeders' Short Course occurs each January. The UK Equine Showcase highlights the university's current equine programs and relevant industry findings. The annual Kentucky Breeders' Short Course is an in-depth program on equine reproduction and horse management issues.
- Each year, UK holds a Distinguished Lecture Series. The Distinguished Lecture Series began in the fall of 2009 and has become a signature program designed to showcase important figures from the equine industry. UK's inaugural lecture featured Keeneland President Nick Nicholson in November 2009, followed by accomplished equestrienne Nina Bonnie in April 2010, Keeneland's Ted Bassett in April 2011, Zenyatta owners Jerry and Ann Moss in September 2011, and Olympian Reed Kessler in November 2012.

- More than 20 events were attended by equine faculty and staff at which a booth was displayed.
- Kentucky Horse Park opened Kids Barn, an interactive group of displays geared for children under 13. UK's display features information about the 4-H Horse Program, body condition scoring, hay and forages, parasites, and horse/human skeleton similarities.
- The Kentucky Equine Networking Association (KENA) was formed in 2010 in a partnership between the Kentucky Horse Council and UK Ag Equine Programs. Its mission is to provide an educational and social venue for equine professionals and other horse enthusiasts from all disciplines to share ideas and business strategies and to obtain current knowledge on horse and farm management with the principal objective of enhancing individual horse ownership and the horse industry at large.
- UK HealthCare partnered with the College of Agriculture, the College of Public Health, and several community partners to launch Saddle Up Safely, a campaign to raise awareness of horseback rider safety. The five-year educational campaign began in 2009 in advance of the World Equestrian Games and aims to increase awareness and educate riders about riding and horse-handling safety. The campaign's purpose is to help make a great sport safer.
- The Kentucky Equine Higher Education Consortium is a unique collaboration among Kentucky universities and colleges with equine programs. Formed in advance of the

World Equestrian Games, the Consortium has celebrated many successes through its partnership, including several high-profile national events and increased collaborative opportunities between programs.

Fundraising

The University of Kentucky College of Agriculture equine programs are fortunate to have many passionate donors who have supported the programs over the past several years. Because state and federal dollars for equine research are short, private donors become even more important.

- Funds have been donated to support research in equine health and nutrition.
- Scholarship dollars were provided for both undergraduates majoring in Equine Science and Management and graduate students in master's or doctorate programs in various departments within the College.
- The equine teams and clubs in the College's equine program have been fortunate to have funds made available to help support their activities and events.
- Horses are donated for use by the clubs and teams
- Horses are donated each year to research programs in equine health and nutrition.
- Private dollars have been used effectively in the past several years to build facilities at the Maine Chance Equine Campus.
- Funds have also been received from private entities to support publications and for putting on International conferences.

UK Research and Education Center at Princeton

The University of Kentucky Research and Education Center (UKREC) holds a unique position as part of the Kentucky Agricultural Experiment Station and the Kentucky Cooperative Extension Service and 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 use 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 and livestock producers 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 University of Kentucky Research and Education Center 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 Center:

- Facilitates life-long learning, informed by scholarship and research
- Expands knowledge through creative research and discovery
- Serves Kentucky communities by disseminating, sharing, and applying knowledge

The UKREC is the headquarters for more than 50 faculty and staff members representing six different academic departments (Animal and Food Sciences, Biosystems and Agricultural Engineering, Entomology, Horticulture, Plant and Soil Sciences, and Plant Pathology) and three units (Agricultural Communications Services, Facilities Management, and Regulatory Services) in the College. Its faculty and staff conduct research, provide diagnostic testing services, and develop educational programs on topics of concern to Kentucky farmers, livestock producers, agribusinesses, and families.

The UKREC Experiment Station Farm consists of almost 1,300 acres, including soils of both sandstone and limestone origins that are 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, livestock producers, and the general public through county offices of the Cooperative Extension Service. Extension

specialists located at the Center have expertise in a broad spectrum of food and agriculture topics.

Crops such as corn, wheat, soybeans, tobacco, fruit, 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, demonstrations, and educational programs are also conducted in the areas of beef and swine production. Agricultural engineering specialists conduct research and educational programs related to both crop and livestock production. In addition, an aquaculture program is conducted in cooperation with Kentucky State University.

Service laboratories located at the Center 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 manager for extension information technology support for cooperative extension has been based at the UKREC since 2006. This position provides leadership for the extension IT unit and directs all state projects from Princeton. Work is focused on electronic services, VoIP systems, data communications and processing, project management, remote and data center operations, policy development, and customer service. The IT manager for extension supports six IT professionals who provide onsite and remote support, training, and development and maintain the overall IT infrastructure for the 120 county extension offices in Kentucky.

The following additional learning opportunities and resources are provided through the UKREC:

- The Rottering-Kuegel Agricultural Research and Extension Building is available to large and small groups for classes and meetings in agriculture, home economics, and 4-H. It is also used for a wide variety of meetings by government agencies, industry, and the general public. Each year approximately 450 different meetings are held in this building, attended by about 14,000 people. Many of these visitors come from other states and foreign countries.
- Commodity-specific and joint commodity field days showcase the work of the UKREC and attract about 3,000 people annually. Visitors observe research, educational displays, and demonstrations representing work conducted at the Center and throughout the state.
- Individuals and small groups visit throughout the year to observe specific projects and talk with specialists.

Research Activities

Animal and Food Sciences

Beef Cattle

- The effect of dietary supplementation of selenium in inorganic and organic forms differentially and commonly in

altering blood and liver selenium concentrations and liver gene expression profiles of beef cows and their calves

- Evaluation of a by-product of biodiesel (glycerin) as a feed ingredient
- Study of whether mixed or organic vs. inorganic forms of selenium (Se) differentially affect tissue selenium concentrations of beef cows and their calves
- Grazing wheat and stockpiled fescue for stocker calves and its effect on subsequent grain yields and compaction

Swine

- Development, implementation, and evaluation of within-production facility (under-slat) manure composting for finishing swine
- Development and evaluation of liquid-solid separation system for nursery and finishing swine
- Evaluation of composting of separated swine manure solids with wood chips

Biosystems and Agricultural Engineering

- Improving energy efficiency in broiler production
- Energy audits for grain and livestock farms
- Improving energy efficiency in grain production
- Improving energy efficiency in dairy production
- Improving energy efficiency in greenhouse production
- Energy assessments for solar PV installations
- Nationwide study on packing factors of six different grains
- Evaluating grain storage systems in West Africa and providing training to facility managers
- Establishing an organic corn enterprise in Kentucky

Entomology

- Using insect pheromone traps to predict outbreaks
- Evaluation of insecticide application and the interaction between planting date and maturity group on the incidence of *Dectes* stem borer in soybeans
- The effect of insecticidal seed treatments and planting dates on yield in soybean
- Survey of native and invasive stink bugs in soybean across Kentucky

Plant and Soil Sciences

Forages

- Alfalfa persistence
- Alfalfa variety test
- Red clover variety test
- White clover variety test
- Tall fescue variety test
- Orchardgrass variety test
- Switchgrass for biofuels

Grain Crops

- Corn population and row spacing study
- No-till wheat management
- Soybean management verification program
- Corn variety trial
- Wheat variety trials (2)
- Soybean variety trial
- Testing of breeding lines

- Wheat fusarium head blight nursery
- Canola variety trial

Horticulture

Nursery/Landscape

- Landscape plant evaluations
- Landscape plant establishment based on production container
- Plantable container 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 use
- Development and maintenance of Kentucky provenance stock plants
- Integrated pest management (IPM) monitoring

Fruit

- Apple and peach rootstock trials
- Peach, wine grape, and blackberry cultivar trials
- Small fruit demonstration plots
- Pecan variety demonstration
- Management practices to limit excessive canopy growth in grape production

Vegetables

- Sweet corn variety trial

Manure Management and Use

- Development and implementation of within-production facility (under-slat) manure composting for finishing swine
- Liquid-solid separation of swine manure and composting of separated manure solids
- Poultry litter use on soybean yields
- Poultry litter, biosolids, and compost used in winter wheat
- Composting swine manure (cooperative study with USDA Animal Waste Management Research Unit)

Plant and Soil Sciences

Soils

- High yield soybean production systems (1 location)
- Tissue nutrient status of winter wheat in Kentucky
- Influence of grazing winter wheat on yields and soil quality
- Influence of adding potassium at different times and rates on soybean yields
- Influence of adding potassium at different rates on corn yield (crop failed, no data collected)
- Poultry litter use on soybean yields
- Poultry litter, biosolids, and compost used in winter wheat
- Composting swine manure (cooperative study with USDA AWMRU)
- Biosolid use as a deer deterrent
- Remediation of the fragipan

Tobacco

- Dark fire-cured variety tests
- Dark air-cured variety tests
- Burley variety tests
- Tobacco transplant production management
- Insecticide performance for tobacco hornworm and budworm control
- Tobacco nitrogen and potassium management
- Sucker control in burley and dark tobacco
- Tobacco tillage systems
- Evaluation of mechanical harvest systems for burley and dark tobacco
- Dark fire-curing systems
- Accumulation of benzo- α -pyrene in dark fire-cured tobacco
- Evaluation of pale yellow dark tobacco lines for fire-curing
- Dark fire-cured and dark air-cured tobacco pesticide residue tests
- Correlation of curing conditions and tobacco-specific nitrosamine accumulation in dark air-cured tobacco
- Effect of post-cure ordering methods on tobacco-specific nitrosamine accumulation in burley and dark tobacco
- Effect of pre-harvest nitrite scavenger application on tobacco-specific nitrosamine accumulation in dark fire-cured tobacco

Weed Science

- Burndown control in corn
- Triazine persistence in soil (Fulton County and UKREC)
- Marestail in corn using fall and spring treatments (Muhlenberg County)
- Marestail control in no-till soybean (6 studies)
- Palmer Amaranth control in soybean (2 studies in Fulton County, 3 studies in Henderson County)
- Waterhemp control in soybean (Union County)
- Marestail control in wheat (2 studies)
- Giant ragweed control in wheat (2 studies)
- Managing volunteer corn prior to planting no-till wheat
- Managing Italian ryegrass in wheat (9 studies)
- Wheat tolerance to early postemergence herbicides

Plant Pathology

- Soybean fungicide efficacy testing
- Wheat fungicide efficacy testing
- Strobilurin-resistance frogeye leaf spot survey
- Effect of poultry litter on soybean cyst nematode populations
- Soybean seed treatment tests
- Soybean rust monitoring
- Soybean vein necrosis-associated virus seed transmission studies

UK Veterinary Diagnostic Laboratory

Overview

The University of Kentucky Veterinary Diagnostic Laboratory (UKVDL) continues to strive to be one of the premier veterinary diagnostic laboratories in the United States, providing timely and accurate 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 University of Kentucky Veterinary Diagnostic Laboratory'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. The UKVDL laboratory is fully accredited by the American Association of Veterinary Laboratory Diagnosticians (AAVLD) and is a member of the USDA National Animal Health Laboratory Network (NAHLN) and the FDA Veterinary Laboratory Response Network (Vet-LRN).

In addition to its clinical diagnostic role, the UKVDL provides surveillance for emerging and endemic diseases such as equine infectious anemia (EIA), equine piroplasmiasis, West Nile virus, chronic wasting disease of deer, contagious equine metritis, bovine spongiform encephalitis (Mad Cow Disease), Johne's disease, bovine leukosis, avian influenza, rabies, and many other diseases of agricultural, public health, and companion animal importance. Furthermore, the laboratory is always on the watch for the emergence of foreign animal diseases (FADs) such as foot and mouth disease and classical swine fever. In 2012, UKVDL continued its proficiency testing programs as part of the NAHLN.

Farmers and animal owners use the UKVDL's services through their practicing veterinarians. These professionals have expertise in selecting, preparing, shipping, and submitting the proper specimens for testing when needed to assist in making a clinical diagnosis. 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. A state-of-the-art Laboratory Information Management System (LIMS) is utilized at our laboratory to provide the most professional, accurate, and timely accessioning, order entry, results capture, and clinical case reporting for our clients.

UKVDL faculty, scientists, and technical staff are specialists in several diagnostic medical 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. During surge testing periods and disease outbreaks, trained technicians are redistributed across sections to assure that the increased workload can be managed in a timely and accurate fashion.

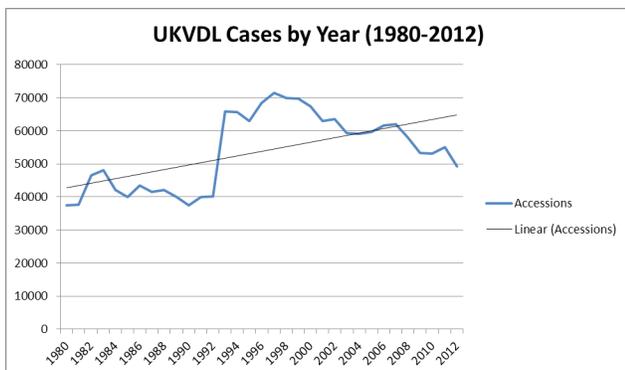
The UKVDL received 49,250 cases in calendar year 2012 (a 10% decrease from calendar year 2011), including 4,128 necropsies (17% decrease from calendar year 2011). This decrease is attributed to the outbreak of Nocardioform Placentitis, which added significantly to the necropsy load. The decrease in diagnostic caseload is attributed primarily to the continued depressed state of the Kentucky horse industries. Total tests run in each laboratory section are listed in the individual section reports.

Outreach

The UKVDL continues to build and enhance outreach programs around Kentucky. The Kentucky VetLabNet listserv continues to distribute animal health bulletins and has grown to more than 600 UKVDL clients, scientists, farmers and stakeholders. The UKVDL director continues to contribute articles quarterly to the KVMA journal and the Kentucky Cattleman Association *Cow Country News*. The UKVDL director, faculty, and staff continue to deliver lectures at scientific and lay meetings and participate in the Equine Diagnostic and Research Seminar Series at the UKVDL, held monthly since 2006. These seminars are filmed by *The Horse* magazine and are edited and made available as webinars that have been viewed in more than sixty countries.

Webinars

- Case studies in equine toxicology, Cynthia Gaskill, UKVDL, January 26.
- Approach to assisted reproduction, Rob Foss, Equine Medical Service, Columbia, MO, February 23.
- Laminitis, Jim Belknap, Ohio State University, March 29.
- Lameness and diagnostic imaging, Kent Allen, Virginia Equine Imaging, Middleburg, VA, April 26.
- Equine parasites, Martin Nielsen, UK Gluck Equine Research Center, May 31.
- Joint diseases, Alicia Bertone, Ohio State University, June 28.
- Stress of weaning, Amanda Adams, UK Gluck Equine Research Center, July 26.
- Equine leptospirosis, Craig Carter, UKVDL, August 30.
- Equine piroplasmiasis, Robert Mealey, Washington State University, September 27.
- Sport horse musculoskeletal injuries, Reid Hanson, Auburn University, October 18.



- Update on equine proliferative enteropathy, David Horohov and Allen Page, UK Gluck Equine Research Center, November 15.

Other Outreach Events

- Preliminary results of a nocardioform placentitis farm-based risk factor study, presented to the Kentucky Association of Equine Practitioners and Kentucky Thoroughbred Farm Managers Club, January 30.
- Dr. Carter attended the EAVLD meeting in Kazimierz-Dolny, Poland as immediate past president of the AAVLD and executive director of the WAVLD, July 1–5.
- Food Animal Practitioner Conference, 35 veterinarians in attendance, August 16.
- The director and eight UKVDL employees attended the AAVLD meeting in Greensboro, NC for continuing education and delivering scientific presentations, October 18–24.
- The director and staff attended the Poultry Health Advisory Committee meeting, Frankfort, October 25.
- The director made a presentation on UKVDL contributions to the equine program at the Equine Forum meeting, Good Barn, Weldon Suite, October 26.
- The director delivered a lecture on the Livestock Care Standards Commission to an Animal Science class, October 30.
- The director attended the NIAA Symposium on Antimicrobial Resistance in Columbus, OH, November 13–15.
- UKVDL hosted the *Lawsonia* and Equine Proliferative Enteropathy Symposium, about 80 people in attendance, November 15.
- The Future of Public Health and One Health presented to a forum of the School of Public Health and Medicine, Robert C. Byrd Medical Center, West Virginia University, December 3.

Personnel Actions

The following key positions were filled and/or reclassified:

- Dr. Erdal Erol, head, Diagnostic Microbiology, position converted from Scientist III to associate professor, Clinical Title Series (non-tenure track)
- Dr. Laura Kennedy, Veterinary Pathologist, position converted from Special Title Series to Clinical Title Series (non-tenure track)
- Dr. Uneeda Bryant, promoted to associate professor with full tenure
- Latissa O’Cull, hired as a histology technician
- Christina Kane, hired as Accounting Clerk III
- Amy Barnes, hired as the histology section chief

Visiting Scientists

- Dr. Oktay Genc, Turkish veterinarian, worked in the Bacteriology section on Nocardioform placentitis, May–October.
- Dr. Masood Rabbani, Pakistani veterinarian, visited to learn about a modern veterinary diagnostic laboratory and to explore options for Pakistan scientists to train in the U.S., August 8–14.

Notable Achievements and Advancements

- Director served as immediate past president of the American Association of Veterinary Laboratory Diagnosticians.
- Director continues to serve as executive director of the World Association of Veterinary Laboratory Diagnosticians and is planning a meeting to be held in Berlin, Germany, June, 2013.
- Director was appointed to chair a committee to conduct a periodic review of the Department of Animal and Food Science.
- Director chaired the USDA Agricultural Research Service (ARS) five-year research review panel.
- Director and associate director served on the committee to plan the International Equine Infectious Disease meeting, which was held in Lexington October 21–25.
- Almost all post-construction issues were resolved by the end of 2012.
- New web site for UKVDL is nearing completion and should be implemented in early 2013.
- Automated scanning of accession forms and related case documents with automated attachment to the USA LIMS software system.
- New virtual server rack installed and implemented, May.
- 10 GB bandwidth high speed dark fiber hub installed.
- Development of financial workload/fee trend reports almost completed.
- UKVDL staff participated in a Low Path Avian Influenza Exercise, Elizabethtown, KY, March 7.
- Director attended the Kentucky State Board of Agriculture to meet the new commissioner of agriculture, James Comer.
- Director worked with the office of the state veterinarian and the commissioner of agriculture to allow charging a fee for Stockyard EIA testing.
- UKVDL video security system implemented for expanded facilities.
- As appointed by the governor, the director served on the Livestock Care and Standards Commission.
- Director chaired the national search for the director of Regulatory Services.
- Q-Pulse QA/QC software selected for use at UKVDL in preparation for the upcoming AAVLD accreditation visit in 2014. Implementation is planned for spring 2013.
- Dr. Carter chaired an OIE committee on genomics in Paris, France, December 3–7.

Initiatives and Programs

- The new UKVDL fee schedule went into effect July 1. Overall, 134 test fees out of 286 total tests were increased (47%) with the strategy to increase fee income by \$230,8510 (17.5%).
- Ms. Valerie Blakemore from the MedTech College in Coldstream toured the UKVDL facilities to see if our laboratory might be able to host interns in their Clinical Laboratory Technician program, December.
- The director discussed a possible genomics laboratory for the UKVDL that would collaborate with the Gluck Equine Research Institute and Texas A&M University, April 2–6.

- As part of the UKVDL marketing plan, business office staff compiled a database of equine practices in an eight-state area, and a mailing encouraged the use of the laboratory.
- The director developed one-page summaries of species-oriented diagnostic testing services offered by UKVDL for mailing and for distribution at scientific and animal agricultural meetings.

Major Issues and Challenges

- Develop a plan for financial sustainability
- Enhance and improve test offerings and service for equine and small animal medicine
- Develop a national reputation as an equine diagnostic testing laboratory
- Investigation and alerting of equine abortion cases, fall 2012
- Investigation and alerting of equine Lawsonia cases, fall 2012
- Investigation and alerting of equine leptospirosis cases, spring 2012

Section Reports

Bacteriology/Mycology

Dr. Erdal Erol

The bacteriology/mycology section of UKVDL performs several types of cultures to isolate and identify pathogenic bacteria or fungi from animals. The section also determines the antimicrobial susceptibility that might be used for the treatment of specific pathogens. Another important duty of this section is regulatory testing. The section performs culture for *Taylorella equigenitalis* and *T. asinigenitalis* for the federal/state contagious equine metritis (CEM) regulatory program in equine. The bacteriology section routinely participates in federal proficiency and ring tests for salmonella, CEM, and general bacteriology.

Highlights

- 9,689 aerobic cultures were performed on samples submitted to the UKVDL; significant bacterial pathogens such as nocardioform bacteria, coliforms, beta-hemolytic streptococci, salmonella, Pasteurella, Mannheimia, Arcanobacterium, mycoplasma, and staphylococci were found in these samples.
- 7,288 samples from equines in Kentucky were cultured for the contagious equine metritis organisms. All horses tested were negative. Because we detected positive CEM horses in 2008 and 2011, we continue to receive a high number of samples. Our early detection of CEM in the quarter horse population prevented the disease from becoming more widespread in the equine population of the U.S.
- 2,715 microbial isolates were tested to determine the antimicrobials that could be used for their treatment in exposed animals. Antimicrobial susceptibility test was performed using the broth microdilution method.
- 477 samples from poultry were tested for salmonellosis by using a protocol following National Poultry Improvement Plan (NPIP). Our participation in NPIP helps poultry industry improve infectious disease control and eradication programs.

- Our laboratory has significant collaboration with other institutes such as UK Gluck Center (Dr. Troedsson, nocardioform), Pfizer (antimicrobial susceptibility), and University of Copenhagen (Dr. Peterson, beta-hemolytic streptococci).

Virology

Dr. Erdal Erol

This important section performs several virological assays. These assays allow veterinarians and animal owners to diagnose viral infections and treat and protect their animals. The virology section investigated several disease outbreaks in Kentucky and performed a number of testings on samples submitted by practitioners and owners not only from Kentucky but also from many other states. Our section also works closely with the UKVDL pathology section to examine necropsy specimens for evidence of viral infections. Another important duty of the virology section is to perform tests necessary for export of animals to other states and countries. The virology section also consults with field veterinarians and animal owners concerning sample selection, preservation, shipping procedures, and interpretation of results. The section also collaborated with other institutions such as Pfizer.

Major tests performed in virology section		
Virus	Test(s)	Number
Bovine corona virus	FA	143
Bovine respiratory syncytial virus	FA	508
	VN	57
Bovine rotavirus	FA	104
Bovine viral diarrhea	ELISA	11021
	FA	810
	1-VN	171
	2-VN	171
Canine adenovirus	FA	33
Canine corona virus	FA	33
Canine distemper virus	FA	162
Canine herpesvirus-FA	FA	38
Canine parvovirus- FA	FA	123
Equine herpesvirus	1-FA	906
	1-VN	106
Equine influenza	A1-HI	30
	A2-HI	1931
Equine rotavirus	FA	23
Equine viral arteritis	VN	11577
Feline herpesvirus	FA	37
Feline infectious peritonitis	FA	81
Feline panleukopenia	FA	70
Infectious bovine rhinotracheitis	FA	625
	VN	133
Parainfluenza-3 virus	FA	507
Potomac horse fever	IFA	175
Vesicular stomatitis	IN-VN	1233
	NJ-VN	1233
Virus isolation		148
West Nile	IgM Capture	135

Highlights

In this section, several thousands of fluorescent antibody tests (FA), virus neutralization tests, ELISA tests, and virus isolation tests were performed in 2012 to support Kentucky's animal industry and beyond.

Molecular Diagnostics

Dr. Erdal Erol

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. Several diagnostic PCR assays are being utilized because of their speed and specificity. This section performs several PCR, real-time PCR, and DNA sequencing assays from the specimens submitted by animal owners, veterinarians, and pathologists. This section also analyzes specimens received from the virology and bacteriology sections to confirm their diagnoses.

Highlights

- The molecular diagnostics section successfully demonstrated our ability to provide accurate, rapid, high-volume testing. This section also became an accredited member of the USDA's National Animal Laboratory Health Network and passed several federal proficiency tests on such topics as foot and mouth disease, classical swine fever, and avian influenza. The membership enables this unit to actively participate in national veterinary disease surveillance and provide rapid coordinated diagnostic response in the event of outbreaks within the veterinary industry.
- We have standardized a new protocol for the calf diarrhea panel, and it is now offered as a service to our large animal practitioners. This panel tests fecal specimens from calves with diarrhea and detects bovine corona virus, bovine rotavirus group A, *E. coli* K99, salmonella, and cryptosporidium.
- The section performed several thousand molecular tests in 2012. The major ones are provided in the table below.

Major molecular tests	
Virus	Number
Amycolatopsis	199
Bovine viral diarrhea	31
<i>Crossiella equi</i>	217
EHV-1	746
EHV-1 TYPING	30
Ehv-4	177
Equine influenza	302
<i>Lawsonia intracellularis</i>	114
<i>Leptospira</i>	666
Johnes	87
Potomac horse fever	230
<i>Rhodococcus equi</i>	82
Salmonella	624
<i>Streptococcus equi</i>	413
West Nile	65

Pathology, General

Neil M. Williams

The UKVDL pathology section is composed of 7 faculty pathologists, a staff laboratory animal pathologist, 4 post-doctoral scholars (pathology residents), 4 histology technicians, 4 full-time necropsy technicians, and 2 part-time necropsy student workers. The pathologists perform complete necropsy examinations on submitted animals, histopathology on necropsy cases and surgical biopsies, and cytological examinations, and are supported by the other section personnel. As part of the comprehensive necropsy examination, additional laboratory tests are ordered by the pathologist 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. Utilizing the abundant cases submitted to the VDL and the faculty expertise, post-doctoral scholars (DVM) are trained in veterinary anatomic pathology in a three-year program, visiting senior veterinary students have extern rotations, and surgical residents visit to fulfill the pathology requirement for the American College of Veterinary Surgeons.

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

Necropsy cases	
Species	Number
Avian	20
Bovine	813
Caprine	108
Equine	1,583
Ovine	135
Porcine	16
Small Animal	350
Miscellaneous	33
Laboratory Animal	213
Total	3,391

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 34,190 microscopic slides produced. In addition to the routine hematoxylin and eosin stained tissue sections, special and immunohistochemical stains were done, resulting in 2,075 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 a portion biopsied from live animals and sent to the laboratory for determination of the type of process, recommended treatment, and potential prognosis. These tissue specimens are processed and microscopic slides prepared for the pathologists to examine by microscopy. Tissue specimens representing 3,507 cases were processed and examined. A report with diagnosis was produced for each case. Typical turn-around on these cases is 24 to 48 hours.

Cytology: Preparations of cells harvested from abnormal lesions or abnormal fluids are placed on slides and stained for examination under the microscope by the pathologists. Cytopathological examinations were performed, a diagnosis made, and a report generated for 479 cases.

Pathology, Research Animal

Kathryn (Casey) Coyle

The research animal pathology service sees mostly small rodents with occasional dogs, rabbits, nonhuman primates, and pigs. There were more than 249 submissions of research animals during 2012, including clinical pathology samples, biopsies, and necropsies. In addition to research animal work, Dr. Coyle handles the diagnostic pathology caseload for the agricultural research animals housed at the various UK farms.

Quality Control/Quality Assurance

Mary Harbour

The goal of the UKVDL quality assurance program is continuous quality improvement of service. An additional goal is to ensure the quality, accuracy, and timeliness of all test results to veterinarians, animal owners, UK researchers, and other clients in the animal industry. The quality team monitors test results, quality control results, and proficiency testing.

The quality assurance program is based on quality system concepts of the American Association of Veterinary Laboratory Diagnosticians (AAVLD) requirements, International Standards Organization (ISO 17025) guidelines, and Organization of International Epizootics (OIE).

The QA section has assisted in preparing reports and submitting data to the National Animal Health Laboratory Network (NAHLN) and the Veterinary Laboratory Research Network (Vet-LRN). The section continues implementing all policies and procedures required by NAHLN and Vet-LRN and assisted the director and laboratory sections in securing grant funds for salaries, equipment, and supplies.

The requirements for maintaining the quality system and management are continuously being updated. To maintain conformance to all requirements, the QA manager attended Quality Assurance and Quality Management Training sponsored by NAHLN at the AAVLD Annual meeting. Internal section audits are conducted throughout the year in preparation for the next AAVLD accreditation visit.

The quality assurance program helps fulfill the university's mission of improving service delivery while achieving excellent human relations (internally and externally), sound leadership, and effective communications.

Ruminant Extension

L. Michelle Arnold

The ruminant extension veterinarian is charged with improving the status of ruminant health by establishing and maintaining information flow among all the stakeholders in the livestock industry. This is accomplished through open communication with food animal veterinarians, county extension personnel, producers, state and federal authorities, and University faculty

and staff in a progressive and responsive manner. Current health topics, including disease risk and occurrence, diagnosis, treatment, prevention, and control, form the core of the information disseminated. New knowledge generated at the university level, governmental directives, and other stakeholder contributions are also gathered centrally then communicated openly for discussion and action to ultimately benefit producers throughout Kentucky.

Highlights

- Presented the herd health portion of the new Master Stocker Program in 6 regions of the state. Updated and presented the herd health portion of Master Cattlemen in 7 regions and 3 Master Grazer sessions. These programs directly affected approximately 300 farming enterprises.
- Hosted two well-attended food animal veterinary continuing education meetings at the diagnostic laboratory (UKVDL) and one at the Breathitt Veterinary Center (BVC). A total of 22 hours of continuing education was made available to food animal veterinarians at no cost to them. Outside sponsors covered the costs of the events. The Winter CE meeting at the UKVDL was sponsored by Pfizer and featured Dr. Vic Cortese as guest speaker. Forty food animal veterinarians attended the winter meeting. A summer meeting was held at the Breathitt Veterinary Center in June. Boehringer Ingelheim Vetmedica Inc. (BIVI) sponsored the event, which was attended by 25 food animal veterinarians from the western portion of the state. The final CE meeting was held in August at the UKVDL, sponsored by BIVI and Elanco Animal Health. Thirty five veterinarians attended.
- Co-sponsored the Small Ruminant Grazing Conference in Bowling Green that drew 75 participants. This conference is held in a different location in Kentucky each year in order to reach sheep and goat producers in all areas of the state.
- Worked with Dr. Erol to develop a neonatal calf diarrhea panel, a PCR test for 5 of the major pathogens that cause diarrhea in the first 21 days of life. Plans for abortion panels and respiratory pathogens are in the works.
- Launched the new extension program Improving Reproductive Efficiency in Beef Cattle in Northern Kentucky with Drs. Les Anderson, Jeff Lehmkuhler, and Darrh Bullock.
- Published fact sheets: *Recommended Milking Procedures for Maximum Milk Quality* (ID-208) and *Management of the Dry Cow to Prevent Mastitis* (ID-209) with Dr. Jeffrey Bewley; and *Infectious Bovine Keratoconjunctivitis ("Pinkeye") in Cattle* (ID-135) with Dr. Jeff Lehmkuhler.
- Participated in an extension agent informational meeting about nitrates in forages after the drought via internet (Microsoft Lync) with Dr. Cindy Gaskill and many extension specialists in the areas of dairy, beef, forages, and crops.
- Co-authored three animal health bulletins with Dr. Cynthia Gaskill on nitrates, cyanide, and mycotoxins in formats for veterinarians and alternate versions for extension and producers.
- Participated in numerous field days, producer meetings, and farm visits throughout the state to educate producers as well as to identify the scope of existing problems and find ways to promote positive change.

- Worked closely with the state veterinarian's office to inform producers of the new animal disease traceability regulations.
- Continued to work collaboratively with state officials, industry representatives, and producers to draft the Livestock Standards Care document. I contributed the university position on tail docking in dairy cattle.
- Continue to expand the database of food animal veterinarians that will allow rapid communication in the event of an animal emergency situation or disease outbreak. This database is continually updated with email addresses and cell phone numbers to enhance the speed of communication.
- Regularly contributed health-related articles for the ag extension newsletters *Off the Hoof* (10 articles) and *Kentucky Dairy Notes* (7 articles). I also contributed 7 articles to *Cow Country News*, the official publication of the Kentucky Cattlemen's Association.
- Submitted material for the *Kentucky Veterinary News* from the KVMA and the veterinary listserv distributed from the diagnostic laboratory.
- Played a major role in writing the budget justification on the Southeast Quality Milk Initiative (SQMI) grant submitted to the Agriculture and Food Research Initiative (AFRI), which is now officially funded. This is a multi-state effort including 6 southeastern states for 3 million dollars over a 5-year funding period to begin February 2013.

Kentucky veterinarians, extension agents, producers, government entities, and the university benefit from a strong livestock sector of which health is a major consideration. In 2012, this position served to reach each of these stakeholders for the overall improvement of livestock health and sustainability of the food animal veterinary profession.

Serology

Meg Steinman

The mission of the serology section is to provide 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. This section also performs testing for movement of animals within the United States and for international export purposes. We were able to send personnel from this section to training for poultry testing and to the National Veterinary Services Laboratory (NVSL) for training in running the microscopic agglutination test (MAT) for *Leptospira*. This section offers a wide variety of tests by various methodologies; the tests and numbers listed below are just a sampling of what is available. Please check the website for additional test offerings.

Equines: This section successfully passed the annual USDA APHIS inspection to continue to offer equine infectious anemia (EIA) antibody testing and piroplasmosis testing. In 2012, we ran 21,960 EIA tests. The serology section continues to monitor equines moving through the state stockyards for EIA antibody, testing 11,533 specimens. All employees of this section passed the required NVSL proficiency testing for piroplasmosis testing (*Babesia caballi* and *Theileria equi*), and tested 4,137 specimens for antibodies to *Babesia caballi* and 4,146 specimens for *Theileria equi*. We tested 917 serum samples for antibody to conta-

gious equine metritis (CEM-CF). The serology section performs antibody screening tests for *Leptospira* in equines for diagnostic and regulatory purposes. In 2012, we tested approximately 7,000 serums.

Poultry: In 2012 the section chief of serology, Meg Steinman, worked with the Kentucky Poultry Federation to host a day of poultry training for veterinarians. The training targeted "backyard producers" and included didactic lectures on respiratory disease, enteric diseases, leukosis diseases, and avian influenza and concluded with a discussion of internal/external parasites. The laboratory continues to pass annual inspections and maintain status as an NPIP approved laboratory. Personnel from this section attended NPIP approved training course for mycoplasma testing and avian influenza testing. In 2012 the serology laboratory tested 5,170 samples for antibody to avian influenza, 17,981 samples for antibody to *salmonella pullorum*, 22,005 samples for antibody to both *Mycoplasma gallisepticum*, and *Mycoplasma synoviae*.

Bovines: This section offers a variety of antibody tests performed on serum from bovines and other ruminant species. In 2012 we tested 228 specimens for antibodies to *Anaplasma marginale*, 95 specimens for antibody to bluetongue virus, 250 specimens for antibodies to the bovine leukemia virus, 1,111 serums for Johnes (*Mycobacterium paratuberculosis*) antibodies, 400 samples for *Leptospira* antibodies, and 437 specimens for antibody to *Neospora canicum*. This lab is also active in regulatory screening for antibodies to *Brucella abortus*, testing 1,382 serums.

Small ruminants: The serology section runs testing on small ruminants, including *Brucella melitensis* (46) and small lentivirus caprine arthritis/encephalitis virus antibody (137).

Canine and feline: This section offers a variety of tests that can be run on dogs and cats. We added an antibody test for feline infectious peritonitis (feline coronavirus). We offer an antibody test for histoplasma and blastomyces. A few examples of the testing done in 2012 includes 140 for antibodies to histoplasmosis and 166 samples for antibodies to blastomyces. Serology also offers *Brucella canis* testing, an important test for breeding, and tested 99 samples.

Porcine: This section also offers testing for swine. In 2012 we tested 117 samples for pseudorabies and brucella antibodies.

Toxicology

Cynthia L. Gaskill

The primary mission of the toxicology section at the UKVDL is to provide toxicological diagnostic testing capabilities and consultations to Kentucky veterinarians, UKVDL pathologists and residents, county extension agents, livestock producers, pet owners, state officials, and others. A large variety of toxicological tests are available through the toxicology section, including assays for metals and minerals; organic compounds including a multitude of pesticides, drugs and other chemicals; biological toxins such as plant, insect, bacterial and fungal toxins; and numerous other toxicants. Tests are performed in tissues, gastrointestinal contents, biological fluids, baits, feed, forages, water, soil, and many other substances.

Consultation services include therapeutic advice; differential diagnoses; residue considerations; toxicological risk assessments; determination of appropriate tests; appropriate sample collection and submission recommendations; interpretation of analytical results; and other general toxicological information. Many consultation cases require many hours to days or longer to complete. In 2012, Dr. Gaskill provided over 2,000 toxicological consultations. Dr. Gaskill also provides the state veterinarian's office with alerts and updates on all cases of poisoning or contaminated animal feeds diagnosed at the UKVDL. The section personnel consist of Dr. Cynthia Gaskill, DVM, PhD, clinical veterinary toxicologist and section head; Dr. Lori Smith, PhD, senior analytical chemist; Michelle Helm, BSc, chemist/technician; and several student interns.

Highlights

- In 2012, many feed related problems occurred due to severe environmental heat and drought conditions. These issues included nitrate accumulation in forages, increased cyanogenic risks, and increased mycotoxin production in grain crops. As a result, the toxicology section performed a large number of forage and feed tests for these toxins. Dr. Gaskill worked with other UK specialists to initiate the UK Mycotoxin Working Group and create a centralized UK web site for information on mycotoxin. This group includes specialists in grain crops, plant pathology, beef and dairy nutrition, veterinary medicine, poultry production, swine production, veterinary toxicology, regulatory services, agricultural engineering, and other areas.
- The toxicology section initiated and coordinated an inter-laboratory proficiency program for nitrate testing for the AAVLD/AAVCT Toxicology Working Group, in cooperation with the FDA Vet-LRN agency. This program involved the majority of veterinary diagnostic laboratories in North America and improved nitrate test consistency and reporting across veterinary diagnostic laboratories.
- The toxicology section collaborated with other UK specialists to develop and distribute safe, new rapid field test kits for nitrate and cyanide testing of forages.
- Dr. Gaskill collaborated with other UK specialists to write and distribute information updates and publications on nitrate, cyanide, mycotoxin, and other issues and participated in several UK Extension Lync sessions focused on these topics.
- Acquired a large FDA Vet-LRN grant shared with the microbiology section that will help fund instrumentation maintenance costs, student labor, and supplies associated with increased analyses in large-scale events of contaminated animal feeds and drugs.
- Initiated fee changes for toxicology tests to make the lab more competitive. This resulted in increased submissions from county extension agents and veterinary diagnostic laboratories from other states.
- Hosted 4 student interns for the forensic science internship program at Eastern Kentucky University, a graduate student from North Dakota State University, and a graduate student from UK.

- Continued to provide forage ergovaline analyses for the University of Kentucky Horse Pasture Evaluation program.
- Developed and validated several new diagnostic toxicology tests, including aflatoxins in feeds and milk, and zearalenone and ochratoxin A in feeds.
- Participated in a number of proficiency testing programs to ensure accuracy and quality control for analytical methods.
- Completed the conversion of the toxicology section to a predominantly paper-free laboratory, with electronic documentation system to reduce paper costs, increase efficiency, and improve data storage and retrieval capabilities.
- Worked closely with UK Regulatory Services on a number of cases involving feed contaminations requiring feed recalls.

The toxicology section participated in several research projects directly applicable to improvements in diagnostic offerings. The funding for these projects helps support instrumentation and labor used also for diagnostic purposes. A few 2012 projects are:

- Development of a novel quantitative method for cyanide analysis of forage and plant materials and development of a rapid semi-quantitative field test for cyanide in plants
- Investigation of the effects of harvest, transport, storage, and processing conditions on ergovaline analyses of tall fescue
- Analysis of trace elements in liver tissue from aborted, stillborn, and neonatal foals to develop normal reference ranges for this group
- Studied liver elemental concentrations in Alabama cattle exposed to water with algal blooms
- Completed a study of ocular fluid nitrate and nitrite concentrations in aborted, stillborn, and neonatal foals to establish a normal reference range for this group

Research findings, methodology, continuing education programs and seminars were presented at numerous meetings and conferences, including:

- American Association of Veterinary Clinical Toxicologists conference
- American Association of Veterinary Laboratory Diagnosticians conference
- Kentucky Veterinary Medical Association annual conference
- University of Kentucky Veterinary Sciences seminar series
- University of Kentucky cooperative extension summer food animal conference
- University of Kentucky cooperative extension Eastern Region Cattlemen's short course
- Eastern Kentucky University Department of Chemistry seminar series
- University of Kentucky Agricultural Biotechnology Program seminar series
- FBI Multi-sector Infrastructure Protection and Threat Workshop, Frankfurt
- North American Mounted Unit Commanders Association conference

In 2012, the toxicology section received samples from more than 1,500 diagnostic cases, with most cases involving multiple samples such as various forage and feed samples, tissues, body fluids, baits, and other samples, and often involving multiple animals and multiple test requests per case. The most common tests requested in 2012 were forage nitrate analyses, mycotoxin analyses, metal and mineral quantifications in tissues such as liver and kidney, screening of rumen and stomach contents for organic compounds, and analysis of environmental samples for pesticides and metals.

Epidemiology

Jacqueline L. Smith

The UKVDL epidemiology section plans and conducts veterinary epidemiological research experiments that lead to the earliest detection of animal disease outbreaks, with our primary mission being to provide animal disease surveillance and assist veterinarians in the investigation of serious and unusual disease problems. Daily monitoring of finalized necropsy and lab testing data streams provide near real-time disease cluster analysis.

The section also conducts data acquisition and statistical analysis in support of the office of the state veterinarian and the USDA and to provide animal health situational awareness for industry stakeholders. Many of these studies lead to publication in peer-reviewed journals and lay publications. Disease reporting to the state veterinarian (reportable infectious diseases, disease of interest, emergency disease notification) is performed weekly for the typical endemic diseases; unusual or emergency disease situations are reported immediately. In-depth field investigations to better characterize disease outbreaks for causative etiology through the collection of diagnostic specimens and

recommending diagnostic testing are provided free of charge to any farm/producer in the state of Kentucky at the request of a local client with the approval of the UKVDL administration.

Highlights

- Research farm visits (UK beef unit) for NIHS Project—7 visits
- Conducted 372 telephone consults asking for suggestions, recommendations, and questions related to animal health issues.
- Statistical requests (from UKVDL faculty, state and federal officials, local veterinarians, and other UK faculty)—121 (1–10 hrs each)
- Graphics requests—93 (2–10 hrs each)
- Reportable disease reports: 52 weekly reports (approximately 1 hr each week)

Educational Achievement

- Epidemiology section chief successfully defended and received her PhD in Animal and Food Sciences.

Research Projects in Progress

- Continuous health monitoring of cattle—Dr. Craig Carter, Ms. Jackie Smith
- Animal disease cluster detection—Dr. Craig Carter, Ms. Jackie Smith
- Mobile wireless and remote diagnostic computer applications—Dr. Craig N. Carter, Dr. Wade Northington, Dr. Michelle Arnold, Ms. Jackie Smith, Dr. Cindy Gaskill, Ms. Jacki Cassidy
- U.S. *Leptospiriosis* sero-epidemiological survey—Dr. Craig Carter, Dr. Noah Cohen, Ms. Jackie Smith, Ms. Meg Steinman, Dr. Erdal Erol

Kentucky Agricultural Experiment Station Projects

Hatch, McIntire-Stemmis, and Animal Health projects for calendar year 2012, as reported in the USDA Current Research Information System (CRIS) database, follow.

Agricultural Economics

- A Comprehensive Study of Kentucky's Equine Industry—*Stowe, C.; Rossano, M.; Coleman, R.; Davis, A.*
- Agricultural and Rural Finance Markets in Transition (NC1014, NC221, NCT-194)—*Katchova, A.*
- Assessing the Consumer Behavior, Market Coordination, and Performance of the Consumer-Oriented Fruit and Vegetable Sector—*Woods, T.A.*
- Benefits and Costs of Natural Resources Policies Affecting Public and Private Lands (from W1133)—*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.*
- Environmental Impacts of Equine Operations—*Stowe, C.*
- Estimation of Demand for Equestrian Trail Recreational Activities in Kentucky—*Pagoulatos, A.; Hu, W.; Stowe, J.*
- Family Firms and Policy in Times of Disruption (NC1030)—*Robbins, L.W.*
- Food Safety Incidents and the Food Supply Chain: The Impacts on Consumers and Producers and the Strategic Response of Supply Chain Managers and Food Industry Leaders—*Saghaian, S.H.*
- Impacts of Social Capital on the Economic Development and Well-Being of Rural Areas—*Debertin, D.L.*
- Rural Change: Markets, Governance and Quality of Life—*Freshwater, D.; Debertin, D.; Davis, A.*
- The Economics of Precision Agricultural Machinery Management—*Dillon, C.*
- The Impact of Food Safety Scares on the Food Supply Chain in an Environment of Highly Integrated Monopolistically Competitive Agriculture and Food Industries—*Saghaian, S.H.*

Animal and Food Sciences

- Characterization of Carbon-Centered Free Radicals in Food Proteins—*Boatright, W.*
- Control of Food-Borne Pathogens in Pre- and Post-Harvest Environments—*Newman, M.*
- Diet and Vascular Endothelial Cell Function—*Henning, B.*
- 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.*
- Fate of Antioxidant Peptides and Proteins in Food Processing—*Xiong, Y.L.*
- 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.*

- Improving the Sustainability of Livestock and Poultry Production in the United States—*Cromwell, G.L.; Grove, J.*
- Integrated Approach to Enhance Efficiency of Feed Utilization in Beef Production Systems—*Matthews, J.*
- Management Systems to Improve the Economic and Environmental Sustainability of Dairy Enterprises (Rev. NC-1119)—*Bewley, J.M.*
- Mastitis Resistance to Enhance Dairy Food Safety—*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.*
- National Animal Nutrition Program—*Cromwell, G.L.*
- 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.*
- Ovarian Influences on Embryonic Survival in Ruminants—*Bridges, P.J.*
- Rapid Assay Probe Technologies and Media for Monitoring Flora in Foodstuffs—*Hicks, C.L.*
- Regulated Expression of Genes/Proteins Critical to Anionic Amino Acid N Metabolism by Developing and Aging Beef Cattle—*Matthews, J.C.; Boling, J.A.*
- Species-Specificity in Carboxymyoglobin Redox Stability—*Suman, S.P.*
- Use of a Carbohydrate-Based Toxin Adsorbent Supplement Provided through a Mineral Carrier to Alleviate Endophyte Toxicosis in Beef Cows and Calves Grazing Tall Fescue—*Ely, D.*

Biosystems and Agricultural Engineering

- Agricultural Safety and Health Research and Extension—*Purschwitz, M.A.*
- Development of an Algae-Based System for CO₂ Mitigation—*Crofcheck, C.L.; Montross, M.D.*
- Development of Stream Assessment Tools and Riparian Corridor Techniques for Enhancing Water Quality in Karst Watersheds in Central Kentucky—*Agouridis, C.T.; Warner, R.C.*
- Engineering for Food Safety and Quality—*Payne, F.A.*
- Marketing and Delivery of Quality Grains and BioProcess Coproducts—*Montross, M.D.; McNeill, S.G.*
- Modeling for TMDL Development and Watershed Based Planning, Management and Assessment—*Edwards, D.R.*
- 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.*

Community and Leadership Development

- Agricultural Education Research—*Hains, B.*
- Interactions of Individual, Family, Community, and Policy Contexts on the Mental and Physical Health of Diverse Rural Low-Income Families—*Dyk, P.*
- Renewing an Agriculture of the Middle: Value Chain Design, Policy Approaches, Environmental and Social Impacts—*Tanaka, K.*

Entomology

- 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—*Yeargan, K.V.*
- Biological Improvement of Chestnut through Technologies that Address Management of the Species, its Pathogens and Pests—*Rieske-Kimney, 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—*Yeargan, K.*
- Delineation of Structural Complexity in Above and Belowground Forest Food Webs—*Harwood, J.D.*
- Ecology and Management of European Corn Borer and Other Lepidopteran Pests of Corn—*White, J.A.*
- 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-Kimney, L.K.*
- Genomic and Metagenomic Analyses of a Wood-Feeding Cockroach, *Cryptocerus punctulatus*—*Zhou, X.*
- Genomic Approaches to Analyses of Immune-Suppressive Genes of the *Camponotus pennsylvanicus* Polydnavirus—*Webb, B.A.*
- Improving Management of Insects of Public Health Significance in Kentucky—*Brown, G.C.*
- Inbreeding and the Fitness Consequences of Colonizing Novel Environments in Herbivorous Insects—*Fox, C.W.*
- Inbreeding Depression in Mating Biology Following Population Bottlenecks in a Storage Pest—*Fox, C.W.*
- Interactions of Emerging Threats and Bark Beetle-Microbial Dynamics in Forest Ecosystems (from W1187)—*Rieske-Kimney, 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 castaneum*—*Palli, S.S.*
- Phylogeny and Biodiversity of Hymenopteran Biological Control Agents—*Sharkey, M.*

Forestry

- 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.*
- Participation of Kentucky Woodland Owners in the Woody Biomass Market—*Stainback, G.A.*
- Use of Underplanting to Enhance the Health and Sustainability of Oak Dominated Ecosystems in Kentucky and the Central Hardwood Region—*Lhotka, J.; Stringer, J.*
- Using Remotely-Sensed Data to Evaluate Post-Fire Vegetation and Fuel Dynamics in Central and Appalachian Hardwood Forests—*Arthur, M.A.*

Horticulture

- Arthropod Resistance of *Lycopersicon hirsutum* LA2329, A Wild Relative of Tomato—*Snyder, J.C.*
- 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 (from W1168)—*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.*
- Multi-State Evaluation of Wine Grape Cultivars and Clones—*Archbold, D.*
- New Horticultural and Grain Crop Opportunities for Kentucky—*Houtz, R.; Van Sanford, D.; Dillon, C.*
- Regulation of Expression and Activity of Sorbitol Dehydrogenase in Apple—*Archbold, D.*
- Sustainable Practices, Economic Contributions, Consumer Behavior, and Labor Management in the U.S. Environmental Horticulture Industry—*Ingram, D.L.*
- Water Management and Quality for Ornamental Crop Production and Health—*Dunwell, W.*

Human Environmental Sciences

- EFNEP Related Research, Program Evaluation and Outreach—*Forsythe, H.E.*
- The Influence of Social Media on Attendee Behavior—*Lu, Y.*

Plant and Soil Sciences

- A Comparison of Soil Seed Bank Dynamics of Herbicide Resistant and Nonresistant *Amaranthus* Species—*Baskin, C.*
- 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 Mass and Energy Transport at Different Vadose Zone Scales (from W1188)—*Wendroth, O.*
- Complementary Approaches to Developing Scab Resistant Wheat Varieties—*Van Sanford, D.A.*
- Cooperative Variety Testing Programs—*Van Sanford, D.A.*
- Design, Assessment, and Management of Onsite Wastewater Treatment Systems: Addressing the Challenges of Climate Change—*Karathanasis, A.D.*
- 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.*
- Environmental and Genetic Determinants of Seed Quality and Performance—*Perry, S.*
- Evaluating the Physical and Biological Availability of Pesticides and Contaminants in Agricultural Ecosystems (from W1082)—*D'Angelo, E.M.*
- Evaluation of Soybean Varieties for Use in Kentucky—*Pfeiffer, T.W.; Lacefield, E.L.*
- Fate, Transport, and Ecological Effects of Livestock Antibiotics in Manure-Amended Agroecosystems—*D'Angelo, E.M.*
- Functional Metagenomic Analysis of Soil-Dwelling and Plant-Associated Microbial Communities—*Moe, L.A.*
- Hydropedology: Genesis, Properties, and Distribution of Hydromorphic Soils—*Karathanasis, A.D.*
- Improving the Sustainability of Livestock and Poultry Production in the United States—*Grove, J.*
- 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.*
- Molecular Genetic Analysis of a Novel Feedback Inhibition Mechanism in the Cytokinin Response Pathway—*Smalle, J.S.*
- Nitrate-Dependent Iron (II) Oxidation in Soils—*Matocha, C.*
- 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.; Shearer, S.A.*
- Regulation of Gene Expression during Plant Embryogenesis—*Perry, S.E.*
- Regulation of Reproductive Sink Size in Soybean (*Glycine max* (L.) Merrill)—*Egli, D.B.*
- Seed Germination Ecology of Hawaiian Montane Species—*Baskin, C.*
- Soil Survey Characterizations and Interpretations for Kentucky Soils—*Karathanasis, A.D.*
- Triacylglycerol Biosynthesis in Soybeans—*Hildebrand, D.*
- Turfgrass and the Environment—*Barrett, M.*
- 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.*

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.*
- Dissecting Defense Signaling Pathways in Soybean and Arabidopsis—*Kachroo, A.*
- Ecological and Genetic Diversity of Soilborne Pathogens and Indigenous Microflora—*Seebold, K.W.*
- Elucidating and Manipulating Alkaloid Biosynthesis Pathways in the Plant-Symbiotic *Epichloe* and *Neotyphodium* species of fungi—*Schardl, C.*
- 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.*
- Molecular Biology of the Interaction between Corn and Corn Stalk Rot Fungi—*Vaillancourt, L.J.*
- Mycotoxins: Biosecurity, Food Safety and Biofuels Byproducts (NC129, NC1025)—*Vaillancourt, L.J.*
- New Strategies to Induce Resistance against Tombusviruses Based on Host Factors—*Nagy, P.*

Veterinary Science

- A Novel Dimorphic Fungus as an Emerging Cause of Reproductive Losses in Mares and Other Livestock—*Szwerczek, T.W.*
- Computational Methods for mRNA Transcriptome from RNA-Seq Data—*MacLeod, J.N.*
- Control of Equine Gastrointestinal Parasites: Immunology, Host Genetics, and Drug Resistance—*Nielsen, M.*
- Control, Transmission, and Prevalence of Natural Infections of Internal Parasites of Equids and Ruminants—*Lyons, E.T.*
- Genetic Basis of Attenuation of the T953 Strain of EHV-1 and Development of a Genetically Defined Live Attenuated Equine Herpesvirus-1 Vaccine—*Balasuriya, U.*
- Identification of Surface Proteins of *Streptococcus equi* with Potential in Vaccine Development—*Timoney, J.*
- Interactions of Equine Viral Pathogens with the Equine Innate Immune System—*Chambers, T.M.; Horohov, D.W.*
- Interferon Gamma Regulation in the Foal—*Horohov, D.W.*
- Investigation of *Sarcocystis neurona* Genes Involved in Parasite Survival and Pathogenesis—*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.*
- Reference Standards, Internal Standards and Critical Reagents/Regulatory Analytes for Analytical/Toxicological Approaches to Problems in Equine Medicine—*Tobin, T.*
- 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, 2012–December 31, 2012) 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.

4-H Central Operations

Total—\$58,105

4-H Council National Mentoring (2011), National 4-H Council, \$33,105—*Burks, J.*
Engaging Youth, Serving Community 10, National 4-H Council, \$25,000—*Mains, M.*

Agricultural Economics

Total \$1,687,756

An Evaluation of ARC Health Projects in Appalachia, Appalachian Regional Commission, \$164,182—*Davis, A.; Allen, J.; Maurer, R.*
Blueberry Product Development for Local Markets, Agricultural Marketing Service, \$69,230—*Batte, M.; Hu, W.; Woods, T.*
CEDIK Scholarship Program for Appalachian Health Care Career Students, New York Community Trust, \$160,000—*Davis, A.*
Flexible Cash Leases: Reducing Price Risk, University of Arkansas, \$12,903—*Halich, G.; Walters, C.*
Grape and Winery Contracting and Supply Chain Management, University of Arkansas, \$44,132—*Woods, T.; Schieffer, J.*
Implement Plan of Work for the Southern Region Sustainable Ag Research and Education (SARE) Program, University of Georgia, \$61,000—*Meyer, A.*
Influence of the Agricultural Cluster on the Fayette County Economy, Fayette County Farm Bureau, \$26,000—*Maynard, L.; Davis, A.; Garkovich, L.*
Initial Feasibility Assessment of a Seed Tape Production System, Strip Intercropping System for Corn and Soybeans, and Small Supervised Autonomous Equipment, Ohio State University, \$31,300—*Batte, M.*
Kentucky Equine Survey—Economic Impact Analysis, Alltech Biotechnology Inc., \$27,000—*Stowe, C.*
Kentucky Equine Survey, Kentucky Horse Council, \$300,000—*Stowe, C.*
KyFarmStart II: A Whole Farm Management Education Program for Beginning Farmers, National Institute of Food and Agriculture, \$561,564—*Meyer, A.; Bewley, J.; Hunter, J.; Isaacs, S.; Katchova, A.; Ritchey, E.*
Local Economic Development in Bath County, Appalachian Regional Commission, \$25,000—*Davis, A.*
Meat Hook Butcher Shop Market, Meat Hook LLC, \$39,679—*Woods, T.*
National Survey of CSAs: Emerging Marketing and Business Strategies, Agricultural Marketing Service, \$49,840—*Woods, T.*
Organic Food Marketing: Panacea or Problem? Ohio State University, \$21,213—*Batte, M.*
Ready Communities Pilot and Program Evaluation, National Institute of Food and Agriculture, \$65,536—*Davis, A.; Garkovich, L.; Maurer, R.*
So SARE PDP Kentucky Model State Plan—Program Assistant, University of Georgia, \$22,000—*Meyer, A.*

U.S. Borlaug Fellows in Global Food Security: A FTF 21st Century Borlaug Leadership Program (Launching Climate Risk Index Futures and Options Markets), Purdue University, \$7,177—*Skees, J.*

Agricultural Programs

Total—\$445,580

Kentucky AgrAbility, National Institute of Food and Agriculture, \$162,000—*Hancock, J.; Purschwitz, M.*
Strengthening Community Agrosecurity Preparedness: Building National Networks and Partnerships, National Institute of Food and Agriculture, \$66,180—*Higdon, A.; Newman, M.; Yeargan, R.*
The EDEN Strengthening Community Agrosecurity Planning (S-CAP) Train-the-Trainer Project: Phase 2, Purdue University, \$41,500—*Higdon, A.; Dwyer, R.; Newman, M.; Priddy, K.; Yeargan, R.*
University of Kentucky Cooperative Extension Agriculture Water Quality Act Compliance, Kentucky Energy and Environment Cabinet, \$3,900—*Gumbert, A.*
University of Kentucky Cooperative Extension Service Liaison, Kentucky Energy and Environment Cabinet, \$172,000—*Gumbert, A.*

Animal and Food Sciences

Total—\$3,757,799

A Preliminary Assessment of the Potential for Compost Bedded Pack Barns in Sustainable Organic Dairy Farming Systems, Organic Valley Family of Farms, \$4,909—*Bewley, J.; Arnold, L.; Day, G.; Jacobsen, K.; Taraba, J.*
Analysis of Digesta and Feed for Amino Acid Composition, Alltech Biotechnology Inc., \$1,500—*Urschel, K.*
Assessing the Role of Mitochondrial Proteome in Beef Color Stability, University of Connecticut, \$50,000—*Suman, S.*
Characterization of Breed Differences in Core Body Temperature, Lying Behavior, Rumination Behavior, and Quarter-Level Milk Conductivity, American Jersey Cattle Association, \$7,992—*Bewley, J.*
Characterization of Protein Expression in Catfish Fillets with Red Pigmentation, Mississippi State University, \$40,000—*Suman, S.*
DAIReXNET-eXtension National Web Resource, University of Nebraska, \$12,500—*Amaral-Phillips, D.*
Editor of the Journal of Nutritional Sciences, Elsevier Science Inc., \$37,613—*Hennig, B.*
Effects of Basal Diet, DIP Source and Level on the Growth Performance of Feedlot Cattle, Alltech Biotechnology Inc., \$20,497—*Harmon, D.*
Effects of Supplementing Rations Differing in Forage Level with Live Yeast Culture, Alltech Biotechnology Inc., \$43,027—*Bewley, J.*
Fighting with Food: Battling Chemical Toxicity with Good Nutrition, Miami University, \$32,691—*Hennig, B.; Gaetke, L.*
KSEF_RDE: Automation of Dairy Cattle Body Condition Scoring through Image Processing, Kentucky Science and Technology Corp Inc., \$49,872—*Bewley, J.*
Master Cattleman Program, Kentucky Beef Network, \$281,394—*Burris, W.; Anderson, L.; Bullock, K.; Lehmkuhler, J.*
Nutrigenomics Applied to Meat Science: Understanding the Impact of Alltech Antioxidant Nutrients on the Quality and Storage Stability of Chicken Meat, Alltech Biotechnology Inc., \$37,008—*Xiong, Y.*
Nutrition and Superfund Chemical Toxicity, National Institute of Environmental Health Sciences, \$2,094,986—*Hennig, B.; Gaetke, L.*
Profitable and Sustainable Poultry Production on Small- and Medium-Sized Farms, National Institute of Food and Agriculture, \$349,999—*Pescatore, A.; Cantor, A.; Rentfrow, G.*
Student Sponsorship Agreement for Good, Alltech Biotechnology Inc., \$12,960—*Pescatore, A.*
Student Sponsorship Agreement for Anthony Quant, Alltech Biotechnology Inc., \$24,300—*Pescatore, A.; Quant, A.*
Student Sponsorship Agreement for Lizza Macalinal, Alltech Biotechnology Inc., \$14,310—*Cantor, A.*
Student Sponsorship Agreement for Zhi Zhang, Alltech Biotechnology Inc., \$7,292—*Matthews, J.*
Student Sponsorship Agreement for Fisher, Alltech Biotechnology Inc., \$37,800—*Pescatore, A.*
Student Sponsorship Agreement for van Benschoten, Alltech Biotechnology Inc., \$37,800—*Pescatore, A.*
The Alltech-UK Animal Nutrigenomics Alliance, Alltech Biotechnology Inc., \$30,000—*Matthews, J.*
Threonine Nutrition in Growing and Mature Horses: Effect of Diet Composition on Threonine Requirements, National Institute of Food and Agriculture, \$460,000—*Urschel, K.*
Use of Natural Remedies to Alleviate Enteric Pathogens in Organic Poultry, Agricultural Research Service, \$69,349—*Pescatore, A.; Jacob, J.*

Associate Dean/Director

Total—\$1,130,683

2012-13 Acquisition of Goods and Services for USDA Offices in Ag North—Field Work, Agricultural Research Service, \$7,618—*Cox, N.*
2012-13 Acquisition of Goods and Services for USDA Offices in Ag North—O&M Account, Agricultural Research Service, \$9,433—*Cox, N.*
Conservation Practice Code 590 Nutrient Management Training, Natural Resources Conservation Service, \$27,500—*Higgins, S.*
Equine Medical Director, Kentucky Horse Racing Authority, \$350,412—*Cox, N.*
Improving Sustainability of Forage-Based Production, Agricultural Research Service, \$735,720—*Cox, N.*

Biosystems and Agricultural Engineering

Total—\$5,293,766

- A Cooperative Extension Program for Kentucky's Energy Efficiency Education Needs 2012-2013, Kentucky Energy and Environment Cabinet, \$113,000—*Fehr, R.*
- Appalachian Research Initiative for Environmental Science (ARIES), Virginia Polytechnic Institute and State University, \$312,350—*Warner, R.; Agouridis, C.; Barton, C.; Uhrine, J.*
- Developing an Organic Corn Enterprise in Kentucky, University of Georgia, \$10,000—*McNeill, S.; Halich, G.; Lee, C.; Meyer, A.*
- Energy Audits for Grain and Poultry Producers in Kentucky, Rural Development, \$10,850—*McNeill, S.; Montross, M.; Overhults, D.; Shearer, S.*
- Evaluation of Pressure in Crop Processing Systems, Case New Holland America LLC, \$41,000—*Montross, M.*
- Implementation and Assessment of Mechanical Burley Tobacco Harvesting Systems in France during 2012, Association Nationale Interprofessionnelle et Technique Du Tabac, \$15,092—*Wells, L.*
- On-Farm Biomass Processing: Towards an Integrated High Solids Transporting/Storing/Processing System, National Institute of Food and Agriculture, \$4,786,525—*Nokes, S.; Crofcheck, C.; DeBolt, S.; Halich, G.; Lee, C.; Montross, M.; Mueller, T.; Smith, S.; Stombaugh, T.*
- Stream Restoration in Guy Cove II, Laurel Fork Fees in Lieu of Stream Restoration Project, Kentucky Department of Fish and Wildlife, \$4,949—*Agouridis, C.; Barton, C.; Warner, R.*

Community and Leadership Development

Total—\$480,754

- Dissemination of Core Health Messages: Using Community-Based Participatory Research to Strengthen the Health of Rural, Low-Income Families, University of Massachusetts, \$1,179—*Dyk, P.*
- E-Discovery Challenge, Appalachian Regional Commission, \$200,000—*Hustedde, R.; Denham, M.*
- Envirothon: Incorporating the Contest into your Curriculum, Kentucky Workforce Development Cabinet, \$5,075—*Epps, R.*
- Mapping Sustainable Farm Systems: An Integrated Focus on Upper South New Producers as Catalysts of "Good Stewardship," University of Georgia, \$270,000—*Tanaka, K.; Jacobsen, K.*
- UK Perkins Teacher Education Award 2012-2013, Kentucky Education and Workforce Development Cabinet, \$4,500—*Hains, B.; Epps, R.; Vincent, S.*

Dietetics and Human Nutrition

Total—\$292,282

- Children, Youth and Families at Risk Liaison, National Institute of Food and Agriculture, \$42,850—*Kurzynske, J.*
- Children, Youth, and Families Education and Research Network—Program Component,

- National Institute of Food and Agriculture, \$180,000—*Kurzynske, J.; Stivers, W.*
- CYFAR Capacity Building Supplement, National Institute of Food and Agriculture, \$31,262—*Kurzynske, J.; Stivers, W.*
- Saving Endangered Hog Breeds, American Livestock Breeds Conservancy, \$38,170—*Perry, R.*

Entomology

Total—\$1,865,505

- 2010 University Protocol for Evaluating Field Efficacy of Herculex I, YieldGard Corn Borer, and Bt11xMIR162 Deployed Against Corn Earworm, Fall Armyworm, and Other Southern U.S. Lepidoptera Larvae, Pioneer Hi Bred International Inc., \$15,290—*Bessin, R.*
- 2013-14 UK Private Pesticide Applicator, Kentucky Department of Agriculture, \$27,500—*Townsend, L.*
- A Bio-economic Study of an Introduced Biological Control Agent: Ecological, Evolutionary, and Economic Factors in Sustainable Agricultural Systems, National Science Foundation, \$424,542—*Kajita, Y.*
- Addressing Multiple Soybean Pest Management Issues through Integrated Studies, Kentucky Soybean Promotion Board \$25,787—*Johnson, D.; Bessin, R.; Hershman, D.*
- Biological Control of Cereal Aphids in Wheat: Implications of Alternative Foods and Intraguild Predation, Binational Agricultural Research and Development Fund, \$62,000—*Harwood, J.*
- Biological Control of the Hemlock Woolly Adelgid, Animal and Plant Health Inspection Service, \$15,000—*Collins, J.*
- Cooperative Agricultural Pest Surveys—Infrastructure, Animal and Plant Health Inspection Service, \$110,043—*Lensing, J.; Collins, J.*
- EAB Public Awareness, Kentucky Energy and Environment Cabinet, \$5,000—*Collins, J.*
- Emerald Ash Borer Survey and Outreach in Kentucky, Animal and Plant Health Inspection Service, \$278,125—*Lensing, J.; Collins, J.*
- Forest Pest Outreach, Animal and Plant Health Inspection Service, \$37,500—*Collins, J.; Lensing, J.*
- Gypsy Moth Survey, Animal and Plant Health Inspection Service, \$90,288—*Lensing, J.; Collins, J.*
- Importance of Natural Enemies for Stink Bug Control, University of Georgia, \$12,000—*Harwood, J.*
- Integrating Biological Control and Chemical Suppression to Save Our Ash Resources, Forest Service, \$85,000—*Rieske-Kinney, L.; Townsend, L.*
- IPM in Kentucky: Integrated Development and Delivery, National Institute of Food and Agriculture, \$93,645—*Bessin, R.; Coolong, T.; Durham, R.; Johnson, D.; Lee, C.; Lucas, P.; Murdock, L.*
- Molecular Analysis of Juvenile Hormone Action, National Institute of General Medical Sciences, \$206,415—*Palli, S.*
- Monitor Gypsy Moth Populations for Slow the Spread Program, Slow the Spread Foundation, \$41,000—*Harper, C.*
- Pesticide Safety Education, National Institute of Food and Agriculture, \$10,000—*Townsend, L.*
- Phytophthora ramorum* Survey, Animal and Plant Health Inspection Service, \$25,000—*Lensing, J.*
- Pine Shoot Beetle (*Tomicus piniperda*) Survey, Animal and Plant Health Inspection Service, \$11,290—*Collins, J.*

- Planning Grant: I/UCRC for Arthropod Management Technologies, National Science Foundation, \$11,499—*Palli, S.*
- Post-Invasion Forests: Composition and Structure Following Invasive Species Establishment, Forest Service, \$30,000—*Rieske-Kinney, L.*
- Recruitment of Natural Enemies Mitigates Impacts of the Asian Chestnut Gall Wasp, Northern Nut Growers Association, \$5,555—*Rieske-Kinney, L.*
- Regional Firewood Outreach and Educational Campaign, Kentucky Energy and Environment Cabinet, \$55,000—*Collins, J.*
- SBIR Phase I: Self-delivering, Biological Control of *Aedes albopictus* Mosquitoes, MosquitoMate Inc., \$7,073—*Dobson, S.*
- TCN: Collaborative Research: Plants, Herbivores, and Parasitoids: A Model System for the Study of Tri-Trophic Associations, University of Delaware, \$55,461—*Sharkey, M.*
- Third Kentucky Invasive Species Conference, Forest Service, \$2,500—*Rieske-Kinney, L.*
- Thousand Cankers Disease Survey, Animal and Plant Health Inspection Service, \$17,157—*Lensing, J.*
- Tracking the Source of Aphid-vectored Virus in Winter Wheat, Kentucky Small Grain Growers Association, \$8,262—*Harwood, J.; Johnson, D.; Kowles, K.*
- Trial of IV Formulae Using *Aedes* Mosquito Species, Intellectual Ventures Management LLC, \$2,797—*Dobson, S.*
- Valent Bioscience VBC3 for Bed Bug Control, Valent BioSciences Corporation, \$10,467—*Haynes, K.; Potter, M.*
- Whole Farm Organic Management of BMSB and Other Pentatomids through Habitat Manipulation, Rutgers University, \$84,309—*Bessin, R.; Coolong, T.*

eXtension

Total—\$799,655

- Building Cooperative Extension's 21st Century Network, University of Nebraska, \$395,324—*Wood, C.*
- ECOP/CSREES E-eXtension-Supplement, University of Nebraska, \$397,840—*Wood, C.; Craycraft, C.*
- The Development, Evaluation and Implementation of an Online Safety Course for Youth Working on Equine Facilities, Michigan State University, \$6,491—*Wood, C.*

Family and Consumer Sciences

Total—\$3,588,773

- 2012 Kentucky Health Literacy Summit: Building Your Health Literacy Toolkit, Foundation for a Healthy Kentucky, \$1,000—*Murray, D.*
- 2012 Kentucky Military Extension Adventure Camp, Purdue University, \$108,576—*Ashurst, K.*
- 2012 OMK Camp Initiative/OSD Supplement, Kansas State University, \$60,150—*Ashurst, K.*
- Child Care and Youth Training and Technical Assistance Project—State Extension Liaisons, University of Nebraska, \$45,000—*Stephenson, L.*
- Operation Military Kids Kentucky 2012, Kansas State University, \$82,500—*Ashurst, K.*
- Specialty Crop: Plate It Up Kentucky Proud Recipe Development for Consumers with Nutrition Research Component, Kentucky Department of Agriculture, \$50,340—*Stephenson, L.; Mullins, J.; Stephenson, T.*

UK Supplemental Nutrition Assistance Program-Education (SNAP-Ed), Kentucky Cabinet for Health and Family Services, \$3,241,207—*Vail, A.; Stephenson, L.*

Forestry

Total—\$414,786

Cow Elk Survival and Mortality Study, Rocky Mountain Elk Foundation, \$17,879—*Cox, J.*
Evaluation of Acidic Atmospheric Deposition and Its Influence on Soil Solution Composition in the Daniel Boone National Forest, Forest Service, \$50,267—*Barton, C.; Karathanasis, A.*
Forest and Wood Product Certification Educational Outreach, Kentucky Energy and Environment Cabinet, \$22,500—*Stringer, J.*
Kentucky Bull Elk Study: Movement and Mortality, Rocky Mountain Elk Foundation, \$63,000—*Cox, J.*
Kentucky Woodlands Magazine—Firewise Issue, Kentucky Energy and Environment Cabinet, \$16,000—*Stringer, J.; Thomas, W.*
Kentucky Woodlands Magazine—What's up with Our Oaks? Issue, Kentucky Energy and Environment Cabinet, \$16,000—*Stringer, J.; Thomas, W.*
Kentucky Woodlands Magazine—Woodland Health Update and Educational Opportunity Issues, Kentucky Energy and Environment Cabinet, \$32,000—*Stringer, J.; Thomas, W.*
Population Growth and Expansion of the Black Bear in Eastern Kentucky, Kentucky Department of Fish and Wildlife, \$90,000—*Cox, J.*
Regional Secondary Wood Using Industry Online and Hardcopy Directory, Kentucky Energy and Environment Cabinet, \$45,140—*Fackler, F.*
Resource Selection, Movement Patterns, Survival, and Cause-Specific Mortality of Adult Bull Elk in Kentucky, Kentucky Department of Fish and Wildlife, \$50,000—*Cox, J.*
Restoring Bottomland Hardwood Forests to Improve Watershed Health Outreach, Kentucky Energy and Environment Cabinet, \$2,000—*Thomas, W.*
UK Forest Stewardship Public Awareness, Publicity and Training, Kentucky Energy and Environment Cabinet, \$10,000—*Stringer, J.*

Horticulture

Total—\$900,928

Analyzing the Environmental Impact (Carbon Footprint) and Economic Costs of Field-grown Flowering Tree Production System Components, Horticultural Research Institute, \$20,000—*Ingram, D.*
Ginseng Monitoring Grant, Kentucky Department of Agriculture, \$10,000—*Wright, S.*
Shielding Cucurbit Crops for Resilient Agroecosystems, Iowa State University, \$164,519—*Coolong, T.; Bessin, R.; Williams, M.*
Specialty Crop: Annual Plasticulture Strawberry Production, Kentucky Department of Agriculture, \$35,642—*Wright, S.; Strang, J.*
Specialty Crop: Rhubarb: An Early Crop for Market Gardeners, Kentucky Department of Agriculture, \$9,204—*Wright, S.*
Specialty Crop: Sustainable Ground Cover Production for More Sustainable Kentucky Landscapes, Kentucky Department of Agriculture, \$10,780—*Ingram, D.*

Specialty Crop: Sustainable Nitrogen Practices in Kentucky Vineyards, Kentucky Department of Agriculture, \$52,000—*Wilson, P.*

Specialty Crop: The Vegetable Academy: A Short Course to Advance Vegetable Production in Kentucky, Kentucky Department of Agriculture, \$24,469—*Coolong, T.; Bessin, R.; Seebold, K.; Wilhoit, J.; Woods, T.; Wright, S.; Yeagan, R.*

The Impact of Sterol Biogenesis on Cellulose Synthesis in Higher Plants, Kansas State University, \$59,380—*DeBolt, S.*

The Kentucky Viticulture and Enology Extension and Research Program, Kentucky Vineyard Society, \$450,000—*Wilson, P.*

Using RNA Interference (RNAi) to Deconvolute Cryptochromes' (HvCRYs) Influences on Gene Expression Controlling ABA Titer Impacting Seed Dormancy in Barley (*Hordeum vulgare*), National Institute of Food and Agriculture, \$64,934—*Downie, A.*

International Programs

Total—\$108,869

Assessment of the Ministry of Agriculture's Extension Plan, Republic of Georgia, Foreign Agricultural Service, \$8,591—*Reed, M.; Infanger, C.*

Borlaug Fellowship Program—Ghana, Foreign Agricultural Service, \$29,878—*Reed, M.; Reed, M.; Snyder, J.*

Extension Services in Serbia and Montenegro, Foreign Agricultural Service, \$70,400—*Reed, M.; Reed, M.*

Kentucky Tobacco Research and Development Center

Total—\$249,878

Folium—Evaluation of Tobacco BioFuels Production, University of California Berkeley, \$146,915—*Yuan, L.; Chambers, O.; Mundell, R.*

STTR: Potential Anti-Relapse Drugs: A Plant Genomics Approach, Naprogenix, \$102,963—*Littleton, J.*

Landscape Architecture

Total—\$13,946

Landscape Prioritization and Conservation for Elk, Rocky Mountain Elk Foundation, \$13,946—*Lee, B.*

Plant and Soil Sciences

Total—\$2,161,088

2008 Southern Regional Water Resource Project, Texas A&M University, \$32,000—*Lee, B.*

Accelerating the Development of FHB-Resistant Soft Red Winter Wheat Varieties, Agricultural Research Service, \$55,112—*Van Sanford, D.*

Agronomic Maximization of Soybean Yield and Quality, University of Minnesota, \$140,000—*Lee, C.*

An Integrated Approach to Understanding the Dynamics of Poultry Litter Use in Corn-Soybean Production Systems, Kentucky Soybean Promotion Board, \$35,000—*Ritchey, E.; Hershman, D.; Martin, J.*

Bacteria and Bioethanol Fermentation: Characterizing the Impact of Bacterial Contaminants and Bacterial Community

Structure on Bioethanol Fermentations across the US, Kentucky Science and Technology Corporation Inc., \$43,940—*Moe, L.*

Bayer Master Agreement—Field Trial, Bayer CropScience GmbH, \$7,000—*Carter, S.; Slack, C.*
Branch-Chain Fatty Acid Production in Plants, Consortium for Plant Biotechnology Research Inc., \$110,228—*Hildebrand, D.*

Center for the Environmental Implications of Nanotechnology (CEIN), Duke University, \$137,800—*Bertsch, P.; Urwine, J.*

Collaborative Proposal: CPSF30 at the Convergence of RNA Processing, Cellular Signaling and Development in Plants, National Science Foundation, \$6,000—*Hunt, A.*

Collaborative Research: Decomposition in Drylands: Soil Erosion and UV Interactions, National Science Foundation, \$31,832—*McCulley, R.*

Collaborative Research: Do Expected Evolutionary Trade-Offs in Ezyme Activities Manifest at the Level of Microbial Community Function? National Science Foundation, \$110,190—*McCulley, R.*

Comparing Corn Systems in Wide and Narrow Rows (Year 2), Kentucky Corn Promotion Council, \$35,000—*Lee, C.; Green, J.*

Corn Growers Fragipan Remediation, Kentucky Corn Growers Association, \$35,000—*Murdock, L.; Grove, J.; Matocha, C.*

Development of Effective Educational Programs to Manage and Mitigate Herbicide Resistant Weeds, Purdue University, \$30,000—*Martin, J.; Green, J.*

Development of Two-Dimensional Field Flow Fractionation Techniques for Analysis of Engineered Nanoparticles in Soil and Sediment Pore Waters and Extracts, Environmental Protection Agency, \$79,896—*Urwine, J.*

DTS Soybean—Service Order No. 14, Monsanto Co., \$9,600—*Carter, S.; Slack, C.*

Establishing *Salvia hispanica* as a Sustainable Grain Crop for Kentucky Farmers, Kentucky Small Grain Growers Association, \$10,000—*Hildebrand, D.*

Evaluating Marestail Control with Wheat Herbicides, Kentucky Small Grain Growers Association, \$3,000—*Martin, J.*

Evaluation of Altria Burley Breeding Lines, Altria Corporate Services Inc., \$22,240—*Miller, R.*

Farm Scale Biomass Production for Electricity Generation and Community Development, Kentucky Forage and Grasslands Council, \$20,000—*Smith, S.; Montross, M.*

Genotype x Environment x Management Interactions in Wheat, Kentucky Small Grain Growers Association, \$6,800—*Lee, C.; Russell, K.; Van Sanford, D.*

Improving Barley and Wheat Germplasm for Changing Environments, University of California Davis, \$56,446—*Van Sanford, D.*

Introducing the Pale Yellow Gene into Increased Chlorophyll Burley, Burley Tobacco Growers Cooperative Association Inc., \$8,000—*Fisher, C.; Li, D.*

KSEF RDE: Host Genetic Control of Strain-Specific Nitrogen Fixation in *Medicago truncatula*, Kentucky Science and Technology Corporation Inc., \$50,000—*Zhu, H.*

KSEF RDE: Stability Control of the Microtubule-Associated Protein SPIRAL1 and Its Role in Plant Salt Stress Tolerance, Kentucky Science and Technology Corporation Inc., \$49,482—*Smalle, J.*

Managing Within-Field Variability of Winter Wheat: Upscaling from Transect to Field,

Kentucky Small Grain Growers Association, \$6,500—*Wendroth, O.; Egli, D.; Lee, C.; Murdock, L.*

Monsanto Test—Service Order No. 13, Monsanto Co, \$8,400—*Slack, C.; Carter, S.*

Multiple Uses for Switchgrass Stands Following Biomass Production, Natural Resources Conservation Service, \$75,000—*Smith, S.*

Performance of Small Grain Varieties in Kentucky, Kentucky Small Grain Growers Association, \$8,500—*Bruening, W.*

Princeton, Kentucky Field Yield and Quality Evaluation of Burley RNAi Nicotine Demethylase Lines and Hybrids, Altria Corporate Services Inc., \$47,955—*Bailey, W.*

Raising Soybean Yield Potential in Dry Seasons: Increased Rooting Depth and Greater Soil Water Extraction with Deeper Depth to the Fragipan, Kentucky Soybean Promotion Board, \$35,000—*Grove, J.; Ritchey, E.*

Regional Biomass Feedstock Partnership, South Dakota State University, \$12,500—*Williams, D.*

Renewable Lubricant Production, Ashland Inc., \$9,000—*Hildebrand, D.*

Residual Timing for Mareestail Control in Soybean, Monsanto Co., \$6,950—*Martin, J.*

Restoring Imperiled Grassland Wildlife through Grazing Innovation in the Eastern United States, University of Tennessee, \$79,901—*Smith, S.; Ditsch, D.*

Seeded Switchgrass Yield Trial--Annex 1, Ceres Inc., \$55,000—*Smith, S.*

Small Grain Fragipan Remediation, Kentucky Small Grain Growers Association, \$13,888—*Murdock, L.; Karathanasis, A.*

Soft Red Winter Wheat Breeding and Variety Development for Kentucky, Kentucky Small Grain Growers Association, \$35,700—*Van Sanford, D.*

Soils Morphology Course, Kentucky Department for Public Health, \$40,000—*Karathanasis, A.*

Soybean Fragipan Remediation, Kentucky Soybean Promotion Board, \$35,000—*Murdock, L.; Karathanasis, A.*

Soybean Management Verification Program: 2012, Kentucky Soybean Promotion Board, \$62,000—*Lee, C.; Herbek, J.; Murdock, L.*

Survey of Herbicide Resistant Palmer Amaranth and Waterhemp, Kentucky Soybean Promotion Board, \$27,997—*Martin, J.; Witt, W.*

Synchrotron X-Ray Microprobe and Microspectroscopy Research at Low Temperature Geochemistry, University of Chicago, \$47,730—*Bertsch, P.*

Synthetic Crop for Direct Biofuel Production through Re-routing the Photorespiration Intermediates and Engineering Terpenoid Pathways, Texas AgriLife Research, \$232,210—*Chappell, J.*

U.S. Wheat and Barley Scab Initiative's Networking and Facilitation Office and Website, Agricultural Research Service, \$111,291—*Van Sanford, D.*

UK Robinson Center Farmer's Market Shelter, Kentucky Governor's Office of Agricultural Policy, \$40,000—*Ditsch, D.*

Using Wheat as a Tool for Managing Palmer Amaranth, Kentucky Small Grain Growers Association, \$5,000—*Martin, J.*

Warrant Soybean Tests 2012—Service Order No. 15, Monsanto Co, \$6,000—*Slack, C.; Carter, S.*

Plant Pathology

Total—\$819,952

2012 Kentucky Soybean Rust Monitoring and Early Warning System, Kentucky Soybean Promotion Board, \$12,000—*Hershman, D.*

Alteration of Alkaloid Profiles of Forage and Turf Grasses by Genetic Manipulation of Endophytic Fungi, West Virginia University, \$230,769—*Schardl, C.*

Effects of Local Corn Debris Management on FHB and DON Levels (Year Two), Kentucky, Agricultural Research Service, \$4,513—*Hershman, D.*

Enhancing Soybean Yield by Manipulating the Expression of Seed Size-Determining Genes, United Soybean Board, \$119,327—*Kachroo, A.; Ghabrial, S.*

Evaluation and Mitigation of Anthracnose Disease Pressure Due to the Introduction of Sorghum for Feedstock Production, Pennsylvania State University, \$218,900—*Vaillancourt, L.*

Glycerol Metabolism and Its Role in Biotrophy versus Necrotrophy in an Arabidopsis/Fungal Hemibiotroph Model System, National Science Foundation, \$6,000—*Kachroo, P.; Kachroo, A.; Vaillancourt, L.*

Molecular, Genetic, and Biochemical Characterization of Oleate-Regulated Defense Gene Expression in Plants, National Science Foundation, \$6,000—*Kachroo, P.; Kachroo, A.*

Multiple Disease Resistant Soybeans: Gene Discovery and Transfer of Disease Resistance into Soybean, University of Illinois, \$56,720—*Ghabrial, S.*

Reducing Losses to Potato and Tomato Late Blight by Enhanced Monitoring of Pathogen Populations and Improved Resistant Plants, Education and Extension, Regents of the University of California Riverside, \$10,706—*Seebold, K.*

Reducing Soybean Yield Loss by Enhancing Resistance to Phytophthora Rot, United Soybean Board, \$93,017—*Kachroo, A.*

Southern Plant Diagnostic Network, Kentucky Component, University of Florida, \$22,000—*Vincelli, P.*

Towards Understanding the Mechanisms of Plant Extreme Resistance to Viruses, Kentucky Science and Technology Corporation Inc., \$40,000—*Kachroo, A.*

Plant Pathology—Research ChallengeTrust Fund

Total—\$443,929

Key Role of the Multifunctional Translation Elongation Factor in Virus Replication, National Science Foundation, \$194,247—*Nagy, P.*

Mechanism of Inhibition of +RNA Virus Replication by Cyclophilins, National Institute of Allergy and Infectious Diseases, \$204,132—*Nagy, P.*

Screening of Temperature Sensitive and Deletion Libraries for Host Factors Affecting Virus Replication, Kentucky Science and Technology Corporation Inc., \$45,550—*Nagy, P.*

Plant Sciences—Agronomy—Research ChallengeTrust Fund

Total—\$110,000

GIS and Cloud Computing Tools for Soil and Water Conservation: Grassed Waterways and Nitrogen Fertilizer Recommendations, Natural Resources Conservation Service, \$75,000—*Mueller, T.*

Methodology for Designing Vegetative Buffers Using GIS and Terrain Analysis, Forest Service, \$35,000—*Mueller, T.*

Regulatory Services

Total—\$170,840

Enhancing and Building the Capability of Feed Safety in Kentucky, Food and Drug Administration, \$131,792—*Webb, S.*

Medicated Feed Mill and BSE Rule Inspections, Food and Drug Administration, \$39,048—*Thorn, W.*

Retailing and Tourism Management

Total—\$93,353

Cotton Incorporated Laundry Study, Cotton Incorporated, \$65,574—*Easter, E.*

Quality Control Laboratory for NAILM, National Association of Institutional Linen Management, \$27,779—*Easter, E.*

Tracy Farmer Center For The Environment

Total—\$77,448

Engaging Partners in a Comprehensive Watershed Project, Urban Waters Small Grant, Environmental Protection Agency, \$59,934—*Hanley, C.; Agouridis, C.*

Stormwater Quality Projects Incentive Grant Program, Lexington Fayette Urban County Government, \$17,514—*Hanley, C.*

UK Veterinary Diagnostic Laboratory

Total—\$95,980

Bovine Spongiform Encephalopathy Testing and Related Services, Kentucky Department of Agriculture, \$24,480—*Carter, C.*

Diagnostic Laboratory Support of NAHLN, Animal and Plant Health Inspection Service, \$55,000—*Carter, C.*

FDA Vet-LRN Veterinary Diagnostic Laboratory Cooperative Agreement Program Funding to Increase Sample Analysis in the Event of Animal Food or Drug Related Illness, Food and Drug Administration, \$16,500—*Gaskill, C.*

Veterinary Science

Total—\$1,069,782

Determining the Role of Maternal Antibodies in Infection and Immunity to *Lawsonia intracellularis*, Morris Animal Foundation, \$53,529—*Horohov, D.*

Development of a Genetically Defined Live Attenuated Equine Herpesvirus-1 Virus, Elanco Animal Health, \$163,752—*Balasuriya, U.; Cook, R.*

Development of Recombinant Vaccines against PRRS: EAV-vectored Chimeric Vaccines against PRRS, Merial Ltd., \$362,112—*Balasuriya, U.; Cook, R.*

Do NSAIDs Affect the Immune Response of Horses to Vaccination?, Grayson Jockey Club Research Foundation Inc., \$54,776—*Horohov, D.; Chambers, T.*

EIAV Envelope Variation and Vaccine Efficacy, University of Pittsburgh, \$345,758—*Issel, C.; Cook, R.; Horohov, D.*

Rapid Detection of Foreign, Emerging and Zoonotic Pathogens of Equines, Kansas State University, \$45,000—*Balasuriya, U.; Artiushin, S.*

Role of the Horse in Interspecies Transmission of Influenza Viruses, Kentucky Science and Technology Corporation Inc., \$44,855—*Chambers, T.; Balasuriya, U.*

Multidisciplinary Grants Led by Other Colleges*

Appalachia Community Cancer Network II—U54, National Cancer Institute, \$1,196,990—*Webber, K.*

BOOST H₂O (Helping Hydrologic Outreach) in Indonesia and Turkey, Department of State, \$197,299—*Agouridis, C.; Hanley, C.; Reed, M.; Tanaka, K.*

Central Appalachian Regional Education Research Center, National Institute of Occupational Safety and Health, \$600,714—*Purschwitz, M.*

Demonstration of an Algae-Based System for CO₂ Mitigation from Coal-fired Power Plants, Kentucky Energy and Environment Cabinet, \$531,408—*Croftcheck, C.*

DIN Waste Management Tool for Estimating Nitrogen Removal by Sediments, Kentucky Science and Technology Corporation Inc., \$49,951—*Agouridis, C.*

Geometry of Gene Cophylogenies as Relates to Genome Evolution and Speciation, National Institute of General Medical Sciences, \$274,428—*Schardl, C.*

Hippocampal Neurotoxicity Induced by Ethanol Withdrawal, National Institute on Alcohol Abuse and Alcoholism, \$335,613—*Littleton, J.*

Implications of Caveolae in Tat Signaling and Integrity of Brain Endothelium, National Institute of Mental Health, (\$168,305)—*Hennig, B.*

Improvement in Provider and Patient Self-Efficacy in Weight Loss in Primary Care, Obesity Society, \$25,000—*Webber, K.*

Indonesia Higher Education Leadership and Management Project, Chemonics International Inc., \$472,672—*Reed, M.; Tanaka, K.*

Kentucky Industrial Assessment Center (KIAC): Developing the Next Generation Energy Assessment Engineering Workforce, Department of Energy, \$213,202—*Colliver, D.*

KSEF RDE: Conservation and Ecology of an Insect Feeding Guild Containing a Kentucky State Endangered Carnivorous Plant, Kentucky Science and Technology Corporation Inc., \$50,000—*Harwood, J.*

KY EPSCoR: Transforming Kentucky's New Economy with EPSCoR, Kentucky Council on Postsecondary Education, \$933,797—*Schardl, C.; Webb, B.*

KY IDEa Networks of Biomedical Research Excellence, University of Louisville, \$333,012—*Farman, M.*

NSF/EPSCoR: Transforming Kentucky's New Economy with EPSCoR, National Science Foundation, \$2,531,000—*Schardl, C.; Webb, B.*

Southeast Center for Agricultural Health and Injury Prevention, National Institute of Occupational Safety and Health, \$498,851—*Hains, B.; Purschwitz, M.; Vincent, S.*

Southeast Center for Agricultural Health and Injury Prevention: Admin Core, National Institute of Occupational Safety and Health, \$1,269,925—*Hains, B.; Isaacs, S.; Purschwitz, M.; Vincent, S.*

State Water Institute Fiscal Year 2011–2012, US Geological Survey, \$92,335—*Agouridis, C.; Wendroth, O.*

Unlocking Transcript Diversity via Differential Analyses of Splice Graphs, University of North Carolina, \$150,551—*MacLeod, J.*

*Only College of Agriculture co-investigators are listed.

Intellectual Property

GenBank Register

Animal and Food Sciences

Silvia, W.J., and J.A. Green. Bison pregnancy associated glycoproteins. Accession JQ609345.1–JQ 609352.1.

Entomology

Chapman, E.G., J.D. Harwood, L.T., Luong, and P.J. Hudson. *Ceuthophilus gracilipes* voucher PS-52 cytochrome oxidase subunit I (COI) gene, partial cds; mitochondrial. Accession JF411599.

Chapman, E.G., J.D. Harwood, L.T., Luong, and P.J. Hudson. *Ceuthophilus guttulatus* voucher PS-90 cytochrome oxidase subunit I (COI) gene, partial cds; mitochondrial. Accession JF411600.

Chapman, E.G., J.D. Harwood, L.T., Luong, and P.J. Hudson. *Ceuthophilus pallidipes* voucher PS-1 cytochrome oxidase subunit I (COI) gene, partial cds; mitochondrial. Accession JF411601.

Chapman, E.G., J.D. Harwood, L.T., Luong, and P.J. Hudson. *Euhadenococcus puteanus* voucher PS-44 cytochrome oxidase subunit I (COI) gene, partial cds; mitochondrial. Accession JF411602.

Chapman, E.G., K.D. Welch, and J.D. Harwood. *Grammonota inornata* voucher Ginor-03 cytochrome c oxidase subunit I (COI) gene, partial cds; mitochondrial. Accession JN801186.

Chapman, E.G., K.D. Welch, and J.D. Harwood. *Tennesseeillum formica* voucher Tform-01 cytochrome c oxidase subunit I (COI) gene, partial cds; mitochondrial. Accession JN801187.

Sharkey, M.J., and S.A.C. Stoelb. *Zelodia* spp. sequences of cytochrome c oxidase subunit I. Accession JQ763436–JQ763460.

Sharkey, M.J., and S.A.C. Stoelb. Sequences of 28S rDNA. Accession JQ929182–JQ929201.

Tucker, E., M. Sharkey, and S. Stoelb. *Camptothlipsis* spp. sequences of 28S rDNA. Accession JN564488–JN564495.

Kentucky Tobacco Research and Development Center

Maiti, I.B., and S. Pattanaik. Complete genomic sequence of Dahlia mosaic virus (DaMV) isolated from Portland Oregon, USA. Accession JX272320.

Maiti, I.B., and S. Pattanaik. Complete genomic sequence of Horseradish latent virus (HRLV) isolated from Lyngle, Denmark, in April 1973. Accession JX429923.

Plant Pathology

Farman, M.L. *Magnaporthe oryzae* 70-15 4-coumarate-CoA ligase 2 (MGG_01951) mRNA, complete cds 1,749 bp linear mRNA. Accession XM_003708645.1 GI:389622078.

Farman, M.L. *Magnaporthe oryzae* 70-15 cytochrome P450 3A19 (MGG_01947) mRNA, complete cds 1,482 bp linear mRNA. Accession XM_003708637.1 GI:389622062.

Farman, M.L. *Magnaporthe oryzae* 70-15 ent-kaurene synthase (MGG_01949) mRNA, complete cds 2,889 bp linear mRNA. Accession XM_003708643.1 GI:389622074.

Farman, M.L. *Magnaporthe oryzae* 70-15 hypothetical protein (MGG_15983) mRNA, complete cds 657 bp linear mRNA. Accession XM_003708641.1 GI:389622070.

Farman, M.L. *Magnaporthe oryzae* 70-15 transferase (MGG_11099) mRNA, complete cds 1,590 bp linear mRNA. Accession XM_003708639.1 GI:389622066.

Ghabrial, S.A. *Sclerotinia sclerotiorum* dsRNA mycovirus-L, complete genome 9,124 bp linear RNA. Accession NC_017915.1 GI:387600886.

Ghabrial, S.A. *Sclerotinia sclerotiorum* dsRNA mycovirus-L isolate Sunf-M, complete genome 9,124 bp linear RNA. Accession JQ513382.1 GI:385889525.

Ghabrial, S.A. *Sclerotinia sclerotiorum* partitivirus 1 strain SsPV1-WF-1 putative capsid protein gene, complete cds 2,292 bp linear RNA. Accession JX297510.1 GI:404551124.

Ghabrial, S.A. *Sclerotinia sclerotiorum* partitivirus 1 strain SsPV1-WF-1 RNA-dependent RNA polymerase gene, complete cds 2,334 bp linear RNA. Accession JX297511.1 GI:404551126.

Ghabrial, S.A. Tobacco streak virus isolate Henry segment RNA 2, complete sequence 2,911 bp linear RNA. Accession JX073657.1 GI:399144453.

- Goodin, M.M. Impatiens necrotic spot virus glycoprotein precursor, gene, partial cds 1,395 bp linear cRNA JX138533.1. Accession GI:399108194.
- Goodin, M.M. Impatiens necrotic spot virus glycoprotein precursor, gene, partial cds 3,411 bp linear cRNA JX138530.1. Accession GI:399108188.
- Goodin, M.M. Impatiens necrotic spot virus non-structural protein (NSm) gene, partial cds 909 bp linear cRNA JX138532.1. Accession GI:399108192.
- Goodin, M.M. Impatiens necrotic spot virus nucleoprotein gene, partial cds 786 bp linear cRNA JX138531.1. Accession GI:399108190.
- Kachroo, P. *Colletotrichum higginsianum* glycerol kinase (Cgk1) gene, complete cds 1,885 bp linear DNA. Accession JN086465.1 GI:387135050.
- Kachroo, P. *Colletotrichum higginsianum* NADH-dependant glycerol-3-phosphate dehydrogenase (GPD1) gene, complete cds 1,355 bp linear DNA. Accession HQ697252.1 GI:359358703.
- Schardl, C.L. *Claviceps purpurea* 20.1 WGS project CAGA00000000 data, contig scaffold00002, whole genome shotgun sequence 950,849 bp linear DNA. Accession CAGA01000002.1.
- Schardl, C.L. *Claviceps purpurea* 20.1 WGS project CAGA00000000 data, contig scaffold00004, whole genome shotgun sequence 873,058 bp linear DNA. Accession CAGA01000004.1.
- Schardl, C.L. *Claviceps purpurea* 20.1 WGS project CAGA00000000 data, contig scaffold00006, whole genome shotgun sequence 804,825 bp linear DNA. Accession CAGA01000006.1.
- Schardl, C.L. *Claviceps purpurea* 20.1 WGS project CAGA00000000 data, contig scaffold00008, whole genome shotgun sequence 774,065 bp linear DNA. Accession CAGA01000008.1.
- Schardl, C.L. *Claviceps purpurea* 20.1 WGS project CAGA00000000 data, contig scaffold00011, whole genome shotgun sequence 660,923 bp linear DNA. Accession CAGA01000010.1.
- Vaillancourt, L.J. *Colletotrichum cereale* culture-collection CBS:129663 beta-tubulin (TUB2) gene, partial cds 495 bp linear DNA. Accession JQ005858.1 GI:401065351.
- Vaillancourt, L.J. *Colletotrichum orbiculare* strain 104-T beta-tubulin (TUB2) gene, partial cds 485 bp linear DNA. Accession JQ005862.1 GI:401065359.
- Vaillancourt, L.J. *Glomerella acutata* culture-collection CBS:112996 beta-tubulin (TUB2) gene, partial cds 492 bp linear DNA. Accession JQ005860.1 GI:401065355.
- Vaillancourt, L.J. *Glomerella tucumanensis* culture-collection CBS:147945 beta-tubulin (TUB2) gene, partial cds 484 bp linear DNA. Accession JQ005856.1 GI:401065347.
- Vaillancourt, L.J. *Monilochaetes infuscanis* culture-collection CBS:86996 beta-tubulin (TUB2) gene, partial cds 472 bp linear DNA. Accession JQ005864.1 GI:401065363.
- Vincelli, P. Tomato rugose yellow leaf curl virus isolate U3 clone 1 segment DNA_A, complete sequence 2,684 bp circular DNA. Accession JN381821.1 GI:380504727.
- Vincelli, P. Tomato rugose yellow leaf curl virus isolate U4 clone 1 segment DNA_A, complete sequence 2,685 bp circular DNA. Accession JN381823.1 GI:380504736.
- Vincelli, P. Tomato rugose yellow leaf curl virus isolate U5 clone 1 segment DNA_A, complete sequence 2,685 bp circular DNA. Accession JN381825.1 GI:380504745.
- Vincelli, P. Tomato rugose yellow leaf curl virus isolate U5 clone 2 segment DNA_A, complete sequence 2,685 bp circular DNA. Accession JN381827.1 GI:380504754.
- Vincelli, P. Tomato rugose yellow leaf curl virus isolate U5 clone 5 segment DNA_B, complete sequence 2,623 bp circular DNA. Accession JN381829.1 GI:380504763.
- Mark L. Farman had 13085 additional accessions.*
Said A. Ghabrial had 5 additional accessions.
Christopher L. Schardl had 347 additional accessions.
Lisa J. Vaillancourt had 100 additional accessions.
Paul Vincelli had 12 additional accessions.
- Veterinary Science**
- Artiushin, S.C., and J.F. Timoney. TcdA of *Clostridium difficile* JF09. Accession AFN52237.
- Artiushin, S.C., and J.F. Timoney. TcdB of *Clostridium difficile* JF09. Accession AFN52238.
- Balasuriya, U.B.R. EAV chimeric infectious cDNA clone rMLV/VBS 234. Accession GU732198.
- Balasuriya, U.B.R. EAV chimeric infectious cDNA clone rMLV/VBS 56. Accession GU732199.
- Balasuriya, U.B.R. EAV chimeric infectious cDNA clone rMLV/VBS S. Accession GU732200.
- Balasuriya, U.B.R. EAV chimeric infectious cDNA clone rVBS/MLV S. Accession GU732201.
- Balasuriya, U.B.R. EAV chimeric infectious cDNA clone rVBS/HK116 S. Accession GU732202.
- Ball, B.A. *Equus caballus* anti-Mullerian hormone mRNA, complete cds; mitochondrial. Accession JF330269.1.
- Nielsen, M.K. *Strongylus vulgaris* SXP mRNA, complete cds. Accession KC155360.
- Quinlivan, M., F. Cook, R. Kenna, S. Callinan, and A. Cullinane. Genetic characterisation of a new pathogenic field strain of equine infectious anaemia virus (EIAV) from the 2006 outbreak in Ireland. Accession JX480631.
- Velineni, S., and J.F. Timoney. SzM of *S. zoepidemicus* NC78. Accession JX014303.
- Velineni, S., and J.F. Timoney. SzM of *S. zoepidemicus* RT. Accession KC146014.
- Velineni, S., and J.F. Timoney. SzM of *S. zoepidemicus* NH38. Accession KC146015.
- Velineni, S., and J.F. Timoney. SzM of *S. zoepidemicus* NH55426. Accession KC146016.
- Velineni, S., and J.F. Timoney. SzM of *S. zoepidemicus* NH182. Accession KC146017.
- Udeni Balasuriya had 5 additional accessions.*
Frank Cook had an additional 209 accessions.
John Timoney had 51 additional accessions.
- Patents Issued**
- Entomology**
- Palli, S.R., and A.K. Singh. Gene expression modulation system for use in plants and method for modulating gene expression in plants. Patent 8,115,059. Issued Feb. 14.
- Horticulture**
- Houtz, R.L. Modified rubisco large subunit n-methyltransferase useful for targeting molecules to the active-site vicinity of ribulose-1,5-bisphosphate. Patent 8,138,309. Issued Mar. 20.
- Plant and Soil Sciences**
- Chappell, J., and B. Greenhagen. Sesquiterpene synthase gene and protein. Patent 8,192,950. Issued June 5.
- Chappell, J., and K. Back. Chimeric isoprenoid synthases and uses thereof. Patent 8,106,260. Issued Jan. 31.
- Chappell, J., and L.F. Ralston. Cytochrome P450S and uses thereof. Patent 8,263,362. Issued Sept. 11.
- Dewey, R.E., B. Siminszky, S.W. Bowen, and L. Gavilano. Alteration of tobacco alkaloid content through modification of specific cytochrome P450 genes. Patent 8,124,851. Issued Feb. 28.
- Wagner, G., and R. Shepherd. Utility of phyloplanins as antibiotics, selective fungicides and for enhancing microbial resistance in plants. Patent 8,227,573. Issued July 24.
- Plant Pathology**
- Kachroo, P., and A. Kachroo. Plants having an enhanced resistance to necrotrophic pathogens and method of making same. Patent 8,207,398. Issued June 26.
- Veterinary Science**
- Bailey, E., and S. A. Brooks. Method for screening for a tobiano coat color genotype. Patent 8,101,354. Issued Jan. 24.
- Palese, P., A. Garcia-Sastre, and T. Chambers. Genetically engineered equine influenza virus and uses thereof. Patent 8,137,676. Issued Mar. 20.
- 2012 Plant Variety Releases**
- Plant and Soil Sciences**
- Miller, R. KT 212LC Hybrid burley tobacco.

Publications

All publication dates are 2012 unless otherwise noted.

Annual Report

One Hundred and Twenty-Fourth Annual Report of the Kentucky Agricultural Experiment Station for 2011. College of Agriculture, University of Kentucky, Nancy M. Cox, Director. June.

Books and Book Chapters

Agricultural Economics

Skees, J.R., and B. Collier. The role of weather markets and the carbon market. pp. 111-164. IN: D. Köhn, ed. *Greening the Financial Sector: How to Mainstream Environmental Finance in Developing Countries.* Springer Verlag, Heidelberg, Germany.

Animal and Food Sciences

Lawrence, L. Nutrition: Breeding farm management. pp. 776-778. IN: D.A. Wilson, ed. *Clinical Veterinary Advisor: The Horse.* Elsevier, St. Louis, MO.

Matthews, J. C., Y. Xue, S.F. Liao, E.D. Miles, and J.A. Boling. Alteration of bovine gene expression and protein function by ergot alkaloids. Chapter 1.5, pp. 24-27. IN: C.A. Young, G.E. Aiken, R.L. McCulley, J.R. Strickland, and C.L. Schardl, eds. *Epichloae, Endophytes of Cool Season Grasses: Implications, Utilization and Biology.* The Samuel Roberts Noble Foundation, Ardmore, OK.

Suman, S.P. Application of proteomics to understand meat quality. Chapter 14, pp. 287-299. IN: Y.H. Hui, ed. *Handbook of Meat and Meat Processing.* CRC Press, Boca Raton, FL.

Eric S. Vanzant contributed to one book chapter in Biosystems and Agricultural Engineering

Biosystems and Agricultural Engineering

Colliver, D.G., et al. *Advanced Energy Design Guide for Medium to Big Box Retail Buildings—Achieving 50% Energy Savings Toward a Net Zero Energy Building.* American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., Atlanta, GA. 198 pp.

Colliver, D.G., et al. *Advanced Energy Design Guide for Large Hospitals—Achieving 50% Energy Savings Toward a Net Zero Energy Building.* American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., Atlanta, GA. 242 pp.

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Family Sciences

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- Bewley, J.M., L.M. Arnold, and D. Amaral-Phillips. Are you using the DHI "Hot Sheet" to manage your herd somatic cell count? Kentucky Dairy Notes, Dec.
- Carter, C.N., ed. Diagnostic laboratory rounds. Kentucky Veterinary News, Spring, Summer, Fall, Winter.
- Carter, C.N. From the diagnostic laboratory. Cattle Country News, Sept.
- UK Veterinary Diagnostic Laboratory**
- Gaskill C.L. Edited toxicology-related chapters. IN: D. Wilson, ed. *The Clinical Veterinary Advisor: The Horse*. Saunders, St. Louis, MO.
- Gaskill, C.L. Fluoridated water and horses. Equine Disease Quarterly 21(4):4–5.
- Gaskill, C.L. Toxin topic: Blue-green algae poisoning. Bluegrass Equine Digest, July, pp. 6–7.
- Gaskill, C.L. Toxin topic: Ionophore intoxication in horses. Bluegrass Equine Digest, Mar., pp. 1–2.

Gaskill C.L. University of Kentucky study to evaluate conditions of county animal shelters and county compliance with Kentucky animal control laws. Kentucky Veterinary News, Summer, pp. 7–8.

Gaskill, C.L., and M. Arnold. Mycotoxins and their effects on cattle. Cow Country News, Nov., p. 34.

Kennedy, L., and C.L. Gaskill. Chlorate poisoning in cattle. Kentucky Veterinary News, Spring, pp. 19–20.

Smith, R., J. Lehmkuhler, C. Gaskill, and L.M. Arnold. Nitrate poisoning in livestock. Cow Country News, Aug.

Smith, R., J. Lehmkuhler, C. Gaskill, and L.M. Arnold. Nitrate poisoning in livestock. Off the Hoof Kentucky Beef Newsletter, July, pp. 3–5.

Williams, N.M. Potomac horse fever. Equine Disease Quarterly 21:4.

Veterinary Science

Adams, A. The “older” horse: An immunological perspective. Equine Disease Quarterly 21(2):5–6.

Bailey, E. Across the fence: Genomics and infectious disease. The Horse 29(1):58.

Chambers, T.M. Conclusions and recommendations of the OIE expert surveillance panel on equine influenza vaccine composition. OIE Bulletin 2012-2, pp. 46–47.

Dwyer, R.M. Commentary. Lloyd’s Equine Disease Quarterly 21(1):1.

Dwyer, R.M. Commentary. Lloyd’s Equine Disease Quarterly 21(4):1.

Dwyer, R.M., and M. Newman. Being prepared for weather disasters. Lloyd’s Equine Disease Quarterly 21(1):3.

Kaplan, R.M., and M.K. Nielsen. Special issue: Equine parasite drug resistance plenary papers presented at the Equine Parasite Drug

Resistance Workshop in Copenhagen, July/Aug. 2008 Preface. Veterinary Parasitology 185(1):1.

Nielsen, M.K. Are natural dewormers effective? www.horsetalk.co.nz, Mar. 23.

Nielsen, M.K. Deworming—Concerns about bots. Equus 419:72–73.

Nielsen, M.K. Evolution in equine parasite control. Equine Disease Quarterly 21(2):4. horsetalk.co.nz, Mar. 15.

Nielsen, M.K. Worming a mare soon after birth. www.horsetalk.co.nz, Mar. 7.

Tiwari, A., S.E. Reedy, D.W. Horohov, and T.M. Chambers. Mechanism of influenza: A virus mediated inhibition of IL-23 expression in macrophage cells. Journal of Equine Veterinary Science 32(10):S16.

Graduate Degrees

Degrees listed are from the 2012 spring semester, 2012 second summer session, and 2012 fall semester.

Ph.D. Dissertations

Agricultural Economics

Conley, John D. Financial development and economic growth in Kentucky counties.

Lim, Kar Ho. Willingness to pay for country-of-origin labeled, traceable and BSE-tested beef.

Yang, Shang-Ho. The impacts of foot-and-mouth disease on international pork trade—An extension of gravity model.

Animal and Food Sciences

Brunner, Mieke. The influence of selenium status on immune function and antioxidant status in the horse.

Holder, Vaughn Barry. The effects of slow release urea on nitrogen metabolism in cattle.

Johnson, Joseph Samuel. Foraging and roosting behaviors of Rafinesque’s big-eared bat (*Corynorhinus Rafinesquii*) at the northern edge of the species range.

Macalintal, Lizza M. In ovo selenium (SE) injection of incubating chicken eggs: Effects on embryo viability, tissue SE concentration, lipid peroxidation, immune response and post hatch development.

Quant, Anthony D. Evaluating the effects of maternal and progeny dietary supplementation of selenium yeast and vitamin E on the performance of broiler-breeder hens and performance and meat quality of progeny.

Skudlarek, Jamie R. Greene. Antimicrobial efficacy of edible soy protein isolate films and coatings incorporated with hop ethanol extract and the influence on shelf-life and sensory attributes of bologna.

Smith, Jacqueline Lee. Temporal analysis of electronically collected physical activity data to assess health status of beef cattle.

Zhao, Jing. The fate of antioxidative soy peptides after reactions with hydroxyl radicals and lipid oxidation-derived aldehydes.

Biosystems and Agricultural Engineering

Amaral, Maira Freire Pecegueiro do. Evaluation of algae concentration in manure based media.

Luck, Joseph D. Development of a variable-orifice spray nozzle with high pressure chemical injection for improved pesticide efficacy.

Pitla, Santosh. Development of control architectures for multi-robot agricultural field production systems.

Zandonadi, Rodrigo S. Computational tools for improving route planning in agricultural field operations.

Entomology

Adkins, Joshua Keith. Impact of the invasive hemlock woolly adelgid on headwater stream aquatic and ground-dwelling invertebrate communities.

Andrews, Elizabeth S. Influential passengers in *Aedes* mosquitoes: Investigations of bacterial diversity and effects on host physiology.

Deacutis, Julianne. The characterization and biological effects of a novel cyovirus on the *Heliothis virescens* and *Campoletis sonorensis* host-parasitoid system.

Mains, James W. The endosymbiont *Wolbachia* in *Aedes* mosquitoes: Characterization of host interactions and population control implications.

Minter, Logan. Integrating sustainable pest management and pollinator conservation efforts in cucurbit production systems.

Peterson, Julie Ann. Delineating the influence of genetically modified crops and non-prey food resources on generalist predator food webs.

Family Sciences

Kankipati, Varudhini. Acculturation of Asian Indian women in the United States.

Kimberly, Claire E. Three studies to investigate biopsychosocial influences on marital conflict.

Plant and Soil Sciences

Plant Physiology

Cai, Bin. Nicotine and nornicotine enantiomeric composition in *Nicotiana tobaccum* L.

Gaffney, Bobby. Characterization of CPSF30 in *Medicago sativa*.

Li, Yan. The role of Auxin Resistant 1 (AXR1) in *Arabidopsis* cytokinin signaling.

Crop Science

King, Brian. T-Phylloplanin and Cis-Abienol, two natural products from tobacco have broad spectrum, anti-fungal activities.

Deaton, Michael. Temperature effects on germination characteristics and traffic tolerance of newly established stands of nineteen commercially available cultivars of seeded bermudagrass.

Goff, Ben. Steer and tall fescue pasture responses to grazing intensity and chemical seedhead suppression.

Ruffner, Marvin. Invasive ecology of exotic old world bluestem grasses and insights for coastal prairie restoration in south Texas.

Plant Pathology

Chanda, Bidisha. Glycerol-3-Phosphate is a novel regulator of basal and induced defense signaling in plants.

Gao, Qing-Ming. Glycerolipids and the plant cuticle contribute to plant immunity.

Mandal, Mihir K. Molecular and biochemical characterization of Oleate-and-Glycerol-3-Phosphate-regulated signaling in plants.

Veterinary Science

Lu, Zhengchun. Development of molecular diagnostic assays for equine respiratory viruses and analysis of the role of equine arteritis virus envelope proteins in virus attachment and entry.

Meade, Barry J. Transmission dynamics of equine herpesvirus type 1 (EHV-1) infection in outbreaks characterized predominantly by neurologic or respiratory illness.

Smith, Katherine L. Development of a new allelic discrimination real-time PCR assay targeting the open reading frame 30 of equine herpesvirus-1 and characterization of the virulence determinants of the virus.

Sun, Lingshuang. *Rhodococcus equi* infection and interferon-gamma regulation in foals.

Woodward, Elizabeth +M. Breeding induced endometritis in the mare: The local innate immune response.

The Department of Forestry co-advised two dissertations in Plant and Soil Sciences and one in Biology.

M.S. Theses

Agricultural Economics

Childress, Ronald. Water quality trading markets for the Kentucky river basin watershed: A point source profile.

Enlow, Sierra Joy. An examination of corporate agribusiness financial performance: How agribusinesses perform over time and under various conditions.

Kalberg, Kolter O'Connor. Optimism in the market for thoroughbred yearlings: An empirical test of cumulative prospect theory.

Kompaniyets, Lyudmyla. Effect of nutrition merchandising and consumer preferences on willingness to pay for local tomatoes and strawberries in Kentucky and Ohio.

In addition, one non-thesis master's degree was awarded in calendar year 2012.

Animal and Food Sciences

Escobar, Carlos S. Effect of feeding a blend of naturally-contaminated corn on nutrient digestibility and feed preference in weaning pigs.

Nair, Mahesh Narayanan. Species-specific interactions between myoglobin and small biomolecules.

Schaeffer, Caleb A. Distiller's grains supplementation for beef steers consuming tall fescue: Forage utilization and steer growth.

Zhang, Zhi. Influence of dietary selenium supplementation form on hepatic transcriptome profiles of maturing beef heifers.

Biosystems and Agricultural Engineering

Craft-Jenkins, Molly E. Development of a noncontact sensor for monitoring milk coagulation and cutting time prediction in cheese making.

Frederick, Jennifer Leanne. Evaluation of separation method additives for the recovery of bacteria from food matrices.

Guffey, Ross L. Evaluating the effectiveness of weep berm systems for treating runoff from a horse muck composting operation.

Lopes, Igor Moreira. Evaluation of transitions for testing agricultural ventilation fans with the fan assessment numeration system (fans).

Maupin, Travis Pritchard. Assessment of conductivity sensors performance for monitoring mined land discharged waters and an evaluation of the hydrologic performance of the Guy Cove stream restoration project.

Mullins, Samuel J. Ultrasonic concentration of microorganisms.

Short, Sarah Nicole. Evaluation of heat shock protein 70a (hsp70a) in *Chlamydomonas reinhardtii*.

In addition, one non-thesis master's degree was awarded in calendar year 2012.

Entomology

Brabant, Peter. Effects of methoprene on the survivorship and fecundity of adult *Aedes* mosquitoes: A strategy for inactivating released mosquitoes.

Brady, Christina. Facultative symbionts of *Aphis craccivora*: A global and local perspective.

Nelson, Lori Antoinette. Geographically distinct *Tsuga*: Variation in tree physiology, host resistance, and predator response.

Family Sciences

Dalton, Melissa. Effects of biofeedback training on therapist anxiety.

Nordquist, Erica. The link between recalled parental differential treatment and self-worth.

Peoples, Benita. Narratives on motherhood of incarcerated women.

Puckett, Jillian. Spirituality in therapy.

Smith, Lindsay. Affording adoption: Financial and emotional costs.

Washington, Katherine. Romantic attachment among young adults: The effects of parental divorce and residential instability.

Zhang, Qun. Preference for retirement savings plans and self-regulation.

Plant and Soil Sciences

Crop Science

Balut, Ana. Validation of Fhb1 and QFhs nau-2DL in several soft red winter wheat populations.

In addition, three non-thesis master's degrees were awarded in calendar year 2012.

Plant Science

Slaughter, Lindsey. Soil microbial community response to climate change: Results from a temperate Kentucky pasture.

Titolo, Donato. Using an active optical sensor to improve nitrogen management in corn production.

Tolson, Joshua. The effect of integrated weed management strategies on weed populations and biomass, pasture productivity, economic returns, and forage quality with and without grazing.

Intergrated Plant and Soil Sciences

Navarro, Martin. Sensing development of a soybean canopy under P or K nutritional stress.

Veterinary Science

Campos, Juliana R. Evaluation of semen quality and the establishment of equine arteritis virus (EAV) persistent infection in stallions experimentally infected with the Kentucky 84 (KY84) strain.

Cerny, Katherine. Presence of bacteria in the reproductive tract of healthy stallions and its relation to the fertility of mares.

Hennig, Jessica. Studies on equine arteritis virus: Seasonal influences on circulating testosterone and viral shedding, inactivation of viral infectivity in semen of carrier stallions, vaccinal prophylaxis of yearling colts, and prevalence of infection in camelids.

Hestad, Drew A. Ingestion of endophyte-infected tall fescue seed induces peripheral vasoconstriction but does not affect cyclicity in non-pregnant mares, and a population of biogenic amine receptors relative to vasoconstriction is identified.

Hughes, Sydney. Performance of horses out of mares suspect for placentitis and effect of reproductive status and foaling season on incidence of dystocia.

Keith, Lauren. Effects of exogenous oxytocin administration on oxytocin receptor expression and function and its relation to luteolysis in mares.

Graduate Enrollment

Graduate enrollment data are from the UK Office of Institutional Research <http://www.uky.edu/IR/student.html>.

	2011	2012	net change
Agricultural Economics			
Master's	21	22	1
Doctorate	28	32	4
Major Total	49	54	5
Animal and Food Sciences			
Master's	26	34	8
Doctorate	22	26	4
Major Total	48	60	12
Biosystems and Agricultural Engineering			
Master's	22	22	0
Doctorate	9	9	0
Major Total	31	31	0
Dietetics and Human Nutrition			
Master's	20	21	1
Doctorate*			
Major Total	20	21	1
Entomology			
Master's	14	13	-1
Doctorate	26	23	-3
Major Total	40	36	-4
Family Sciences			
Master's	20	22	2
Doctorate	21	27	6
Major Total	41	49	8
Forestry			
Master's	17	15	-2
Doctorate*			
Major Total	17	15	-2
Plant Pathology			
Master's	0	1	1
Doctorate	20	17	-3
Major Total	20	18	-2
Plant and Soil Sciences/Horticulture			
Master's	26	29	3
Doctorate	51	48	-3
Major Total	77	77	0
Retailing and Tourism Management			
Master's	10	10	0
Doctorate*			
Major Total	10	10	0
Rural Sociology/Career, Technology and Leadership Education			
Master's	33	30	-3
Doctorate	10	5	-5
Major Total	43	35	-8
Veterinary Science			
Master's	12	10	-2
Doctorate	21	17	-4
Major Total	33	27	-6
Grand Total	429	433	4

*Degree type not offered.

Financial Statement

Statement of Federal Formula Funds

Fiscal Year 2012

Income

Federal Funds	
Hatch	4,389,361
Hatch Multi-State	896,961
McIntire-Stennis	518,808
Animal Health	64,409
Total Federal Funds	5,869,538
State Funds	
Total State Funds	29,748,233
Total Funds	35,617,771

Expenditures

	Federal	State	Total
Personal Services	4,977,732	23,556,400.45	28,534,133
Travel	137,803	577,311.83	715,115
Other Operating Expenses	688,602	5,115,253.34	5,803,856
Equipment	65,400	499,266.94	564,667
Total Expenditures	5,869,538	29,748,233	35,617,771

Staff

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Departments

Following are departmental faculty and leadership lists for calendar year 2012. (R) denotes Experiment Station appointment.

Agricultural Communications

Skillman, L.M., Director

Agricultural Economics

Maynard, L.J., Professor and Chair (R)
Batte, M.T., Part-time Research Professor
Brown, R., Senior Lecturer
Dasgupta, S., Adjunct Assistant Professor
Davis, A., Associate Extension Professor
Debertin, D.L., Professor (R)
Dillon, C., Professor (R)
Freshwater, D., Professor (R)
Gorton, W.T., Adjunct Assistant Professor
Halich, G., Assistant Extension Professor
Hu, W., Associate Professor (R)
Isaacs, S., Extension Professor
Katchova, A., Assistant Professor (R)
Kusunose, Y., Assistant Professor (R)
Meyer, A.L., Extension Professor
Nogueira, L., Assistant Professor (R)
Reed, M.R., Professor (R)
Robbins, L., Professor (R)
Saghaian, S., Associate Professor (R)
Schieffer, J.K., Assistant Professor (R)
Simon, M.F., Adjunct Assistant Professor
Skees, J.R., Professor (R)
Snell, W.M., Extension Professor
Stowe, C.J., Assistant Professor (R)
Walters, C.G., Assistant Extension Professor
Williamson, L., Extension Professor
Woods, T.A., Extension Professor

Animal and Food Sciences

Harmon, R.J., Professor and Chair (R)
Aaron, D.K., Professor (R)
Aiken, G.E., Adjunct Associate Professor
Amaral-Phillips, D.M., Extension Professor
Anderson, L.H., Associate Extension Professor
Andries, K.M., Adjunct Assistant Professor
Ao, T., Adjunct Assistant Professor
Bewley, J.M., Assistant Extension Professor
Boatright, W.L., Professor (R)
Boling, J.A., Professor (R)
Brennan, K.M., Adjunct Assistant Professor
Bridges, P.J., Assistant Professor (R)
Bullock, K.D., Extension Professor
Burris, R., Extension Professor
Cantor, A.H., Associate Professor (R)
Camargo, F.C., Assistant Extension Professor
Coffey, R.D., Extension Professor
Coleman, R.J., Associate Extension Professor
Cox, N.M., Associate Dean for Research
Cromwell, G.L., Professor (R)
Dawson, K.A., Adjunct Professor
Ely, D.G., Professor (R)
Flythe, M.D., Adjunct Assistant Professor
Harmon, D.L., Professor (R)
Heersche, G., Jr., Extension Professor
Hennig, B., Professor (R)
Hicks, C.L., Professor (R)

Klotz, J.L., Adjunct Assistant Professor
LaBonty, E.A., Lecturer
Lawrence, L.M., Professor (R)
Lehmkhuler, 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., Extension 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., Associate 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.D., Adjunct Assistant Professor
Xiong, Y., Professor (R)

Biosystems and Agricultural Engineering

Nokes, S.E., Professor and Chair (R)
Agouridis, C.T., Assistant Professor (R)
Byers, M.E., Adjunct Assistant Professor
Castillo, M.Z., Adjunct Associate Professor
Colliver, D.G., Professor (R)
Crofcheck, C.L., Associate Professor (R)
Duncan, G.A., Extension Professor Emeritus
Dvorak, J.S., Assistant Professor (R)
Edwards, D.R., Professor (R)
Fehr, R.L., Extension Professor Emeritus
Gates, R.S., Adjunct Professor
Higgins, S.F., Adjunct Assistant Professor
McNeill, S.G., Associate Extension Professor
Montross, M.D., Professor (R)
Murphy, W.E., Professor
Overhults, D.G., Extension Professor
Payne, F.A., Professor (R)
Purschwitz, M.A., Extension Professor (R)
Shearer, S.A., Professor Emeritus
Stiglbauer, P.F., Adjunct Assistant Professor
Stombaugh, T.D., Associate Extension Professor (R)
Taraba, J.L., Extension Professor
Walker, S.P., Assistant Professor (R)
Warner, R.C., Extension Professor
Webb, E.G., Adjunct Assistant Professor
Wells, L.G., Professor Emeritus
Wheeler, E.F., Adjunct Associate Professor
Wilhoit, J.H., Associate Extension Professor
Workman, S.R., Professor and Assistant Dean for Research (R)

Community and Leadership Development

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

Dietetics and Human Nutrition

Bastin, S.S., Extension Professor and Chair
Adams, I.K., Assistant Extension Professor
Addo, K., Associate Professor (R)
Brewer, D., Lecturer
Chow, C.K., Professor
Forsythe, H.W., Associate Professor (R)
Gaetke, L.M., Professor (R)
Gustafson, A., Assistant Professor (R)
Kurzynske, J.S., Professor
Mullins, J.T., Associate Extension Professor
Stephenson, T.J., Senior Lecturer
Webber, K.H., Assistant Professor (R)

Entomology

Obrycki, J.J., Professor and Chair (R)
Bessin, R.T., Extension Professor
Brown, G.C., Professor (R)
Dobson, S.L., Professor (R)
Fox, C.W., Professor (R)
Harwood, J.D., Associate 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-Kinney, 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)
Yeagan, K.V., Professor (R)
Xuguo, Z., Assistant Professor (R)

Environmental and Natural Resource Initiative

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

Family Sciences

Werner-Wilson, R.J., Endowed Professor and Chair (R)
Brock, G.W., Professor Emeritus
Culp, K., III, Adjunct Associate Professor
Flashman, R., Extension Professor
Haleman, D., Lecturer
Hans, J., Associate Professor (R)
Heath, C.J., Professor (R)
Hosier, A., Assistant Extension Professor
Hunter, J.L., Assistant Extension Professor
Kim, H., Associate Professor (R)
Parker, T.S., Assistant Professor (R)
Stephenson, L., Adjunct Associate Professor
Smith, D.R., Associate Professor (R)
Vail, A., Professor, Director of the School of Human Environmental Sciences and Assistant Director of Family and Consumer Sciences Extension (R)
Vazsonyi, A.T., Endowed Professor (R)
Werner-Wilson, T.A., Lecturer, Director of the University of Kentucky Family Center
Wood, N., Assistant Professor (R)

Forestry

Baker, T.T., Professor and Chair (R)
Arthur, M.A., Professor (R)
Barnes, T.G., Extension Professor
Barton, C., Associate Professor (R)
Connors, T.E., Extension Associate Professor
Contreras, M.A., Assistant Professor (R)
Cox, J.J., Adjunct Professor (R)
Kalisz, P.J., Associate Professor
Lacki, M.J., Professor (R)
Lhotka, J.M., Assistant Professor (R)
Price, S.J., Assistant Professor (R)
Ringe, J.M., Professor
Stainback, G.A., Assistant Professor (R)
Stringer, J.W., Extension Professor
Wagner, D.B., Associate Professor

Horticulture

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

Kentucky Tobacco Research and Development Center

Chambers, O., Managing Director
Yuan, L., Research Director
Jack, A., Research Specialist
Ji, H., Scientist II
Maiti, I., Scientist III
Mundell, R., Scientist II
Pattanaik, S., Scientist II
Zaitlin, D., Scientist III

Landscape Architecture

Crankschaw, N.M., Professor and Chair
Fields, L., Assistant Professor
Hargrove, R.A., Assistant Professor
Koo, J., Assistant Professor, Extension
Lee, B.D., Associate Professor
Nieman, T.J., Professor (R)
Schach, H., Professor
Segura, A.C., Lecturer

Plant and Soil Sciences

Pfeiffer, T., Professor and Chair
Aiken, G., Adjunct Professor
Bailey, W.A., Associate Extension Professor (R)
Barrett, M., Professor (R)
Baskin, C.C., Professor (R)
Bertsch, P., Professor (R)
Bush, L.P., Professor Emeritus
Chappell, J., Professor (R)
Coyne, M.S., Professor (R)
D'Angelo, E., Associate Professor (R)
Davies, H., Professor (R)
Dinkins, R., Adjunct Assistant Professor
Ditsch, D., Extension Professor
Egli, D., Professor (R)
Goff, B., Assistant Professor
Green, J.D., Extension Professor
Grove, J., Professor (R)
Hildebrand, D., Professor (R)
Hunt, A., Professor (R)
Kagan, I., Adjunct Assistant Professor
Karathanasis, A.D., Professor (R)
Lee, C., Associate Extension Professor
Lee, B., Associate Extension Professor
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Moe, L., Assistant Professor (R)
Mueller, T., Associate Professor (R)
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Sistani, K., Adjunct Professor
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Unrine, J.M., Assistant Professor (R)
Van Sanford, D.A., Professor (R)
Weintraub, M., Adjunct Assistant Professor

Wendroth, O., Professor (R)
Williams, D., Associate Professor (R)
Yuan, L., Associate Professor (R)
Zhu, H., Associate Professor (R)
Zhu, J., Adjunct Assistant Professor
Zourarakis, D., Adjunct Assistant Professor

Plant Pathology

Schardl, C.L., Professor and Chair (R)
Farman, M.L., Professor (R)
Ghabrial, S.A., Professor (R)
Goodin, M.M., Associate Professor (R)
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Kachroo, A.P., Assistant Professor (R)
Kachroo, P., Associate Professor (R)
Nagy, P.D., Professor (R)
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Vaillancourt, L.J., Professor (R)
Vincelli, P.C., Extension Professor
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Barrow, M.C., Inspector
Flood, J.S., Inspector
Green, K.M., Tag Registration Specialist
Harrison, G.A., Feed/Milk Coordinator
Hickerson, R.R., Inspector
Johnston, C.B., Inspector
Keith, N., Inspector
Kiser, R., Assistant Lab Manager
Mason, D.W., Inspector
McMurry, S.W., Fertilizer/Seed Coordinator
True, J.A., Inspection Coordinator
Pinkston, W.W., Inspector
Prather, T.G., Inspector
Sikora, F.J., Soil Testing/Lab Coordinator & Associate Professor
Counts, R., Auditor
Webb, S.F., QA/QC Coordinator
Young, B., Inspector

Retailing and Tourism Management

Jackson, V.P., Professor and Chair
Brown, D., Associate Professor
Day, T., Lecturer
Easter, E.P., Professor
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Lu, Y., Assistant Professor
Michelman, S., Associate Professor
Miller-Spillman, K., Associate Professor
Swanson, J.R., Assistant Professor
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