

*The Kentucky  
Agricultural Experiment Station*

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**116<sup>th</sup>**

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**Annual Report**  
2003

**UK**

UNIVERSITY OF KENTUCKY  
College of Agriculture

University of Kentucky • Lexington, Kentucky 40546



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To His Excellency,  
The Honorable Ernie Fletcher  
Governor of Kentucky

I herewith submit the one hundred and sixteenth annual report of the Kentucky Agricultural Experiment Station for the period ending December 31, 2003. 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,

*M. Scott Smith*

M. Scott Smith, Director  
Lexington, Kentucky  
June 30, 2004



# Contents

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Purpose of the Kentucky Agricultural Experiment Station .....	7
Statewide Research.....	7
Livestock Disease Diagnostic Center .....	8
Regulatory Services.....	11
Kentucky Agricultural Experiment Station Projects .....	14
Collegewide Extramural Funding .....	17
Intellectual Property .....	22
Publications.....	23
Graduate Degrees.....	38
Financial Statement.....	40
Staff.....	41



# Purpose of the Kentucky Agricultural Experiment Station

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

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

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

This annual report lists Experiment Station research projects and publications completed during 2003. This publication serves to record all grant funding and refereed publications for the entire College of Agriculture. A personnel list is also provided.

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

## Statewide Research

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Research activities of the Kentucky Agricultural Experiment Station were conducted at Lexington, Princeton, Quicksand, and Owenton and in counties throughout the state in 2003.

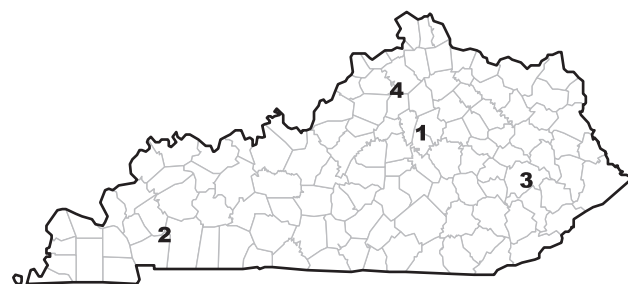
Efforts are constantly made to ensure that the research studies have application to the problems of all Kentucky farmers and other clientele groups. Locations of the experimental facilities provide conditions representative of most sections of the state.

### Map Position 1

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

### 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, swine, fruits and vegetables, forages, and tobacco.



### Map Position 3

- At Quicksand (*Breathitt County*), the **Robinson Station** 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.

# Livestock Disease Diagnostic Center

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The Livestock Disease Diagnostic Center (LDDC) is charged with the diagnoses of animal diseases and performance of tests that safeguard the health of the animal population in Kentucky. The LDDC helps identify infectious diseases, identifies chemical and toxic contaminants that may harm animals or humans, diagnoses nutritional diseases, identifies regulatory diseases, provides the means to meet export sales requirements, and provides an early warning system for impending epidemics.

The objective of the program is to provide veterinary diagnostic laboratory-based assistance to veterinary practitioners, farmers and agribusinesses, companion animal owners, wildlife conservationists, and public programs. Also, laboratory support is provided to the animal disease control and eradication programs of the Animal Health Programs, Kentucky Department of Agriculture. An outcome of handling complex and difficult cases is consultation and continuing education for veterinarians in veterinary diagnostic medicine.

The program provides surveillance for emerging diseases such as West Nile Virus (WNV) infection and for possible threats to Kentucky agribusiness such as foot and mouth disease. Also, for more than 16 years, a stringent surveillance program for bovine spongiform encephalopathy (BSE), also known as mad cow disease, has been in place. Results of the surveillance are reported quarterly to federal authorities. No suspicious cases have been identified.

Animal owners use the LDDC's services through their veterinarians who have expertise in selecting, preparing, shipping, and submitting the proper specimens for testing when necessary. When reporting its findings, the laboratory will involve the submitter's veterinarian, since this professional often is in the best position to recommend and administer treatment and preventative measures.

Professional and technical staff are specialists in essential scientific disciplines directly related to animal health. Disease diagnostic efforts are coordinated and handled by specialists in the appropriate disciplines. The LDDC is organized into sections so that specialized workload/activities can be handled efficiently.

## Highlights:

All faculty and staff continue to participate in the Mare Reproductive Loss Syndrome (MRLS) diagnostic and investigational efforts. The number of equine abortion accessions of all breeds are posted on a weekly basis for the winter and spring on the College of Agriculture, Department of Veterinary Science Web site. This weekly posting of abortion accessions was done to help the equine industry manage concerns about the perceived long-term impact of MRLS. Identifying the cause(s) of equine abortion was a major challenge throughout 2003. In cooperation with the Kentucky Department of Public Health and the Kentucky Department

of Agriculture, the LDDC conducted assays for statewide surveillance and diagnosis of West Nile Virus (WNV) in birds, horses, and mosquito pools. The LDDC provided laboratory support for the Kentucky Department of Agriculture and the Kentucky Department of Fish and Wildlife Resources for surveillance of chronic wasting disease in the wild and farmed cervid population.

## PATHOLOGY

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*L.R. Harrison*

The LDDC provides services in necropsy, histopathology, and surgical biopsy. Pathologists evaluate changes found at necropsy and correlate them with other laboratory test results, including light microscopic examination of tissues.

**Necropsy:** A postmortem examination is conducted to identify any injury or change in an organ that has resulted in impairment or loss of function.

<b>Total Necropsy Cases</b>	<b>5,804</b>
Avian .....	108
Canine and feline.....	410
Caprine and ovine.....	531
Bovine.....	1,501
Equine.....	3,010
Porcine .....	.66
Other species (exotic—zoo, wildlife) .....	178

**Histopathology:** Tissues are prepared for light microscopic examination to reveal changes in body tissues due to disease. Tissues of 6,469 cases were processed and examined. A report has been generated for each case.

**Biopsy:** Small tissue specimens prepared for light microscopic examination for evidence of neoplasia or other diseases. Tissue samples representing 4,522 cases were processed and examined. A report was generated for each case.

**Cytology:** Preparations of cells denuded from tumors or other type lesions, recovered from secretions and exudates for microscopic examination. Cytopathologic examinations were done and a report generated for 564 cases.

## BACTERIOLOGY/MYCOLOGY

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*J.M. Donahue*

The primary mission of the Bacteriology/Mycology Section is to detect or isolate and identify pathogenic bacteria or fungi present in animals. The section also determines the antibiotics that might be used for the treatment of specific bacterial infections. The section is responsible for culture of bacteria for two federal/state regulatory programs: contagious equine metritis (CEM) in equine and brucellosis in bovine.



**Highlights:**

- 20,236 aerobic cultures were performed on samples submitted to the LDDC; significant bacterial pathogens were found in more than 50% of the samples.
- 3,563 milk samples from dairy cows were tested for microorganisms that cause mastitis; more than 50% were positive for pathogenic microorganisms.
- 5,755 different bacterial isolates were tested to determine the antibiotics that could be used for their treatment in exposed animals.
- 10,667 samples from horses were cultured for contagious equine metritis organism (CEMO). All horses tested were negative for the bacterium, demonstrating that the disease no longer exists in horses in Kentucky.
- The bacterium responsible for most cases of equine nocardioform placentitis was characterized and found to be a new species of bacterium, which we named *Crossiella equi*.

**SEROLOGY**

B. J. Smith

The Serology Section provides accurate and timely results for both diagnostic and regulatory testing. This provides veterinarians and regulatory personnel with data upon which to base their decisions. These tests also enable Kentucky to export animals internationally. Testing for 30 animal diseases was available utilizing various testing techniques. A total of 165,867 tests were performed.

**Highlights:**

Anaplasmosis.....	504
Avian influenza.....	5,607
Bovine Leukemia Virus .....	1,224
Brucellosis .....	14,048
Contagious Equine Metritis .....	1,393
Equine Infectious Anemia .....	50,296
Johne’s disease .....	2,321
Leptospirosis .....	3,549
Mycoplasma gallisepticum .....	34,988
Mycoplasma synoviae .....	34,988
Salmonella pullorum-typhoid .....	12,988

**MOLECULAR DIAGNOSTICS**

S. Sells

The Molecular Diagnostics Section uses assays designed to detect and identify the specific nucleic acids (DNA and RNA) of pathogenic bacteria and viruses. This application takes advantage of technologies in molecular science that have been developed during the last decade. 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.

**Highlights:**

This section is responsible for providing the majority of Kentucky’s arbovirus (mosquito-borne virus) testing for an environmental risk analysis program with the Ken-

tucky Department for Human Health. More than 16,000 tests were performed for West Nile virus, eastern equine encephalitis virus, Saint Louis virus, and California/bunywemera viruses. Fifty-two of Kentucky’s counties were detected to have West Nile virus after sampling equines, dead birds, and mosquito pools.

The section offers specific assays for more than 30 pathogens and has been increasingly used to confirm the identity of isolates cultured in the Bacteriology and Virology sections of the LDDC and area veterinary clinics. The numbers of the most requested assays include:

<i>Streptococcus equi</i> .....	42
<i>Equine herpesvirus</i> .....	337
<i>Moraxella bovis</i> .....	72
<i>Mycoplasma bovis</i> .....	62
<i>Lawsonia intracellularis</i> .....	60
<i>Clostridium perfringens</i> .....	60
<i>Campylobacter fetus</i> .....	25
<i>Neorickettsia risticii</i> .....	19

In addition, DNA sequencing was used to identify 14 bacterial isolates that were cultured in the Bacteriology section of the LDDC.

**VIROLOGY**

M.L. Vickers

The Virology Section of the LDDC provides diagnostic virology support to the laboratory pathologists, veterinarians, regulatory officials, and the State and Federal Veterinarians.

**Highlights:**

This section provides 65 different tests, including 35 fluorescent antibody tests to detect antigens of viruses in tissues, 13 serology tests to detect antibodies of viruses, virus isolation for cattle, horses, sheep, pigs, goats, cats, dogs, birds, reptiles, etc., as well as electron microscopy and various tests kits for detection of viral antigens. In addition, this section maintains 12 tissue culture cell lines that are used routinely.

The section performed 25,883 tests during this year. Of this total, 10,224 were virus neutralization serology tests done to meet regulatory requirements.

This is the fourth year of funding from the Kentucky Department of Public Health by the Centers for Disease Control for West Nile virus (WNV) testing. The purpose of this grant is for surveillance/monitoring of WNV in wild birds, horses, and mosquitoes. West Nile virus is transmitted by mosquitoes. Mosquito trapping was carried out, and the pools of these insects were submitted to the laboratory for identification and testing for this virus. Birds are the most important sentinel species to provide information on the earliest activity of the virus in a given locality. The public was encouraged to report dead birds and to submit them to the local health department for shipment to the laboratory. Testing of birds and mosquitoes for WNV was done as a cooperative effort of this section and Molecular Diagnostics. WNV was first detected in the Commonwealth of Kentucky in the fall of 2001.

A variety of assays are done routinely that identify poisonous substances in tissues taken at necropsy such as metals, certain elements, pesticides, plant toxins, and a variety of other toxins. Also, blood, serum, and urine from live animals are assayed for mineral/element deficiencies and toxins. These assays are done when a potential toxicological problem exists and when a pathologist identifies changes in tissues/organs that are consistent with specific toxic agents.

**Highlights:**

*The numbers refer to the number of cases, not the number of animals involved. On some premises, numerous animals were involved.*

Acidosis..... 11  
 Acorn poisoning ..... 1  
 Amylobarbitone poisoning ..... 1  
 Antifreeze poisoning..... 8  
 Arsenic poisoning ..... 4  
 Black locust poisoning..... 1  
 Brodifacoum toxicosis ..... 1  
 Buckeye poisoning ..... 1  
 Carbofuran poisoning ..... 5  
 Deficient copper levels.....20  
 Elevated copper levels..... 11  
 DDT poisoning ..... 1  
 Endrin poisoning ..... 1  
 Horse nettle (*Solanum carolinense*) toxicosis ..... 1  
 Lead poisoning ..... 3  
 Nitrate at dangerous levels..... 14  
*Taxus* poisoning ..... 7  
 Tumex (8-quinolinol) toxicosis (*this compound is a fungicide*) ..... 1  
 Elevated vomitoxin levels..... 10

A ruminant extension veterinarian located at the Livestock Disease Diagnostic Center is available to assist veterinarians in the investigation of serious or unusual disease problems.

**Highlights:**

- This professional is involved with the Extension Disaster Educational Network (EDEN) as a core committee member.
- Information on the Internet is provided to all citizens of Kentucky on methods to mitigate disaster problems, including drought with livestock.
- Regular radio sessions are given to improve the health of Kentucky livestock, including cattle, sheep and goats.
- A videotape “Beef Procedures” was developed to demonstrate proper procedures to produce a quality product. Copies of the video were sent to each county in Kentucky and to the other 47 Beef Quality Assurance participating states.
- As a result of attending Iowa State University’s Center for Food Security and Public Health seminar, several presentations were made to organizations about bioterrorism and livestock health, including a radio session.
- A clinical trial with stocker cattle was performed to investigate protocols to improve health and decrease morbidity and mortality rates. Information gained from this study will aid in future decisions on arrival treatments.

# Regulatory Services

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

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

Ten regulatory inspectors and one auditor cover the state collecting samples, inspecting facilities, and auditing records. A specialty product inspector is dedicated to monitoring and sampling small-package and specialty pet food, fertilizer, and seed products throughout the state. This reflects the Division's commitment to provide consumer protection to the purchaser of non-agricultural products such as lawn seed, fertilizer, and dog and cat food. Another inspector is dedicated to the milk regulatory program, auditing records and monitoring activities of sampler-weighers, handlers, testers, and lab facilities.

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

## AUDITING PROGRAM

*H.S. Spencer*

Audits of sales and fee payments were made on 203 of 422 feed, fertilizer, seed, and milk firms in Kentucky to verify inspection fees. Fees are assessed to help defray costs of inspecting, sampling, and analyzing commodities in accordance with state laws. Fees are indicated below. Cash receivables were substantiated on 2,250 fertilizer reports, 3,048 feed reports, 747 seed reports, and 81 milk reports. Reports were checked for accuracy and compared to field audits of the submitting firms.

## 2003 inspection fees for industries regulated by the Division of Regulatory Services.

Industry	Fee Assessed per Unit
Feed.....	35 cents/ton
Fertilizer .....	50 cents/ton
Milk (handlers and producers).....	0.5 cents/100 lb.
Seed tags.....	4-24 cents/unit

## Division of Regulatory Services 2003 income from fees, licenses, and testing services.

Industry	2003 Income
Feed.....	\$866,307
Fertilizer .....	476,841
Milk.....	200,716
Seed tags, licenses, and service testing .....	403,384
Soil service testing .....	179,170
<b>Total .....</b>	<b>\$2,126,418</b>

## FEED REGULATORY PROGRAM

*S. Traylor*

The feed regulatory program provides consumer protection for purchasers of livestock feed and pet food products as well as monitoring a marketplace environment that promotes fair and equitable competition. The Kentucky Commercial Feed Law outlines standards of quality, safety, and efficacy of commercial livestock feed and pet food industries through specific labeling requirements. Labels should identify the purpose, a guaranteed composition, ingredient list, and directions as well as warning or caution statements required for proper use. A statewide inspection, sampling, and testing program monitors feed products for accurate labeling.

The feed program is also involved in ensuring safety and suitability of animal products used for human consumption and participates in a nationwide effort by state and federal agencies to ensure food safety and to promote consumer confidence in our food supply. The feed program and the FDA are cooperatively working together to inspect facilities for compliance with the ruminant-to-ruminant feeding ban, which was promulgated to prevent establishment and amplification of bovine spongiform encephalopathy (BSE, or "mad cow disease").

### 2003 Highlights:

- Administered actions on 3,825 official and 362 unofficial samples of commercial feed involving 22,806 tests to monitor about 3 million tons of commercial mixed feed and feed ingredients distributed in Kentucky.
- Administered a cooperative program with the FDA to inspect 15 feed mills that mix restricted drugs in feed and to inspect these mills for compliance with FDA's national BSE Rule. An additional 85 BSE inspections were contracted with FDA for mills not required to be licensed with FDA.

- Conducted 7,500 label reviews and maintained product registration for about 15,000 products from 900 companies.
- Participated in FDA's Medicated Licensed Mill inspection training.

## FERTILIZER REGULATORY PROGRAM

*D.L. Terry*

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

### 2003 Highlights:

- Administered actions on 3,091 official and 220 unofficial samples of fertilizer involving 9,425 tests of the approximately 922,930 tons of fertilizer distributed in Kentucky.
- Reviewed labels and registered 3,734 products from 518 firms, including 205 who manufactured custom blends of fertilizers.

## FEED AND FERTILIZER LABORATORY

*M. Bryant*

The laboratory provided analytical support for the feed, fertilizer, and soil programs. Accurate and timely analyses of these materials were provided for the fertilizer and feed regulatory programs and for the support of agriculture in Kentucky. In 2003, the lab analyzed 3,314 fertilizer samples and 4,468 feed samples. In addition, 44,652 agriculture-related samples were analyzed in the spectroscopy laboratory, i.e., soil, manure, litter, and research samples. The laboratory analyzed many materials from check sample programs and special sample requests. Heavy metals, Cu and Zn, acid detergent fiber, crude fat, protein, nitrogen, and other analyses support was provided for research and other regulatory laboratories. Laboratory special projects were also conducted for method development and evaluation of laboratory method performance.

Check sample materials were analyzed from regional, national, and international programs: AAFCO, Magruder®, mycotoxins, UAN, AFPC phosphate rock, mineral, and other sample types. The lab routinely provides program support using approximately 75 different analytical methods. Samples are also submitted to and analyzed by commercial and other regulatory programs to provide additional analytical method support and to ensure the quality of laboratory results. The lab participates in a monthly aflatoxin share sample program.

Improvements in sample and data processing efficiency were achieved. Excel® spreadsheets were developed for 12 analytical methods that allow for importation of sample identification and guarantees, automated collection of sample weights, and exportation of final calculated sample results. New software for the automated flow spectrophotometer analyzer increased the measurement range to allow pure fertilizer

ingredients to be analyzed. Previously, pure ingredients have required manual chemical methods because the software and hardware could not handle the wide range of nutrients found in various fertilizer materials.

## INSPECTION PROGRAM

*S. McMurry*

The inspection program strives to promote industry compliance with consumer protection laws administered by the Division. Inspectors strategically located throughout the state carry out this responsibility in respective assigned areas. Their primary duty is to visit manufacturing plants, processing facilities, storage warehouses, and retail sites to collect official samples of feed, pet food, fertilizer, milk, and seed. While visiting these firms, inspectors also review records and offer assistance in improving operations to achieve compliance with the laws.

### 2003 Highlights:

- 11 inspectors completed more than 4,200 feed, fertilizer, and seed inspections of processing, manufacturing, and marketing firms in the state.
- Emphasis in the feed area included feed mill inspections for compliance with FDA's BSE regulations.
- Two inspectors visited and sampled small package specialty feed, fertilizer, and seed products in urban markets.
- Five inspectors made 270 visits to determine compliance with Kentucky's Farm Milk Handler Law.
- Inspectors collected the following official samples for laboratory verification of appropriate constituents and quality:

Feed.....	4,184
Fertilizer .....	3,157
Seed.....	2,550
Milk.....	5,785

## MILK REGULATORY PROGRAM

*C. Thompson*

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 \$209 million per 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 and processors. The milk program also operates a laboratory that is available for Kentucky producer, processor, and handler service testing.

**2003 Highlights:**

- Reviewed and issued licenses to five transfer stations, 22 milk handlers, 21 laboratories, 71 testers, and 352 sampler-weighers.
- Analyzed and administered action on 5,785 official samples.
- Distributed 3,024 samples to licensed laboratories for comparison purposes.
- Conducted 17 pay-record and 18 raw milk receiving manifest audits.
- Conducted 35 milk laboratory inspections.
- Collaborated with Kentucky Cabinet for Health Services Milk Safety Branch to train sampler-weighers.
- Trained and examined 26 new sampler-weighers and eight new testers.
- Conducted 18 inspections of raw milk transfer stations.
- Conducted 651 sampler-weigher inspections.

**SEED REGULATORY PROGRAM**

*D.T. Buckingham*

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

**2003 Highlights:**

- Performed 1,865 inspections and sampled agricultural, lawn, turf, and garden seeds at more than 600 wholesale and retail locations.
- Collected and tested 2,550 official seed samples.
- Issued stop-sale orders on 390 official seed samples and 661 violative seed lots at seed dealer and seed processor locations.
- Cooperated with the USDA-Seed Branch regarding shipments of seed into the state that were in violation of the Federal Seed Act.
- Reviewed and issued 207 agricultural permits and 45 vegetable and flower permits to label seed.
- Registered 375 seed dealers and 28 non-certified custom conditioners.
- Provided training to firms on labeling requirements, mixing procedures, and batching records.

**SEED TESTING LABORATORY**

*C. Finneseth*

The Division maintains the only seed testing facility in Kentucky. This laboratory conducts all official testing in the state and provides service testing for producers, dealers, retailers, researchers, and homeowners. Laboratory capabilities include purity testing, weed and crop seed identification, seed counts, accelerated aging, test weight, fluorescence testing for ryegrass, moisture content, tetrazolium, herbicide tolerance, endophyte, and germination as well as many other tests. Laboratory analysts participated in regional and national referee testing through the Association of Official Seed Analysts to ensure inter-laboratory and intra-laboratory quality of test results. More than 19,500 different tests were performed by laboratory personnel in 2003, a 23% increase from the previous year.

**2003 Highlights:**

Sample Type	2003 Completed Samples
Official samples.....	2,550
Service samples.....	6,126
Tobacco.....	1,660
Other certified crops.....	234
<b>Total samples.....</b>	<b>8,676</b>

**SOIL TESTING LABORATORY**

*F.J. Sikora and D. Reid (Lexington)  
Paula Howe (UK Research and Education Center, Princeton)*

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

The soil test Web site contains information on our services and calculators for determining fertilizer, lime, and manure application rates. The site is at <soils.rs.uky.edu>.

**The number of samples analyzed in 2003 were:**

Type	Number	% Increase from 2002
Agriculture.....	30,349	-20
Home lawn and garden.....	5,875	-13
Strip-mine reclamation.....	0	
Commercial horticulture.....	601	-11
Greenhouse.....	54	-17
Research.....	6,736	-38
Atrazine residue in soil.....	20	-44
Animal waste.....	327	45
Nutrient solution.....	28	40
Special research solutions.....	662	-28
<b>Total.....</b>	<b>44,652</b>	<b>-21</b>

# Kentucky Agricultural Experiment Station Projects

## HATCH, MCINTIRE-STENNIS, AND ANIMAL HEALTH PROJECTS

Hatch, McIntire-Stennis, and Animal Health projects for calendar year 2003, as reported in the USDA Current Research Information System (CRIS) database, follow.

### Agricultural Economics

Alternative Policy Designs for Sharing Agricultural Risk in Market Based Economies—Skees, J.  
Analyzing the Industrial Organization and Financial Economic Performance of the Global Agribusiness Sector—Vickner, S.  
Analyzing the International Competitiveness of the U.S. Agricultural Processing Industry—Reed, M.  
Benefits and Cost of Natural Resources Policies Affecting Public and Private Lands—Fleming, R.  
Effects of Policy and Product Changes on the International Demand for U.S. Agricultural Products—Reed, M.  
Ex-Post Evaluations of Environmental Projects That Affect Kentucky Agriculture and Rural Communities—Pagoulatos, A.; Fleming, R.  
Financing Agriculture and Rural America: Issues of Policy, Structure, and Technical Change—Freshwater, D.  
Fruit and Vegetable Supply-Chain Management, Innovations, and Competitiveness—Woods, T.  
Impacts of Trade Agreements and Economic Policies on Southern Agriculture—Marchant, M.  
Impacts of Trade and Domestic Policies on the Competitiveness and Performance of Southern Agriculture—Marchant, M.  
In-Depth Study of Production and Business Management Practices of Sustainable, Profitable Australian Beef and Meat Goat Producers—Trimble, R.  
Risk Management and Profit Potential of Alternative Production Practices, Enterprises, and Technologies—Dillon, C.  
Rural Labor Markets: Workers, Firms, and Communities in Transition—Freshwater, D.  
Technological Progress in Agriculture, Farmers, and Rural Communities—Debertin, D.  
U.S. Consumer Demand for Dairy Products: Needs-Driven Methods and Analysis—Maynard, L.

### Agronomy

Breeding and Genetics of Forage Crops to Improve Productivity, Quality, and Industrial Uses—Phillips, T.  
Breeding for Fusarium Head Blight Resistance in Wheat for Kentucky—Van Sanford, D.  
Breeding Grasses for the Transition Zone—Bush, L.; Collins, M.; Dougherty, C.  
Corn Breeding and Genetics: White Endosperm Breeding, Genetic Variation in Food Quality and Hybrid Performance Tests—Poneleit, C.  
Efficient Leaf Aldehyde Production—Hildebrand, D.; Nagy, P.  
Environmental and Genetic Determinants of Seed Quality and Performance—TeKrony, D.; Egli, D.; Baskin, C.; Baskin, J.; Perry, S.; Geneve, R.; Downie, A.  
Evaluation of Perennial Forage Crop Varieties—Spitaleri, R.  
Forage for Advancing Livestock Production—Collins, M.; Vanzant, E.; Phillips, T.; Henning, J.; Harrison, L.  
Fragipan Influence on Hillslope Hydrology and Soil Water Quality—Thom, W.  
Functions of Multiple Poly (A) Polymerases in Arabidopsis—Hunt, A.  
Identification and Characterization of Genes Regulated by AGL15, an Embryo-Expressed MADS-Box Gene—Perry, S.  
Identification of Plant Genes That Confer Enhanced Capacity to Tolerate Oxidative Stress—Falcone, D.

Identification of Protein Interactors of AGL15, an Embryo MADS-Domain Factor—Perry, S.  
Interactions of Iron with the Nitrogen Cycle—Matocha, C.  
Introgressing Alleles from the Wild Species *G. soja* into Soybean—Pfeiffer, T.  
IPM of Weeds, Clover, and Endophyte in Tall Fescue Grassland—Dougherty, C.; Anderson, J.; Baskin, J.; Bush, L.; Collins, M.; Cornelius, P.  
Metabolic Engineering to Study the Regulation/Plasticity of and to Modify Diterpene Metabolism in Trichome Gland Cells—Wagner, G.  
Microbial Ecology of Nitrate Reduction in Fragipan Soils—Coyne, M.  
Mineralogical Controls on Colloid Dispersion and Solid-Phase Speciation of Soil Contaminants—Barnhisel, R.; Karathanasis, A.  
Plant Genetic Resource Conservation and Utilization—Taylor, N.  
Potential Impact of Global Warming on Seed Germination Ecology of Summer Annual and of Winter Annual Weeds—Baskin, C.  
Predicting Solute Transport Parameters from Pore Characteristics of Kentucky Soils—Karathanasis, A.  
Regulation of Isoprenoid Metabolism in Plant-Pathogen Interactions—Chappell, J.  
Seed Biology and Technology Investigations—Tekrony, D.  
Soil Biogeochemical Indicators to Assess Water Quality Improvement Function of Wetlands—D'Angelo, E.; Karathanasis, A.  
Studies on Decreasing Tobacco-Specific Nitrosamines in Burley Tobacco during Curing—Burton, H.; Bush, L.; Pearce, R.  
Turfgrass Management Practices in Kentucky—Williams, D.; Powell, A.

### Animal Sciences

Animal Manure and Waste Utilization, Treatment, and Nuisance Avoidance for a Sustainable Agriculture—Cromwell, G.; Grove, J.  
Antiatherogenic Properties of Zinc—Hennig, B.  
Assessment and Implications of Carbohydrate Utilization in the Small Intestine of Beef Cattle—Harmon, D.; McLeod, K.  
Assessment and Regulation of Sexual Behavior in Beef Bulls—Schillo, K.; Silvia, W.  
Breeding to Optimize Maternal Performance and Reproduction of Beef Cows in the Southern Region—Thrift, F.; Aaron, D.  
Calcium and Phosphorus Nutrition of Pregnant and Lactating Mares—Lawrence, L.  
Detection of Estrus in Gilts and Sows—Edgerton, L.  
Development of a Swine Model to Evaluate the Reduction of Antibiotic-Resistant Enteric Bacteria in Domestic Livestock—Newman, M.  
Development of Peptide Blockers to Enhance Cheese Production—Hicks, C.  
Dietary Regulation of Cationic Amino Acid Transporter Protein Expression in Cattle—Matthews, J.; Harmon, D.  
Effect of Phenolic Compounds on the Antibiotic Resistant Bacteria in Swine—Newman, M.  
Enhancing Food Safety through Control of Food-Borne Disease Agents—Newman, M.  
Enhancing the Beef/Forage Potential of Small and Mid-Sized Beef Operations—Burriss, W.; Anderson, J.; Henning, J.; Anderson, L.; Bullock, D.; Johns, J.  
Forage Protein Characterization and Utilization for Cattle—Vanzant, E.  
Formation and Treatment of Ovarian Cysts in Dairy Cows—Silvia, W.  
Formation and Treatment of Ovarian Follicular Cysts in Dairy Cows—Silvia, W.  
Genetic (Co) Variance of Parasite Resistance, Temperament, and Production Traits of Traditional and Non-*Bos indicus* Tropically Adapted Breeds—Thrift, F.  
Genetic Selection and Crossbreeding to Enhance Reproduction and Survival of Dairy Cattle—Franklin, S.; McAllister, A.  
Interaction of Structurally Modified Food Proteins in Processed Meat Systems—Xiong, Y.  
Interpreting Cattle Genomic Data: Biology, Applications, and Outreach—Matthews, J.

Management Systems to Improve the Economic and Environmental Sustainability of Dairy Enterprises—*Amaral-Phillips, D.; Franklin, S.*  
 Mechanism of Oxidation-Induced Functionality Changes of Myofibrillar Protein—*Xiong, Y.; Alderton, A.*  
 Modifying Milk Fat Composition for Improved Manufacturing Qualities and Consumer Acceptability—*Franklin, S.*  
 Modulation of the Vascular Endothelium—*Hennig, B.; Toborek, M.*  
 Molasses-Based, Strategic Supplementation Program to Enhance Beef Cow Reproductive Performance and Calf Weaning Weight from Endophyte-Infected Tall Fescue Pasture—*Ely, D.; Aaron, D.*  
 Nutrition and Health of Dairy Calves—*Franklin, S.; Jackson, J.; Harmon, R.; Amaral-Phillips, D.*  
 Nutritional Regulation of Pancreatic Alpha-Amylase in Ruminants—*Harmon, D.; Matthews, J.*  
 Nutritional Systems for Swine to Increase Reproductive Efficiency—*Lindemann, M.*  
 Nutritional Systems for Swine to Increase Reproductive Efficiency—*Lindemann, M.; Aaron, D.; Fleming, R.*  
 Organic Chromium and Anionic Salt Supplementation in the Diet of Transition Dairy Cattle—*Jackson, J.; Harmon, R.; Franklin, S.*  
 Post-Harvest Biochemistry of and Methods of Minimizing Methanethiol and Dimethyl Trisulfide in Soy Protein Products—*Boatright, W.*  
 Proteomic Analysis Equipment for Study of Mammalian and Microbial Cells—*Matthews, J.; Hennig, B.; McDowell, K.; Toborek, M.*  
 Proteomic Analysis of Anaerobic Bacterial Metabolism—*Strobel, H.*  
 Regulation of Carbohydrate Digestion and Absorption in the Ruminant Small Intestine—*Harmon, D.; Matthews, J.*  
 Regulation of Estrous Behavior in Dairy Cows—*Silvia, W.; Schillo, K.*  
 Residual Soybean Sulfur Metabolism in Isolated Soy Proteins: Sulfate to Cysteine—*Boatright, W.*  
 Strategies for Improving Ewe Lactational Performance and Predicting Preweaning Growth of Lambs—*Aaron, D.; Ely, D.*  
 Water Quality Issues in Poultry Production and Processing—*Cantor, A.; Pescatore, A.; Ford, M.*  
 Zinc Nutrition and Endothelial Integrity—*Hennig, B.*

### **Biosystems and Agricultural Engineering**

Cattle Production Practices in Grazed Watersheds of the Humid Region—*Workman, S.R.; Bicudo, J.R.; Vanzant, E. S.; Edwards, D. R.*  
 Characterization of Laboratory and Pilot Scale Foam Fractionation of Industrial Enzymes—*Crofcheck, C.*  
 Decision Support for Design and Control of Plant Growth Systems—*Gates, R.; Buxton, J.; Anderson, R.; Geneve, R.*  
 Demand-Controlled Ventilation (DCV) for Residential Indoor Air Quality Control—*Colliver, D.*  
 Marketing and Delivery of Quality Cereals and Oilseeds—*Montross, M.; McNeill, S.*  
 Optical Sensor Measurement of Food Composition Based on Light Scattering Distribution—*Payne, F.; Crofcheck, C.; Menguc, P.*  
 Optimization of Aeration Systems for Value-Added Crop Preservation—*Montross, M.; McNeill, S.*  
 Precision Agriculture: Development and Assessment of Integrated Practices for Kentucky Producers - Phase II—*Shearer, S.; Mueller, T.; Dillon, C.*  
 Precision Agriculture: Development and Assessment of Integrated Practices for Kentucky Producers - Phase III—*Shearer, S.; Mueller, T.; Dillon, C.*  
 Precision Agriculture: Development and Assessment of Integrated Practices for Kentucky Producers - Phase V—*Shearer, S.; Mueller, T.; Dillon, C.*  
 Precision Agriculture: Development and Assessment of Integrated Practices for Kentucky Producers - Phase IV—*Shearer, S.; Mueller, T.; Dillon, C.*  
 Reducing Ammonia Emissions from Poultry Houses by Enhanced Manure and Diet Management—*Gates, R.; Pescatore, A.; Bicudo, J.*  
 Science and Engineering for a Biobased Industry and Economy—*Nokes, S.; Montross, M.; Crofcheck, C.; Strobel, H.*  
 Sensors for Delineation of Spatial Management Zones—*Stombaugh, T.; Mueller, T.*

Simplified Technology for Enzyme Production with Thermophilic Anaerobic Bacteria—*Nokes, S.; Strobel, H.; Marchant, M.; Krishna, C.*  
 Stress Factors of Farm Animals and Their Effects on Performance—*Turner, L.; Gates, R.; Bicudo, J.; Bridges, T.; Overhults, D.; Vanzant, E.*  
 Systems for Controlling Air Pollutant Emissions and Indoor Environments of Poultry, Swine, and Dairy Facilities—*Gates, R.; Overhults, D.; Turner, L.; Cantor, A.; Pescatore, A.*  
 Water and Solute Transport in Subsurface Environments—*Workman, S.*

### **Community and Leadership Development**

Assessing Impacts of Welfare Reform on Individual, Family, and Community Well-Being in the Rural South—*Zimmerman, J.*  
 How Do Structured Out-of-School Experiences Contribute to Positive Youth Development?—*Dyk, P.; Hansen, G.*  
 Impacts of Structural Change in the Dairy Industry—*Garkovich, L.; Crist, W.; Dyk, P.*  
 Local Food Systems and Agricultural Diversification: Opportunities and Obstacles—*Swanson, M.; King, B.; Burmeister, L.; Tanaka, K.; McCourt, M.*  
 Rural Low-Income Families: Monitoring Their Well-Being and Functioning in the Context of Welfare Reform—*Dyk, P.*

### **Entomology**

Administration and Evaluation of the Southern Region IPM Program—*Knapp, F.*  
 Biological Control of Arthropod Pests and Weeds—*Yeagan, K.*  
 Biology and Management of Insects Attacking Turf and Woody Landscape Plants—*Potter, D.*  
 Characterization of Selected Proteins Derived from an Insect Parasitoid—*Palli, S.*  
 Consequences of Variation in Host Plant Resistance for the Evolution of Offspring Size in a Seed-Feeding Beetle—*Fox, C.*  
 Development of a Soybean Aphid Management Strategy for the Southern Region—*Brown, G.; Dillon, C.; Ghabrial, S.; Hershman, D.; Johnson, D.; Yeagan, K.*  
 Development of Pest Management Strategies for Forage Alfalfa Persistence—*Witt, W.; Vincelli, P.; Lacefield, G.*  
 Development, Evaluation, and Safety of Entomopathogens for Control of Arthropod Pests—*Brown, G.*  
 Dynamic Soybean Pest Management for Evolving Agricultural Technologies and Cropping Systems—*Yeagan, K.*  
 Ecology and Management of European Corn Borer and Other Stalk-Boring Lepidoptera—*Brown, G.*  
 Enhancing Biological Control of Turf-Infesting Scarabaeid Grubs by Native and Exotic Tiphid Wasps—*Potter, D.*  
 Field Evaluation and Implementation of Economic Injury Levels Incorporating Biological Control Agent—*Brown, G.*  
 Functional Implications of Polydnavirus Genome Organization—*Webb, B.*  
 Genome Evolution of Mutualistic Insect Viruses—*Webb, B.; Strand, M.*  
 Herbivory in Deciduous Forests: Implications for Forest Regeneration and Restoration—*Rieske-Kimney, L.*  
 Identification Keys to the Economically Important Species of Parasitic Wasps of the Genus *Cotesia* (Hymenoptera: Braconidae)—*Sharkey, J.*  
 Impacts of Interactions among Generalist Arthropod Predators in Two Complex Food Webs: Vegetable-Crop Gardens and Forest-Floor Leaf Litter—*Wise, D.*  
 Molecular Analysis of Pest Development and Resistance to Insecticides—*Palli, S.*  
 Potential for Evolution of Resistance to Synthetic Pheromone—*Haynes, K.*  
 Sources, Dispersal, and Management of Stable Flies on Grazing Beef and Dairy Cattle—*Dobson, S.*  
 Systematics and Biodiversity of Biological Control Agents with Special Reference to the Braconidae—*Sharkey, M.*  
 Wolbachia Infections in Mosquitoes as an Applied Tool for Modifying Natural Populations—*Dobson, S.*

## Forestry

- Biological Improvement of Chestnut and Management of the Chestnut Pathogens and Pests—*Rhoades, C.*
- Conservation, Ecology, and Restoration of Large Mammals in Eastern Kentucky—*Maehr, D.*
- Controls on Litter Decay and N Transformations: Effects of Tree Species, Microclimate, and Soil Mesofauna in Oak and Mixed Hardwood Stands—*Arthur, M.; Muller, R.*
- Developing a Digital Photogrammetric Method for Forest Stand Density Estimation—*Liu, C.*
- Edaphic and Fungal Controls on American Chestnut Restoration: Seedling Growth and Susceptibility to the Root Pathogen *Phytophthora Cinnamomi*—*Rhoades, C.; Miller, S.; Hartman, J.*
- Effects of Disturbance Corridors (Roads and Hiking Trails) on Invertebrate Macrofauna of Forest Soils on the Cumberland Plateau of Kentucky—*Kalisz, P.*
- Genetic Diversity of White Oak Regeneration in Kentucky Forests—*Wagner, D.*
- Restoration of the American Peregrine Falcon (*Falco peregrinus anatum*) to Cliff Habitats in Kentucky—*Lacki, M.*

## Horticulture

- Botrytis cinerea* Development and Natural Volatile Compounds from Strawberry Fruit—*Kemp, T.*
- Controlled Water Table Irrigation for Container Plant Production—*Buxton, J.*
- Evaluation of Growth and Phenolic Content of Echinacea Species under Greenhouse Conditions—*Anderson, R.; Geneve, R.*
- Evaluation of Natural Products for Mediating Plant Resistance to Arthropods and for Use in Protecting Horticultural Crops from Insect Damage—*Snyder, J.*
- Mechanism and Significance of Post-Translational Modifications in the Large (LS) and Small (SS) Subunits of Rubisco—*Houtz, R. L.*
- Molecular Characterization of the Role of Raffinose in the Model Plants Corn and Arabidopsis—*Downie, A.*
- New Crop Opportunities—*Ingram, D.; Van Sanford, D.; Ibendahl, G.*
- Optimizing the Water and Air Relationship and Nutrient Concentration in a Controlled Water Table Irrigated Container Growing Medium—*Buxton, J.*
- Peptide Deformylase: A Novel Herbicide Target Amenable to Genetically Engineered Tolerance—*Williams, M.*
- Production of Ethylene and Its Biosynthetic Precursors as Indicators of Seed Vigor—*Geneve, R.*
- Regulation of Sorbitol Dehydrogenase Activity during Apple Fruit Development: Genotypic Differences and the Impact of Cultural Practices—*Archbold, D.*
- Ripening and Storage Life Extension of the Native American Pawpaw Fruit—*Archbold, D.*
- Rootstock and Interstem Effects on Pome- and Stone-Fruit Trees—*Masabni, J.*
- Technical and Economical Efficiencies of Producing, Marketing, and Managing Environmental Plants—*McNiel, R.*

## Landscape Architecture

- A Planning Model for Assessment of Agricultural Potential in Appalachia Using Information Technology Tools—*Nieman, T.*

## Nutrition and Food Science

- Dietary Antioxidants, NF-kB, and Carcinogenesis—*Glauert, H.*
- Effect of Dietary Antioxidants on Hepatic NF-kB Activation—*Glauert, H.*
- Mechanisms of Anti-Inflammatory Action of Eicosapentaenoic Acid (EPA)—*Chen, L.*

## Plant Pathology

- Advanced Genetic Technologies—*Schardl, C.; Webb, B.; Bailey, E.; Chappell, J.; Farman, M.; Gan, S.*
- Advanced Genetic Technologies—*Schardl, C.; Vaillancourt, L.; Nagy, P.; Perry, S.; Dobson, S.; Hildebrand, D.*
- Advanced Genetic Technologies—*Schardl, C.; Timoney, J.; Howe, D.; Matthews, J.; Downie, A.; Ghabrial, S.; McLeod, K.*
- Biological Control of Soilborne Plant Pathogens for Sustainable Agriculture—*Hendrix, J.*
- Characterization of Host Factors Involved in Plant Virus Replication Using Yeast as a Host—*Nagy, P.*
- Characterization of R-Gene-Mediated Signaling and Cross Talk between Defense Signaling Pathways—*Kachroo, P.*
- Enhancing Genetic Analysis and Sequencing Facility—*Schardl, C.; Webb, B.; Perry, S.; Gan, S.; Howe, D.; Nagy, P.*
- Epidemiology, Genetic Diversity, and Strategies to Control Bean Pod Mottle Virus—*Ghabrial, S.*
- Genetics and Biochemistry of Alkaloid Production by Endophytes—*Schardl, C.*
- Genomic Studies of the Model Phytopathogenic Fungus *Magnaporthe grisea*—*Farman, M.*
- National Agricultural Program to Clear Pest Control Agents for Minor Uses—*Nesmith, W.*
- Mechanisms of the Transition between Biotrophy and Necrotrophy in a Hemibiotroph—*Vaillancourt, L.*
- Molecular Basis of Disease in a Virus-Infected Plant Pathogen Fungus—*Ghabrial, S.*
- Molecular Genetics of the Interaction between Corn and Corn Stalk Rot Fungi (*Colletotrichum graminicola* and *Fusarium graminearum*)—*Vaillancourt, L.*
- Role of Promoter and Enhancer Elements in the Replication of Defective Interfering Tombusvirus RNA—*Nagy, P.*

## Veterinary Science

- Changes in Gene Expression in Equine Conceptuses and Uteri during Estrous Cycle and Early Pregnancy—*McDowell, K.*
- Control, Transmission, and Prevalence of Natural Infections of Internal Parasites of Equids—*Lyons, E.*
- Identification and Characterization of Immunodominant Antigens from the Coccidian Parasite *Sarcocystis neurona*—*Howe, D.*
- Induced Protectively Immunogenic Outer Envelope Proteins of *Leptospira kennewicki*—*Timoney, J.*
- Investigation of the Role of Thyroxine in the Control of Seasonal Reproductive Activity in the Mare—*Fitzgerald, B.*
- Molecular Mechanisms, Ecology, and Control of Natural Infections of Equids and Ruminants by Drug-Resistant Internal Parasites—*Lyons, E.*
- NAGRP Species Coordinator for the Horse—*Bailey, E.*
- National Animal Genome Research Program—*Bailey, E.; Cothran, E.; Graves, K.; Webb, B.*
- New Therapeutic Approaches for Equine Protozoal Myelitis—*Tobin, T.*
- Non-Immune Cellular/Molecular Responses to Influenza Infection of the Horse—*Chambers, T.*
- Novel, Protectively Immunogenic, Surface Exposed, and Secreted Proteins of *Streptococcus equi*—*Timoney, J.; Artiushin, S.*
- Pathogenesis of Equine Infectious Anemia—*Issel, C.; Cook, R.*
- Pregnancy Maintenance in Mares—*McDowell, K.*
- Reactivation and Transmission of Latent Equine Herpesvirus-1 in Pregnant Mares: Role as Risk Factors for Equine Herpesvirus Abortion—*Allen, G.*
- Thirteenth North American Colloquium on Animal Cytogenetics and Gene Mapping—*Lear, T.; Bailey, E.*
- West Nile Virus Immunity in Horse Foals—*Chambers, T.*



# 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, 2003-December 31, 2003) and any budgetary addition or reduction to existing projects processed within the reporting period.

## Agricultural Economics

Total—\$90,007

Detailed Sector Analysis of the Holstein Beef Market, Livestock Marketing Information Center, \$6,800—Meyer, A., *Burdine, K.*  
Kentucky Blueberry Market Development, Univ. of Georgia, \$4,786—Woods, T., *Ernst, M.*  
Measuring the Entrepreneurial Performance of Kentucky 2002, Kentucky Economic Development Cabinet, \$6,300—*Freshwater, D.*  
Policy Designs for Sharing Agricultural Risk, GlobalAgRisk Inc., \$50,800—*Skees, J.*  
South-Central Lender Training Program, Texas A&M Univ., \$15,000—*Ibendahl, G., Isaacs, S., Trimble, R.*  
Southern Region Enterprise Budget Resources: Database, Training, and Educational Materials, Texas A&M Univ.—\$4,321 *Ibendahl, G.*  
University of Kentucky Entrepreneurs Club, Kentucky Science and Technology Corporation Inc., \$2,000—*Woods, T.*

## Agriculture Programs

Total—\$69,122

Attaining Sustainability of Agriculture and Economic Development Systems, Univ. of Georgia \$10,000—*Deaton, P.*  
Nutrient Management Plans as Tools to Achieve Sustainable Animal Waste Utilization, Kentucky Natural Resources Environmental Protection Cabinet, \$9,985—*Duncan Jr., J.*  
The Story of the Forest: Forest Connections ... A Family Economic Issue, Univ. of Tennessee, \$5,661—*Szymanski, M., Henken, K., Stringer, J.*  
UK CES Liaison, Kentucky Natural Resources Environmental Protection Cabinet, \$43,476—*Duncan Jr., J.*

## Agronomy

Total—\$2,443,711

Accelerating Development of Scab-Resistant Wheat Varieties, Department of Agriculture, \$43,902—*Van Sanford, D.*  
Arabidopsis Polyadenylation Factor Subunits—Mutants and Protein Interaction Networks, National Science Foundation, \$859,000—*Hunt, A.*  
Biological Effects of Epoxy Fatty Acids, Consortium for Plant Biotechnology Research Inc., \$40,000—*Hildebrand, D.*  
Developing Higher Value Soybeans, Kentucky Soybean Promotion Board, \$15,000—*Hildebrand, D.*  
Development of Soybeans as a Commercial Source of Epoxy Fatty Acids, United Soybean Board, \$28,294—*Hildebrand, D.*  
Efficient Leaf Aldehyde Production, Department of Agriculture, \$162,521—*Hildebrand, D., Nagy, P.*  
Epoxy Fatty Acid Accumulation in Seed Oil, Consortium for Plant Biology Research, \$20,000—*Hildebrand, D.*  
Establishing Year-Round Grazing Strategy for Beef Cattle and Eliminating or Reducing the Need for Stored Feed, Univ. of Georgia, \$15,000—*Ditsch, D., Isaacs, S., Johns, J.*  
Evaluation of Levitation Mixer in Disposable Bioreactor, Levtech Inc., \$32,604—*Chappell, J.*  
*In vitro* Selection of Oligonucleotide Aptamers that Recognize Herbicides, Kentucky Science and Technology Corporation Inc., \$14,850—*Siminszky, B.*  
Indirect Benefit of No-Till Wheat: Enhanced Yield of Rotational Corn and Soybeans, Kentucky Soybean Promotion Board, \$4,000—*Murdock Jr., L.*  
Indirect Benefit of No-Till Wheat: Enhanced Yield of Rotational No-Till and Soybean, Kentucky Small Grain Growers Assoc., \$8,000—*Murdock Jr., L., Grove, J.*  
Investigating and Improving Dense Pubescence Germplasm, Kentucky Soybean Promotion Board, \$5,000—*Pfeiffer, T.*

Kentucky Watershed and Water Quality Education Project, Texas A&M Univ., \$70,000—*Thom, W.*  
KSEF R&D Excellence: Efficient Leaf Aldehyde Production, Kentucky Science and Technology Corporation Inc., \$35,201—*Hildebrand, D., Nagy, P.*  
Management of Troublesome Weeds in Highway Rights of Way, Kentucky Transportation Cabinet, \$150,550—*Witt, W.*  
Matching Soybean Cultivars to Soils, Kentucky Soybean Promotion Board, \$4,000—*Lee, C., Egli, D., Grove, J.*  
Molecular Regulation and Transport of Sterols in Plants, National Science Foundation, \$110,963—*Chappell, J.*  
Physiological Basis for Yield Reduction in No-Till Wheat, Kentucky Small Grain Promotion Council, \$5,000—*Van Doren, S., Grabau, L.*  
Screening Soybean Strains for Resistance to Sudden Death Syndrome, Southern Illinois Univ., \$4,800—*Pfeiffer, T.*  
Screening Soybean Strains for Resistance to Sudden Death Syndrome, Southern Illinois Univ., \$5,000—*Pfeiffer, T.*  
Soft Red Winter Wheat Breeding and Variety Development for Kentucky, Kentucky Small Grain Promotion Council, \$31,000—*Van Sanford, D.*  
Soil Morphology Training Course, Kentucky Health Services Cabinet, \$60,000—*Karathanasis, A.*  
Soybean Genetic Engineering for Increased Disease Resistance, Kentucky Soybean Promotion Board, \$10,000—*Collins, G., Dinkins, R., Meurer, C.*  
Soybean Tissue Culture and Genetic Engineering Center, United Soybean Board, \$331,511—*Collins, G., Dinkins, R.*  
Soybean Tissue Culture and Genetic Engineering Center, United Soybean Board, \$331,515—*Collins, G., Dinkins, R.*  
Survey for Herbicide-Resistant Ryegrass, Kentucky Small Grain Promotion Council, \$2,000—*Martin, J., Call, D., Witt, W.*  
Structure and Function of Terpene Cyclase, Salk Institute, \$44,000—*Chappell, J.*

## Animal Sciences

Total—\$3,564,763

Commercialization Fund: Development of a Value-Added Food Processing Incubator, Kentucky Science and Technology Corporation Inc., \$75,000—*Mikel, W., Newman, M.*  
Comparative Investigation of Physiological Features of Cellulose Utilization by Bacteria, Dartmouth College, \$38,878—*Strobel, H.*  
Determination of the Potential for Peptide Amino Acid Absorption in the Dog, IAMS Co., \$13,302—*Matthews, J.*  
Developing *in vitro* Methods for Assessing Digestibility of Feed Ingredients, Cooperative Research Farms, \$41,600—*Lawrence, L.*  
Development of a Rapid Response System for Bioterrorism, Food Safety and Inspection Service, \$25,000—*Mikel, W., Newman, M.*  
Development of a Spanish Version of Appropriate Sanitation Methods, Food Safety and Inspection Service, \$13,000—*Mikel, W., Newman, M.*  
Evaluation of the Efficacy of Flame Beef Trim, Food Safety and Inspection Service, \$25,000—*Mikel, W., Newman, M.*  
Evaluation of the Microbial Status of Country Cured Hams, Food Safety and Inspection Service, \$25,000—*Mikel, W., Newman, J.*  
Evaluation of Various Intervention Methods against Salmonella on Pork Carcasses, Food Safety and Inspection Service, \$25,000—*Mikel, W., Newman, M.*  
Evaluation of Various Intervention Methods for Small Processors and Development of a CD Demonstrating Appropriate Harvest Methods, Food Safety and Inspection Service, \$25,000—*Mikel, W., Newman, M.*  
Evaluation of Various Sanitation Methods for Listeria, Food Safety and Inspection Service, \$25,000—*Mikel, W., Newman, M.*

Forage for Advancing Livestock Production III, Cooperative State Research Education and Extension, \$403,064—Collins, M., Phillips, T., Vanzant, E., Harrison, L.

Goat Friendly Pastures, Univ. of Georgia, \$1,000—Hutchens, T.

Goat Friendly Pastures, Univ. of Georgia, \$10,775—Hutchens, T.

Goat Friendly Pastures, Univ. of Georgia, \$3,200—Hutchens, T.

HACCP Training for Small Meat Processors, Food Safety and Inspection Service, \$15,000—Mikel, W.

IAMS Restructured Product Development, IAMS Co., \$17,600—Mikel, W., Alderton, A.

Integrated Resource Management, Kentucky Beef Council, \$199,500—Anderson, L. Bullock, K., Burris, W.

KSEF R&D Excellence: Remote, Continuous Temperature Detection in Beef Cattle, Kentucky Science and Technology Corporation Inc., \$46,564—Vanzant, E., Bullock, K., Johns, J., Schillo, K., Gates, R., Turner, L.

Mechanism of Oxidation-Induced Functionality Changes of Myofibrillar Protein, Cooperative State Research Education and Extension, \$90,000—Xiong, Y., Alderton, A.

Metabolic Engineering of Isoprenoid Metabolism in Plants, Firmenich, \$384,567—Chappell, J.

National Beef Cattle Evaluation Consortium, Cornell Univ., \$20,000—Bullock, K.

Nutrient Utilization in the Dog, Hills Pet Nutrition Inc., \$115,000—Harmon, D.

Protection against Atherosclerosis by Dietary Zinc, National Cattlemen's Beef Assoc., \$38,948—Hennig, B.

R&D Excellence: Development of Bio-Active Probes Derived from Bacteriophage, Kentucky Science and Technology Corporation Inc., \$15,000—Hicks, C.

R&D Excellence: Viral Peptides Used to Develop a Model System for Rapid Assay Probes, Kentucky Science and Technology Corporation Inc., \$80,000—Hicks, C.

Residual Soybean Sulfur Metabolism in Isolated Soy Proteins: Sulfate to Cysteine, Cooperative State Research Education and Extension, \$118,000—Boatright, W.

Shared Faculty Position with CREES/USDA, Cooperative State Research Education and Extension, \$30,000—Cromwell, G.

Superfund NIEHS, National Institute of Environmental Health Sciences, \$1,579,470—Hennig, B., Bastin, S., D'Angelo, E.

Superfund NIEHS, National Institute of Environmental Health Sciences, \$7,983—Hennig, B., Bastin, S., D'Angelo, E., Gaetke, L.

Superfund NIEHS, National Institute of Environmental Health Sciences, \$14,480—Hennig, B., Bastin, S., D'Angelo, E., Gaetke, L.

Superfund NIEHS, National Institute of Environmental Health Sciences, \$39,204—Hennig, B., Bastin, S., D'Angelo, E., Gaetke, L.

USDA Meat Grading Services for Small Producers on a Limited Basis to Determine Economic Enhancements, Department of Agriculture, \$3,628—Mikel, W.

## **Arboretum**

Total—\$21,775

Creating Natural Ecosystems in an Urban Environment, Kentucky Department for Natural Resources, \$20,000—Farris, M.

Museum Assessment Program for Arboretum, Institute of Museum and Library Services, \$1,775—Farris, M.

## **Associate Dean**

Total—\$787,062

Forage-Animal Production Research, Department of Agriculture, \$260,000—Cox, N., Collins, M., Harmon, D., Lawrence, L., Matthews, J., McLeod, K., Vanzant, E., Boling, J., Potter, D., Rieske-Kinney, L., Webb, B., Harrison, L., McDowell, K., Tobin, T.

Forage-Animal Production Research, Department of Agriculture, \$443,937—Cox, N., Collins, M., Harmon, D., Lawrence, L., Matthews, J., McLeod, K., Vanzant, E., Boling, J., Potter, D., Rieske-Kinney, L., Webb, B., Harrison, L., McDowell, K., Tobin, T.

State Matching Funds for NSF Partnership Grant 4-66395, Kentucky Economic Development Cabinet, \$40,000—Cox, N.

Support of Agricultural Research of Mutual Interest, Agricultural Research Service, \$15,000—Cox, N.

Support of Agricultural Research of Mutual Interest, Agricultural Research Service, \$28,125—Cox, N.

## **Biosystems and Agricultural Engineering**

Total—\$1,345,540

Biosystems and Agriculture Engineering Training-Educational Consortium for Sustainable Plant and Animal Production Systems, Department of Education, \$2,586—Gates, R., Bicudo, J., Montross, M.

Biosystems and Agriculture Engineering Training-Educational Consortium for Sustainable Plant and Animal Production Systems, Department of Education, \$27,264—Gates, R., Bicudo, J., Montross, M.

Converting Soybean Oil to Hydrogen for Fuel Cell Development, Kentucky Soybean Promotion Board, \$6,670—McNeill S., Montross, M.

Cooperative Extension Program for Kentucky's Building Systems Energy Needs, Kentucky Department for Natural Resources, \$59,882—Gates, R., Turner, L.

Cooperative Extension Radon and Indoor Air Quality Education, Kentucky Department for Public Health, \$22,000—Piercy, L., Hash, G.

Cooperative Extension Radon and Indoor Air Quality Education, Kentucky Department for Public Health, \$50,000—Piercy, L., Hash, G.

Developing a Low-Cost Portable Vision Device for Inspecting Agricultural Products for Safety, Agricultural Research Service, \$55,000—Gates, R.

Developing a Low-Cost Portable Vision Device for Inspecting Agricultural Products for Safety, Agricultural Research Service, \$59,530—Gates, R.

Developing a Low-Cost Portable Vision Device for Inspecting Agricultural Products for Safety, Agricultural Research Service, \$65,480—Gates, R.

Detection of Robust, Automatic Calibration Algorithms for Online Detection of Diseased and Defective Poultry Carcasses, Agricultural Research Service, \$70,085—Gates, R.

EnergyStar Energy-Efficient State Fair Exhibit, Kentucky Department for Natural Resources, \$20,000—Gates, R., Hash, G.

KSEF R&D Excellence: Development of Embedded Processor Platform for Intelligent Sensors, Kentucky Science and Technology Corporation Inc., \$22,836—Payne, F.

KSEF R&D Excellence: Improved Recovery of Engineered Pharmaceutical Proteins from Tobacco Plant Extract, Kentucky Science and Technology Corporation Inc., \$24,921—Crofcheck, C.

KSEF: R&D Excellence: Monitoring the Bubble Size and Liquid Hold-Up in a Foam Fractionation Column Using a Polarized Light Sensor, Kentucky Science and Technology Corporation Inc., \$15,000—Crofcheck, C.

KSEF: Sensor Technology Development for Monitoring and Control of Curd Syneresis, Kentucky Science and Technology Corporation Inc., \$15,000—Payne, F., Castillo, M.

KSEF: R&D Excellence: Mild Solvent Extraction of Wood Waste to Produce Value-Added Materials, Kentucky Science and Technology Corporation Inc., \$15,000—Montross, M., Crofcheck, C.

Limiting Grazing Cattle Access to Ponds to Improve Water Quality and Water and Feed Intake, Univ. of Georgia, \$14,945—Bicudo, J.

PACE in Kentucky 03-04 Physically Active Community Environments, Kentucky Department for Public Health, \$36,752—Wyatt, C.

Physically Active Community Environments (PACE) in Kentucky, Kentucky Department for Public Health, \$30,480—Wyatt, C.

Precision Agriculture: Development and Assessment of Integrated Practices for Kentucky Producers - Phase V, Cooperative State Research Education and Extension, \$689,110—Shearer, S., Isaacs, S., Mueller, T., Hancock, D., Stombaugh, T., Higgins, S., Wells, L., Debertin, D., Dillon, C., Fleming, R., Vickner, S.

TRACE in Kentucky 03-04 Transportation for Active Community Environments, Kentucky Transportation Cabinet, \$32,937—Wyatt, C.

White Paper on Air Quality and Emissions from Livestock and Poultry Production Systems, North Carolina State Univ., \$10,062—Bicudo, J., Gates, R.

## Community and Leadership Development

Total—\$431,690

- Barriers and Opportunities for Adding Value to Small Ruminant Animals, North Carolina State Univ., \$44,490—*King, B.*
- Expanding Community-Based Retail Opportunities for Agricultural Products through the Woodford County Farmers Market Association, Univ. of Georgia, \$9,700—*King, B.*
- Improve Technical Education Programs through Preservice and Inservice Teacher Education Programs, Kentucky Department for Technical Education, \$8,500—*Peiter, R.*
- Leadership Program to Stimulate the Entrepreneurial Culture in Tobacco Dependent Counties of Northeast Kentucky, Kentucky Governor's Office of Agricultural Policy, \$189,000—*Hustedde, R., Jones, L., Scorsone, E.*
- Local Food Systems and Agricultural Diversification: Opportunities and Obstacles, Cooperative State Research Education and Extension, \$180,000—*Swanson, M.*

## Entomology

Total—\$2,461,282

- Administration and Evaluation of the Southern Region IPM Program, Department of Agriculture, \$20,000—*Knapp, F.*
- APHIS [Animal and Plant Health Inspection Service], Department of Agriculture, \$17,449—*Obrycki, J., Bessin, R., Dillon, C.*
- Biologically-Based Management of White Grubs, Cutworms, and Mound-Building Ants on Golf Courses, U.S. Golf Assoc., \$76,719—*Potter, D.*
- Blight Resistance Alters Foliar Chemistry and Herbivore Pressure: Implications for Restoration of Chestnut into the Eastern Deciduous Forest, Forest Service, \$22,590—*Rieske-Kinney, L.*
- Collaborative Research: Large-Scale Phylogeny of Hymenoptera, National Science Foundation, \$1,379,725—*Sharkey, M.*
- Cooperative Agricultural Pest Survey, Department of Agriculture, \$107,395—*Knapp, F., Dillon, C.*
- Cooperative Agricultural Pest Survey, Department of Agriculture, \$113,935—*Knapp, F., Dillon, C.*
- Evolutionary Genetics of Sexual Size Dimorphism in a Seed-Feeding Beetle, National Science Foundation, \$6,000—*Fox, C., Rauter, C.*
- Identification and Assessment of Potential for Insect Viruses to Sustainable Reduce Eastern Insect Survey of a Megadiverse Country (Phase II): Colombia, National Science Foundation, \$12,000—*Sharkey, M.*
- Kentucky Pest Management Communication and Information Center, Univ. of Florida, \$86,104—*Johnson, D., Bessin, R., Townsend Jr, L.*
- Monitor Gypsy Moth Populations for Slow the Spread Program, Slow the Spread Foundation, \$50,000—*Knapp, F., Collins, J., Harper, C.*
- Potentiation of Pest Control by Insect Immunosuppression, Binational Agricultural Research & Development Fund, \$50,000—*Webb, B.*
- Recovery of Wood Vegetation Following Overstory Mortality from the Southern Pine Beetle - Phase I, Forest Service, \$40,000—*Rieske-Kinney, L.*
- Recovery of Woody Vegetation Following Overstory Mortality from the Southern Pine Beetle -Phase II, Forest Service, \$10,000—*Rieske-Kinney, L.*
- Special Project to Supplement Research on Eastern Tent Caterpillar Control, Grayson Jockey Club Research Foundation Inc., \$50,000—*Potter, D., Townsend Jr, L.*
- Tent Caterpillar Populations in Central Kentucky, Agricultural Research Service, \$97,561—*Webb, B.*
- Trophic Cascades and Interacting Control Processes in a Detritus-Based Terrestrial Food Web, National Science Foundation, \$6,000—*Wise, D.*
- Vector Population Modification Using Wolbachia Symbionts, National Institute of Allergy and Infectious Diseases, \$204,000—*Dobson, S.*
- Wolbachia Research Coordination Network, National Science Foundation, \$15,868—*Dobson, S.*
- Wolbachia Research Coordination Network, National Science Foundation, \$95,936—*Dobson, S.*

## Family and Consumer Sciences

Total—\$897,108

- Environmental Community Garden Project, Environmental Protection Agency, \$20,000—*Bastin, S.*
- Health Education through Extension Leadership (HEEL), Department of Agriculture, \$658,384—*Tanner, B.*
- Providing Healthy Homes for Kentucky Families and Children, Georgia Cooperative Extension, \$5,000—*Heaton, L., Henken, K.*
- University of Kentucky Food Stamp Nutrition Education Plan, Kentucky Families and Children Cabinet, \$213,724—*Kurzynske, J., May, R.*

## Family Studies

Total—\$990,200

- Child Development Assistant/Research Assistantship, Kentucky Educational Television, \$18,560—*Hildreth, G.*
- Evaluation of the Governor's Initiative on Early Childhood Development (Kids Now), Kentucky Governors Office, \$250,000—*Grisham-Brown, J., Hallam, R.*
- Executive Director of the Governor's Office of Early Childhood Development, Kentucky Governors Office, \$94,590—*Townley, K.*
- Improve Technical Education Programs through Preservice and Inservice Teacher Education Programs, Kentucky Workforce Development Cabinet, \$9,800—*Alexander, K.*
- Kentucky Services for Children Who Are Deaf-Blind (2002-03 Main Grant), Kentucky Department of Education, \$60,968—*Grisham-Brown, J.*
- Kentucky Services for Children Who Are Deaf-Blind (2002-03 Main Grant), Kentucky Department of Education, \$123,863—*Grisham-Brown, J.*
- Kentucky Services for Children Who Are Deaf-Blind (2003-2004 Supplement Grant) MIS #1, Kentucky Department of Education, \$13,536—*Grisham-Brown, J.*
- Kentucky Services for Children Who Are Deaf-Blind (2003-2004 Supplement Grant) MIS #2, Kentucky Department of Education, \$27,880—*Grisham-Brown, J.*
- Partnership to Promote Linkages among Assessment Curriculum and Outcomes in Order to Enhance School Success in Head Start Programs, Administration for Children and Families, \$199,916—*Hallam, R., Grisham-Brown, J.*
- Person-Centered Training for Services to Students with Deaf Blindness, Kentucky Department of Education, \$13,536—*Grisham-Brown, J.*
- Promoting Positive Learning Outcomes through an Activity-Based Approach with Young Children with Disabilities, Department of Education, \$174,051—*Grisham-Brown, J.*
- Transdisciplinary Service Delivery for Children with Severe and Multiple Disabilities Including Deaf Blindness, Kentucky Commission for Children with Special Health Care Needs, \$3,500—*Haynes, D.*

## Forestry

Total—\$1,806,576

- Biotic Control of Calcium Supply: Distinguishing Sources to Regrowing Forests, State Univ. of New York, \$22,951—*Arthur, M.*
- Carbon Sequestration on Surface Mine Lands, Department of Energy, \$334,000—*Graves, D., Warner, R.*
- Cerulean Warbler and Golden Wing Warbler Status and Distribution in Kentucky, Kentucky Department of Fish and Wildlife, \$40,000—*Maehr, D.*
- Effects of an Introduced Pest on the C and N Dynamics of a Northern Hardwood Forest, Institute of Ecosystems Studies, \$32,653—*Arthur, M.*
- Elk Effects on Landscape, Successional, and Community Processes in Eastern Kentucky, Rocky Mountain Elk Foundation, \$10,500—*Maehr, D.*
- Establishing Baselines for Nitrogen Cycling in Mammoth Cave National Park Forests, National Park Service, \$15,018—*Arthur, M.*
- Establishing Baselines for Nitrogen Cycling in Mammoth Cave National Park Forests, National Park—Service, \$15,000—*Rhoades, C.*
- Evaluation of Two-Aged Silviculture Options for Upland Hardwoods, Forest Service, \$5,034—*Stringer, J.*

Hyporheic Zone Development and Water Quality Improvement in a Restored Riparian Area, Forest Service, \$77,000—*Barton, C.*  
 Implementing Strategies for Drying and Pressing Wood without Emissions Controls, Institute of Paper Science and Technology, \$67,840—*Conners, T.*  
 Influence of Riparian Management Prescriptions on the Use of Upland and Riparian Habitats by Bats in Forests of the Pacific Northwest, Northwest Bat Cooperative, \$40,000—*Lacki, M.*  
 Post-Mining Reforestation Demonstration Project III, Forest Service, \$978,000—*Graves, D., Warner, R.*  
 Restoration of Elk and Colonization of Black Bears in Kentucky, Kentucky Department of Fish and Wildlife, \$125,000—*Maehr, D.*  
 Restoration of the American Peregrine Falcon (*Falco peregrines anatum*) to the Cliff Habitats in Kentucky, Kentucky Department of Fish and Wildlife, \$10,580—*Lacki, M.*  
 Status, Distribution, and Reproductive Characteristics of River Otters (*Lontra canadensis*) in Western Kentucky, Kentucky Department of Fish and Wildlife, \$8,000—*Lacki, M., Dzialak, M.*  
 Status, Distribution, and Reproductive Characteristics of River Otters in Kentucky, Kentucky Department of Fish and Wildlife, \$25,000—*Lacki, M., Dzialak, M.*

#### 4-H

Total—\$261,776

Kentucky Youth Development Partnership, Administration for Children and Families, \$120,000—*Delahanty, T., Kurth, J.*  
 State Youth Development Collaboration Demonstration Project, Administration on Children, Youth and Families, \$21,776—*Duncan, G., Stivers W.*  
 State Youth Development Collaboration Demonstration Project, Administration on Children, Youth and Families, \$120,000—*Duncan, G., Stivers W.*

#### Horticulture

Total—\$3,430,188

Analysis of Dislodgeable Residues from Strawberry Leaves, National Institute of Occupational Safety and Health, \$7,480—*Snyder, J.*  
 Chloroplast-Localized N-Terminal Protein Processing by Peptide Deformylase, National Science Foundation, \$200,000—*Dirk, Lee, C., Houtz, R., Williams, M.*  
 Enhancing the Native Tree Walk and Web Site Associated with the UK Arboretum, Kentucky Department for Natural Resources, \$12,200—*Durham, R., Geneve, R.*  
 Ginseng/Goldenseal Research Project 2002-2003, Kentucky Department of Agriculture, \$8,000—*Jones, R.*  
 Ginseng/Goldenseal Research Project 2003-2004, Kentucky Department of Agriculture, \$8,000—*Jones, R.*  
 Kentucky Horticulture Council Grant 2, Kentucky Horticulture Council, \$2,149,100—*Ingram, D.*  
 KSTC: R&D Voucher: Database Design and Usability Testing for Advanced Digital Information Systems in Horticulture, Athenic Systems, \$136,298—*Williams, M.*  
 Mechanism and Significance of Post-Translational Modifications in the Large Subunit of Ribulose Biphosphate Carboxylase/Oxygenase, Energy Research, \$220,000—*Houtz, R.*  
 New Crop Opportunities Phase IV, Department of Agriculture, \$689,110—*Ingram, D., Ibendahl, G., Woods, T., Lee, C., Grove, J., Pfeiffer, T., Van Sanford, D., McNeill, S., Williams, M., McNiel, R., Anderson, R.*

#### International Programs

Total—\$64,165

Curriculum Development at the Cherkassy Institute of Management (Ukraine), Alabama A&M University, \$58,008—*Reed, M.*  
 Scholarships for Thai Ministry of Agriculture Officials, Thai Ministry of Agriculture and Cooperatives, \$6,157—*Reed, M.*

#### Kentucky Tobacco Research and Development Center

Total—\$55,681

Development of a Novel *in vitro* Model for the Study of Traumatic Brain Injury, Kentucky Spinal Cord and Head Injury Research Trust, \$55,681—*Prendergast, M.*

#### Livestock Disease Diagnostic Center

Total—\$543,500

Cooperative Homeland Security Agreement, Kentucky Department of Agriculture, \$30,000—*Harrison, L.*  
 Diagnostic Laboratory Services for Farmers and Agribusinesses, Kentucky Department of Agriculture, \$370,000—*Harrison, L.*  
 Fall MRLS Disease Study, Kentucky Department of Agriculture, \$40,000—*Harrison, L.*  
 West Nile Surveillance of Horses and Birds, Kentucky Department for Public Health, \$21,500—*Harrison, L., Vickers, M.*  
 West Nile Surveillance of Horses and Birds, Kentucky Department for Public Health, \$82,000—*Harrison, L., Vickers, M.*

#### Merchandising, Apparel and Textiles

Total—\$38,937

Quality Control Laboratory for NAILM, National Association of Institutional Linen Management, \$38,937—*Easter, E.*

#### Plant Pathology

Total—\$1,331,543

Advanced Genetic Technologies, Cooperative State Research Education and Extension, \$626,887—*Schardl, C., Matthews, J., McLeod, K., Downie, A., Ghabrial, S., Howe, D., Timoney, J.*  
 Characterization of Host Factors Involved in Plant Virus Replication Using Yeast as a Host, Cooperative State Research Education and Extension, \$75,000—*Nagy, P.*  
 Characterization of HRT-Mediated Resistance to Turnip Crinkle Virus in Arabidopsis, Boyce Thompson Institute for Plant Research, \$124,840—*Kachroo, P.*  
 Development of Management Strategies to Control Major Soybean Virus Diseases in the North Central States, Iowa State Univ., \$28,366—*Ghabrial, S.*  
 Dissecting the Mechanism of Viral RNA Recombination, National Institute of Allergy and Infectious Diseases, \$68,000—*Nagy, P.*  
 Extraction and Identification of Antimycotic Compounds from *Acremonium implicatum* Infected Brachiaria Grasses, Centro Internacional de Agricultura Tropical, \$20,000—*Schardl, C.*  
 KSEF R&D Excellence: Development of a Novel Biotechnology Tool Based on RNA Recombination, Kentucky Science and Technology Corporation Inc., \$22,744—*Nagy, P.*  
 KSEF R&D Excellence: Identification of Signal(s) Modulating Cross Talk between Defense Signaling Pathways, Kentucky Science and Technology Corporation Inc., \$14,850—*Kachroo, P.*  
 Molecular Biology and Biosynthesis of Lolines by Grass Endophytes, National Science Foundation, \$26,143—*Schardl, C., Bush, L.*  
 Molecular Biology and Biosynthesis of Lolines by Grass Endophytes, National Science Foundation, \$130,000—*Schardl, C., Bush, L.*  
 Pierce's Disease of Grapes Caused by *Xylella fastidiosa*: A Survey for the Pathogen, Identification of Reservoir Hosts, and Identification of Insect Vectors in Kentucky Vineyards, Cornell Univ., \$10,000—*Hartman, J., Bessin, R., Strang, J., Beale, J., Schardl, C.*  
 Pierce's Disease of Grapes Caused by *Xylella fastidiosa*: A Survey for the Pathogen, Identification of Reservoir Hosts, and Identification of Insect Vectors in Kentucky Vineyards, Cornell Univ., \$15,000—*Hartman, J., Bessin, R., Strang, J., Beale, J., Schardl, C.*  
 Southern Region Plant Diagnostic Laboratory Network Kentucky Co-operating National Plant, Univ. of Florida, \$44,000—*Nesmith, W.*

Survey and Epidemiology of Soybean Mosaic Virus and Bean Pod Mottle Virus in Late Planted Soybean in Kentucky, Kentucky Soybean Promotion Board, \$10,000—*Ghabrial, S., Hershman, D.*  
Whole Genome Analysis of Pathogen-Host Recognition and Subsequent Responses in the Rice Blast Patho-System, North Carolina State Univ., \$115,713—*Farman, M.*

### **Regulatory Services**

Total—\$28,144

Feed Establishment Inspections, Food and Drug Administration, \$28,144—*Traylor, S.*

### **School of Human Environmental Sciences-Administration**

Total—\$14,940

Lexington-Fayette County Living Wage Study, Community Action Council for Lexington-Fayette, \$14,940—*Heath, C.*

### **Veterinary Science**

Total—\$868,820

Cartilage-Specific Fibronectin Isoform and Osteoarthritis, Arthritis Foundation, \$116,726—*MacLeod, J.*

Combination Vaccination for Equine Influenza Flu Avert Plus Encevac TC-4, Intervet Inc., \$85,220—*Chambers, T.*

EIA Vaccine Trial, Univ. of Pittsburgh, \$49,450—*Issel, C.*

EIAV Envelope Variation and Vaccine Efficacy, Univ. of Pittsburgh, \$199,424—*Issel, C.*

Galactokinase 1: A Candidate Gene for Juvenile Cataracts in Dogs, AKC Canine Health Foundation, \$3,000—*Graves, K.*

Mucosally Immunogenic Surface Exposed Proteins of *Streptococcus equi*, Grayson Jockey Club Research Foundation Inc., \$46,500—*Timoney, J., Artiushin, S., Walker, J.*

Quality Assurance/Blind Sample Testing and New Analytical Methods/Metabolite Synthesis/Standardized Testing Research, Kentucky State Racing Commission, \$243,500—*Tobin, T.*

Quantitation of Murine Antibodies and Cytokines in Bronchoalveolar Lavage and Serum Samples, Louisiana State Univ., \$125,000—*Issel, C.*

## **MULTI-DISCIPLINARY GRANTS LED BY OTHER COLLEGES**

(College of Agriculture co-investigators are listed.)

Total—\$3,642,486

Aluminum Bioavailability from Foods, National Institute of Environmental Health Sciences, \$219,531—*Buxton, J.*

Antiapoptotic Neuroprotection by Nicotine in Spinal Cord Injury, Research Management Group, \$184,372—*Hennig, B.*

Brain Endothelial Cell TNF and Tat-Induced Cell Injury, National Institute of Mental Health, \$253,400—*Hennig, B.*

Development of a Novel Optical Radiation Depolarization Technique for Online Measurements of Particle and Bubble Sizes, Virginia Polytechnic Institute and State Univ., \$73,385—*Crofcheck, C.*

Drive Unit Improvement and Bioreactor Development, Levtech Inc., \$56,987—*Chappell, J.*

Ethanol, Tat, and Dysfunction of Brain Endothelium, National Institute on Alcohol Abuse and Alcoholism, \$147,000—*Hennig, B.*

Exploring Changes, Kentucky Department of Education, \$57,979—*Hanley, C.*

Exploring Kentucky's Ecosystems: A Road Trip across Kentucky, Kentucky Department of Education, \$57,028—*Hanley, C.*

Fellowship for Gudrun Reiterer: Zinc, PPAR, and Endothelial Cell Activation, American Heart Association Ohio Valley Affiliate, \$17,000—*Hennig, B.*

HIV Interventions for Young Appalachian Risk Takers, National Institute of Mental Health, \$360,927—*Hansen, G.*

National Early Childhood Transition Center, Department of Education, \$1,399,605—*Hallam, R.*

Rural Health Bioterrorism and Emergency Preparedness, Univ. of Louisville, \$393,404—*Newman, M., Priddy, K., Hustedde, R., Nesmith, W., Scharko, P.*

State Water Resources Research Institute Grant, Geological Survey, \$84,234—*Coyne, M.*

State Water Resources Research Institute Grant, Geological Survey, \$84,234—*Matocha, C.*

Tat-Mediated Brain Endothelial Cell Dysfunction, National Institute of Neurological Disorders & Stroke, \$253,400—*Hennig, B.*

# Intellectual Property

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## PATENTS ISSUED

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### Agronomy

Joseph Chappell and co-inventors Kathleen R. Manna, Joseph P. Noel, and Courtney M. Starks received a patent for "Synthases." Patent No. 6,645,762. Issued Nov. 11.

Joseph Chappell and co-inventors Shaohui Yin and Catherine Cornett received a patent for "Pathogen- or Elicitor-Inducible Transcription Regulatory Element from the Tobacco 5-Epi-Aristolochene Synthase Gene and Plants Transformed Therewith." Patent No. 6,605,764. Issued Aug. 12.

Joseph Chappell and co-inventors Kathleen R. Manna, Joseph P. Noel, and Courtney M. Starks received a patent for "Synthases." Patent No. 6,569,656. Issued May 27.

Joseph Chappell and co-inventors Kathleen R. Manna, Joseph P. Noel, and Courtney M. Starks received a patent for "Synthases." Patent No. 6,559,297. Issued May 6.

### Plant Pathology

Richard R. Muse (Engineering, Center for Manufacturing) and co-inventors Lisa J. Vaillancourt (Plant Pathology) and William J. Young received a patent for "Cutter Assembly for a Microscope and Related Method." Patent No. 6,601,488. Issued Aug. 5.

## GENBANK REGISTER

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### Agronomy

Hatanaka, T., and D.F. Hildebrand. Expression of a *Stokesia laevis* epoxxygenase gene. DEFINITION *Stokesia laevis* 12 fatty epoxxygenase mRNA, complete cds. ACCESSION AY462108.

Siminszky, B., A.M. Freytag, B.S. Sheldon, and R.E. Dewey. Coexpression of a NADPH:P450 reductase enhances CYP71A10-dependent phenylurea metabolism in tobacco. DEFINITION Soybean NADPH: Cytochrome P450 reductase mRNA, complete cds. ACCESSION AY170374.

### Animal Sciences

Matthews, J.C. Expression of ASCT1 mRNA by cattle. DEFINITION *Bos taurus* sodium-dependent neutral amino acid transporter ASCT1 mRNA, partial cds. ACCESSION AY186583.

Matthews, J.C., and N.M.P. Etienne. Differential expression of system N1 mRNA by developing cattle. DEFINITION *Bos taurus* Na<sup>+</sup> and H<sup>+</sup> coupled amino acid transport system N1 mRNA, partial cds. ACCESSION AY186584.

Matthews, J.C., and N.M.P. Etienne. The pattern of EAAC1 and GLT-1 glutamate transporter expression by skeletal and adipose tissues of fattening cattle differs from that of glutamine synthetase. DEFINITION *Bos taurus* glutamine synthetase mRNA, partial cds. ACCESSION AY186585.

Matthews, J.C., and N.M.P. Etienne. EAAC1 is the major high-affinity L-glutamate transporter and expression is upregulated during differentiation of neonatal porcine enterocytes. DEFINITION *Sus scrofa* high-affinity glutamate transporter EAAC1 mRNA, partial cds. ACCESSION AY195622.

### Horticulture

Nosarzewski, M., B. Downie, and D.D. Archbold. *Malus x domestica* NAD-dependent sorbitol dehydrogenase 1 mRNA, complete cds. ACCESSION No. AY0244806.

Nosarzewski, M., B. Downie, and D.D. Archbold. *Malus x domestica* NAD-dependent sorbitol dehydrogenase 2 mRNA, partial cds. ACCESSION No. AY0244807.

Nosarzewski, M., B. Downie, and D.D. Archbold. *Malus x domestica* NAD-dependent sorbitol dehydrogenase 2 gene, partial cds. ACCESSION No. AY0244808.

Nosarzewski, M., B. Downie, and D.D. Archbold. *Malus x domestica* NAD-dependent sorbitol dehydrogenase 3 gene, partial cds. ACCESSION No. AY0244809.

Nosarzewski, M., B. Downie, and D.D. Archbold. *Malus x domestica* NAD-dependent sorbitol dehydrogenase 9 mRNA, complete cds. ACCESSION No. AY0244810.

Nosarzewski, M., B. Downie, and D.D. Archbold. *Malus x domestica* NAD-dependent sorbitol dehydrogenase 5 gene, partial cds. ACCESSION No. AY0244811.

Nosarzewski, M., B. Downie, and D.D. Archbold. *Malus x domestica* NAD-dependent sorbitol dehydrogenase 8 gene, partial cds. ACCESSION No. AY0244812.

Nosarzewski, M., B. Downie, and D.D. Archbold. *Malus x domestica* NAD-dependent sorbitol dehydrogenase 7 gene, partial cds. ACCESSION No. AY0244813.

Nosarzewski, M., B. Downie, and D.D. Archbold. *Malus x domestica* NAD-dependent sorbitol dehydrogenase 6 gene, partial cds. ACCESSION No. AY0244814.

### Plant Pathology

Zhao, T., W.M. Havens, and S.A. Ghabrial. The virus-induced diseased phenotype in *Cochliobolus (Helminthosporium) victoriae* is independent of overexpression of the cellular RNA-binding protein Hv-p68. *Hv-p68* gene, complete cds. ACCESSION AY497010.

### Veterinary Science

Graves, K.T. and R.B. Ennis. Exon scan of the canine galactokinase (GALK1) gene in dog breeds affected with juvenile cataract. DEFINITION *Canis familiaris* galactokinase (GALK1) gene, complete cds. ACCESSION AY267338.

Zhang, D., T. Asai, and D.K. Howe. Identification of a nucleoside triphosphate hydrolase in *Sarcocystis neurona*. DEFINITION *Sarcocystis neurona* nucleoside triphosphate hydrolase (NTP) mRNA, complete cds. ACCESSION AY325815.

# Publications

All publication dates in this section are 2003 unless otherwise noted.

## ANNUAL REPORT

*One Hundred and Fifteenth Annual Report of the Kentucky Agricultural Experiment Station for 2002.* College of Agriculture, University of Kentucky, M. Scott Smith, Director. June.

## BOOKS AND BOOK CHAPTERS

### Agricultural Economics

Dillon, C.R. A framework for economic analysis of cropping systems: Profitability, risk management and resource allocation. pp. 409-432. IN: Anil Shrestha, ed. *Cropping Systems: Trends and Advances*. Haworth Press.

Freshwater, David. The new open economy: What has changed in rural areas. pp. 25-36. IN: G. Dalton, J. Bryden, M. Shucksmith, and K. Thomson, eds. *European Rural Policy at the Crossroads*. Arkleton Center for Rural Development Research, Aberdeen, Scotland.

Freshwater, David. Will manufacturing remain a pillar of rural development? IN: *The Future of Rural Policy*. OECD, Paris.

Marchant, Mary A., and Francis Tuan, guest editors. AgBioForum: The Journal of Agrobiotechnology Management and Economics. Special Issue: Agricultural Biotechnology in China. 178 pp.

Zhong, Funing, Mary A. Marchant, Yulian Ding, and Kaiyu Lu. GM foods: A Nanjing case study of Chinese consumers' awareness and potential attitudes. pp. 254-267. IN: Proceedings, International Symposium on Food Safety: Consumers, Trade and Regulation Issues, Hangzhou, China. October.

### Agronomy

Baskin, J.M., and C.C. Baskin. New approaches to the study of the evolution of physical and physiological dormancy, the two most common classes of seed dormancy on earth. pp. 371-380. IN: G. Nicolás, K.J. Bradford, D. Côme, and H.W. Pritchard, eds. *The Biology of Seeds: Recent Research Advances*. CABI Publishing, Wallingford, U.K.

Dinkins, R.D., M.S.S. Reddy, C.A. Meurer, C.T. Redmond, and G.B. Collins. Recent advances in soybean transformation. pp. 3-21. IN: P.K. Jaiwal and R.P. Singh, eds. *Focus on Biotechnology*, Vol 10B. Applied Genetics of Leguminosae Biotechnology. Kluwer Academic Publishers, Great Britain.

Greenhagen, B.T., M.A. Schoenbeck, Y.S. Yeo, and J. Chappell. The chemical wizardry of isoprenoid metabolism in plants. pp. 231-251. IN: John T. Romeo, ed. *Integrative Phytochemistry: From Ethnobotany to Molecular Ecology*. Pergamon Press, Boston.

Hildebrand, D. and K. Yu. Genetics of crop improvement; Primary metabolism—acyl lipids. pp. 464-477. IN: D. Murphy, ed. *Encyclopedia of Applied Plant Sciences*. Elsevier Science B.V.

Palmer, R.G., T.W. Pfeiffer, G.R. Buss, and T.C. Kilen. Qualitative genetics. pp. 137-233. IN: H.R. Boerma and J.E. Specht, eds. *Soybeans: Improvement, Production, and Uses*. 3rd ed. American Society of Agronomy, Madison, Wis.

Taylor, N. L. Distribution of perennial *Trifolium*. pp. 81-89. IN: S. J. Bennett, ed. *New Perennial Legumes from Sustainable Agriculture*. University of Western Australia Press, Perth.

### Animal Sciences

Krehbeil, C.R., and J.C. Matthews. Absorption of amino acids and peptides. Chapter 3, pp. 41-70. IN: J. P. F. D'Mello, ed. *Amino Acids in Animal Nutrition*, 2nd ed. CAB International, Wallingford.

Schillo, K.K. Puberty. pp. 2145-2152. IN: *Encyclopedia of Dairy Sciences*. Academic Press.

### Biosystems and Agricultural Engineering

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C.L. Hicks contributed to two publications with primary author in the Biosystems and Agricultural Engineering Department.

S.T. Franklin contributed to one publication with primary author in the Agricultural Economics Department.

In addition, members of the department published 54 abstracts.

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T.S. Stombaugh and S.A. Shearer contributed to one publication with primary author in the Agronomy Department.

In addition, members of the department published six abstracts.

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In addition, members of the department published five abstracts.

## Family Studies

Partial list available at the time of publication.

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C.D. Barton contributed to one publication with primary author in the Agronomy Department.

In addition, members of the department published 15 abstracts.

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H. Conn, L. Dirk, M. Williams, and R. Houtz contributed to one publication with primary author in the Agronomy Department.

R.L. Geneve and J.W. Buxton contributed to one publication with primary author in the Biosystems and Agricultural Engineering Department.

In addition, members of the department published seven abstracts.

## Livestock Disease Diagnostic Center

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D.C. Bolin contributed to two publications with primary author in the Forestry Department.

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- P. Vincelli contributed to one publication with primary author in the Forestry Department.*
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- Veterinary Science**
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K. McDowell contributed to one publication with primary author in the *Livestock Disease Diagnostic Center*.

In addition, members of the department published 37 abstracts.

## OTHER RESEARCH PUBLICATIONS

### Agricultural Economics

- Dillon, C.R. and J. Grove. A profitability and risk management potential of different remedial processes for low yielding areas. American Society of Agronomy/Crop Science Society of America/Soil Science Society of America Meeting, Nov. 2-6, Denver, Colo.
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Bolin, D.C., Harrison, L.R., Donahue, J.M., Giles, R.C., Hong, C.B., Poonacha, K.B., Roberts, J.F., Sebastian, M.M., Sells, S.F., Smith, R.A., Swerczek, T.W., Tramontin, R.R., Vickers, M.L., and Williams, N.M. The pericarditis correlate of mare reproductive loss syndrome. pp. 25-27. IN: D.G. Powell, A. Troppman, and T. Tobin, eds. Proceedings, First Workshop on Mare Reproductive Loss Syndrome, Kentucky Agricultural Experiment Station, University of Kentucky, Lexington.  
Bolin, D.C., Donahue, J.M., and Vickers, M.L. Equine abortion associated with *Cellulosimicrobium cellulans* infection. 22nd Annual Summer Meeting, Midwest Association of Veterinary Pathologists. Carrollton, Kentucky. Aug. 14-15.  
Bryant, U., Giles, R., Roberts, J., Donahue, M., Sells, S., and Bolin, D. Mycobacterial abortion in a Thoroughbred mare. 22nd Annual Summer Meeting, Midwest Association of Veterinary Pathologists, Aug. 14-15, Carrollton, Kentucky.  
Callahan, J.D., S.F. Sells, T.A. Gay, M.E. Reos, M.L. Vickers, G.W. Long, W.M. Nelson. Detection of West Nile virus in equine neurological tissue by real-time RT-PCR. 46th Annual Conference of American Assoc. of Vet. Lab. Diagnosticians, Oct. 11-13, San Diego, Calif.  
Donahue, J., Sells S., Giles R., Harrison L., Hong C., Poonacha K., Roberts J., Sebastian M., Smith R., Swerczek T., Tramontin R., Vickers M., Williams N. Bacteria associated with mare reproductive loss syndrome: Late fetal losses. pp. 27-29. IN: D.G. Powell, A. Troppman, and T. Tobin, eds. Proceedings, First Workshop on Mare Reproductive Loss Syndrome, Kentucky Agricultural Experiment Station, University of Kentucky, Lexington.  
Jackson, C.B. Case report on Protozoal colitis/typhlitis in a horse. 22nd Annual Summer Meeting, Midwest Association of Veterinary Pathologists meeting, Aug. 14-15, Carrollton, Kentucky.

Poonacha, K.B., Bolin, D., Jackson, C., Giles, R.C., Harrison, L., Hong, C.B., Sebastian, M.M., Roberts, J., Williams, N., Sells, S., Vickers, M.L. The pathology of equine West Nile virus infection outbreak in Kentucky USA. p. 4. Proceedings, 11th International Symposium of the World Association of Veterinary Laboratory Diagnosticians.  
Roberts, J.F., Bolin, D.C., Giles, R.C., and Donahue, J.M. Lymphoma in an Argentine boa constrictor. 22nd Annual Summer Meeting, Midwest Association of Veterinary Pathologists, Aug. 14-15, Carrollton, Kentucky.  
Rung, S.M., Kuehl, T.J., Jackson, C.B., Estrada, E.A., and Reyes, M. Subchronic toxicity of the gadolinium chelates. International Contrast Media Research Symposium, Oct. 28-Nov. 1, San Diego, California.  
Scharko, P.B. Solving cattle producer's problems. 40th Annual Veterinary Conference and Alumni Reunion, University of Georgia, Athens. April.  
Scharko, P.B. Livestock disease diagnostic update. Morehead Clinic Days, Morehead, Ky. June.  
Scharko, P.B. Use and performance of a non-specific immune stimulant (Immunoboost™) in cattle. Academy of Veterinary Consultants. Kansas City, Mo. July.  
Scharko, P.B. Solving cattle producer's problems. Kentucky Veterinary Medical Association MidAmerica Conference, Louisville. October.  
Sebastian, M., Williams, D., Harrison, L., Donahue, J., Seahorn, T., Slovis, N., Richter, D., Fuller, T., Trail, C., Douglas, R., and Tobin, T. Experimentally induced mare reproductive loss syndrome late fetal losses with eastern tent caterpillars. pp. 80-81. IN: D.G. Powell, A. Troppman, T. Tobin, eds. Proceedings, First Workshop on Mare Reproductive Loss Syndrome, Kentucky Agricultural Experiment Station, University of Kentucky, Lexington.  
Williams, N.M., Bolin, D.C., Donahue, J.M., Giles, R.C., Harrison, L.R., Hong, C.B., Poonacha, K.B., Roberts, J.F., Sebastian, M.M., Smith, B.J., Smith, R.A., Swerczek, T.W., Tramontin, R.R., Vickers, M.L. Gross and histopathological correlates of mare reproductive loss syndrome. pp. 24-25. IN: D.G. Powell, A. Troppman, T. Tobin, eds. Proceedings, First Workshop on Mare Reproductive Loss Syndrome, Kentucky Agricultural Experiment Station, University of Kentucky, Lexington.  
Williams, N.M., Donahue, J.K., Bolin, D.C., Giles, R.C., Harrison, L.R., Hong, C.B., Jackson, C.B., Poonacha, K.B., and Vickers, M.L. Equine placental pathology: Kentucky perspective. Equine Placental Workshop, University of Kentucky Maxwell H. Gluck Equine Center, Dec. 5-6, Lexington.

### Plant Pathology

Bachi, P.R., J.W. Beale, J.R. Hartman, D.E. Hershman, W.C. Nesmith, and P. Vincelli. Plant Diseases in Kentucky—Plant Disease Diagnostic Laboratory Summary, 2002. UK Department of Plant Pathology.  
Hershman, D.E. 2003 Foliar fungicide test results. UK Wheat Science Research Report 6-7.  
Uddin, W., G. Viji, and P. Vincelli. Gray leaf spot of perennial ryegrass: An emerging problem for the turfgrass industry. USGA Record 7-13. Nov./Dec.  
Vincelli, P., and E. Dixon. Evaluation of spray programs for controlling Qi-resistant strains of *Pyricularia grisea* on perennial ryegrass, 2002. Fungicide and Nematicide Tests 58:T007.  
Vincelli, P., and E. Dixon. Summer fungicide spray programs for putting greens. Golf Course Management 87-90. June.  
Vincelli, P. Controlling gray leaf spot—failures and options. Turf News 61-62. Jan/Feb.  
Vincelli, P. EPA restrictions on chlorothalonil make sense. Turfgrass Trends 47-50, Golfdom, March.  
Vincelli, P., E. Dixon, D. Williams, and P. Burrus. Efficacy of fungicides for control of brown patch of creeping bentgrass on a sand-based green, 2002. Fungicide and Nematicide Tests 58:T012.  
Vincelli, P., E. Dixon, D. Williams, and P. Burrus. Efficacy of fungicides for control of brown patch on a mixed creeping bentgrass/*Poa annua* soil-based green, 2002. Fungicide and Nematicide Tests 58:T013.  
Vincelli, P., E. Dixon, D. Williams, and P. Burrus. Efficacy of fungicides for control of dollar spot of creeping bentgrass managed as a fairway, 2002. Fungicide and Nematicide Tests 58:T014.

- Vincelli, P., E. Dixon, D. Williams, and P. Burrus. Efficacy of fungicides for control of gray leaf spot of perennial ryegrass, 2002. *Fungicide and Nematicide Tests* 58:T015.
- Vincelli, P., E. Dixon, D. Williams, and P. Burrus. Efficacy of fungicides for control of brown patch of tall fescue, 2002. *Fungicide and Nematicide Tests* 58:T016.
- Vincelli, P., E. Dixon, D. Williams, and P. Burrus. Variation among cultivars in susceptibility to spring dead spot of bermudagrass under fairway management, 2002. *Biological and Cultural Tests* 18:T012.
- Vincelli, P., E. Dixon, D. Williams, and P. Burrus. Efficacy of fungicides for control of dollar spot of creeping bentgrass on a sand-based green, 2002. *Fungicide and Nematicide Tests* 58:T010.
- Vincelli, P., E. Dixon, D. Williams, and P. Burrus. Efficacy of fungicides for control of dollar spot in a mixed creeping bentgrass/*Poa annua* soil-based green, 2002. *Fungicide and Nematicide Tests* 58:T011.
- Vincelli, P., R. Spitaleri, and E. Dixon. Evaluation of selected alfalfa cultivars and breeding lines for resistance to *Sclerotinia* crown and stem rot, 2002. *Biological and Cultural Tests* 18:F001.
- Veterinary Science**
- Camargo, F., L. Dirikolu, M. Sebastian, C. Hughes, J. Crutchfield, J.D. Harkins, J. Boyles, A. Troppman, K. McDowell, L. Harrison, and T. Tobin. Cyanide and mandelonitrile and their role in mare reproductive loss syndrome: A preliminary communication. pp. 303-307. *Proceedings, 14th International Conference of Racing Analysts & Veterinarians*, Orlando, Fla.
- Dirikolu, L., A.F. Lehner, C. Hughes, W. Karpiesiuk, F.C. Camargo, J.D. Harkins, W.E. Woods, J. Bosken, J. Boyles, A. Troppman, M. Fisher, and T. Tobin. Detection, quantification and pharmacokinetics of furosemide in horses: A preliminary report. pp. 29-33. *Proceedings, 14th International Conference of Racing Analysts & Veterinarians*, Orlando, Fla.
- Dirikolu, L., B.A. Mollett, W.E. Woods, C. Bratton, A.F. Lehner, W. Karpiesiuk, C. Hughes, J. Boyles, J.D. Harkins, A. Troppman and T. Tobin. Albuterol by torpex and apparent ELISA "Detection Times": A preliminary report. pp. 337-342. *Proceedings, 14th International Conference of Racing Analysts & Veterinarians*, Orlando, Fla.
- Dwyer, R.M. Commentary. *Lloyd's Equine Disease Quarterly* 12(3):1.
- Dwyer, R.M. I never thought it would happen to me. *The Horse* 20(9):73-77.
- Harkins J.D., L. Dirikolu, A.F. Lehner, C. Hughes, D. Schroedter, B. Mayer, C. Bratton, M.V. Fisher, and T. Tobin. The detection and biotransformation of guanabenz in horses: A preliminary report. *Veterinary Therapeutics* 4(2):197-209.
- Harkins, J.D., L. Dirikolu, M. Sebastian, C. Hughes, J. Crutchfield, A. Troppman, J. Boyles, B. Webb, K. McDowell, W. Long, J. Henning, L. Harrison, T. Fitzgerald, and T. Tobin. Cherry trees, plant cyanogens, caterpillars, and mare reproductive loss syndrome: Toxicological evaluation of a working hypothesis. pp. 68-74. IN: D.G. Powell, A. Troppman, and T. Tobin, eds. *Proceedings, First Workshop on Mare Reproductive Loss Syndrome*, Kentucky Agricultural Experiment Station, University of Kentucky, Lexington.
- McDowell, K. An overview of mare reproductive loss syndrome. pp. 37-40. *Proceedings, Zwolse International Stallion Show*, Lexington, Kentucky.
- McDowell, K. Use of recommended insecticides in the vicinity of broods. pp. 96-98. IN: D.G. Powell, A. Troppman, and T. Tobin, eds. *Proceedings, First Workshop on Mare Reproductive Loss Syndrome*, Kentucky Agricultural Experiment Station, University of Kentucky, Lexington.
- McDowell, K., R. Allman, and J. Henning. Phytoestrogens and estrogenic activity in white clover samples from no loss and high loss fields during mare reproductive loss syndrome 2001. pp. 63-65. IN: D.G. Powell, A. Troppman, and T. Tobin, eds. *Proceedings, First Workshop on Mare Reproductive Loss Syndrome*, Kentucky Agricultural Experiment Station, University of Kentucky, Lexington.
- Powell, D.G. West Nile virus 2002. *Equine Veterinary Education* 5:88.
- Sebastian, M., D. Harkins, C. Jackson, T. Fuller, C. Trail, D. Richter, L. Harrison, and T. Tobin. A laboratory animal model of mare reproductive loss syndrome: Preliminary evaluation of a mouse model. pp. 51-53. IN: D.G. Powell, A. Troppman, and T. Tobin, eds. *Proceedings, First Workshop on Mare Reproductive Loss Syndrome*, Kentucky Agricultural Experiment Station, University of Kentucky, Lexington.
- Sebastian, M., D. Williams, L. Harrison, J. Donahue, T. Seahorn, N. Slovis, D. Richter, T. Fuller, C. Trail, R. Douglas, and T. Tobin. Experimentally induced mare reproductive loss syndrome late fetal losses with eastern tent caterpillars. pp. 80-81. IN: D.G. Powell, A. Troppman, and T. Tobin, eds. *Proceedings, First Workshop on Mare Reproductive Loss Syndrome*, Kentucky Agricultural Experiment Station, University of Kentucky, Lexington.
- Stirling, K., R. Bellocq, and T. Tobin. National Horsemen's Benevolent and Protective Association Inc. Proposed national policy on drug testing and therapeutic medication. *Journal of Equine Veterinary Science* 23(1):4-5, 18-40.
- Timoney, P.J. West Nile virus: Controlling the risk to your horse. Educational brochure published by the American Association of Equine Practitioners.
- Timoney, P.J. Commentary. *Equine Disease Quarterly* 12(4):1.
- Timoney, P.J. West Nile virus: Controlling the risk to your horse. <http://www.xcodesign.com/aaep/displayArticles.cfm?ID=219>
- Timoney, P.J., and U. Wernery. Special report: International conference on equine grass sickness, Dubai, United Arab Emirates. *The Veterinary Journal* 165:7-10.
- Tobin, T. Session 5 Summary. p. 75. IN: D.G. Powell, A. Troppman, and T. Tobin, eds. *Proceedings, First Workshop on Mare Reproductive Loss Syndrome*, Kentucky Agricultural Experiment Station, University of Kentucky, Lexington.

# Graduate Degrees

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## PH.D. DISSERTATIONS

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### Agricultural Economics

- Kanakasabai, Murali. Essays on farm adaptation to climatic change.
- Miriti, Kimathi. Hedging smallholder common risk with instruments for microfinance.
- Yeboah, Godfred. Demand specification and functional form selection: A case study of Japanese meat demand.

### Agronomy

- Abdel-Reheem, Mohammed. Apperception and appraisal of the mechanism of  $\omega$ -3 fatty acid accumulation in high  $\omega$ -3 fatty acid producing plants.
- Adams, Christopher Allan. A comparative study of seed morphology, dormancy, and germination of four closely-related *Aristolochia* subgenus *Siphisia* species (Aristolochiaceae, Piperales); a test of two hypotheses on ecological changes in species within a lineage through geological time.
- Bhavsar, Victoria M. Soil resilience and nitrogen transformations in soils of three Kentucky organic farms.
- Caruso, Leonardo V. Axillary shoot formation on *Nicotina tabacum* L.
- Greenhagen, Bryan T. Origins of isoprenoid diversity: A study of structure-function relationships in sesquiterpene synthases.
- Hawkins, Tracy Kay. A comparative life history study of six species of Apiaceae of the eastern North American deciduous forests, with particular reference to biomass allocation.
- Pena-Yewtukhiw, Eugenia M. Use of spatial and temporal probability in the study of soil-water-landscape relationships.
- Woltz, James M. Freeze injury during corn seed development and maturation.
- Wonprasaid, Sodchol. Sensitivity of soil quality indicators to soil management.

### Animal Sciences

- Bailey, John D. An approach to the measurement of sexual behavior in the bull (*Bos taurus*) using variable female stimulus conditions.
- de Souza, Ana L.P. Assessment of dietary enzyme supplementation on ileal and total tract digestibilities in gestating and lactating swine.
- Meyer, Terry A. Evaluation of different N-6/N-3 fatty acid ratios derived from menhaden and corn oil in young pig growth and feed consumption, gut morphology, and immune function.
- Scaletti, Roger W. Effect of copper source in enhancing resistance to coliform mastitis.
- Stika, John F. Properties of fresh and precooked/reheated restructured beef steaks manufactured from mature cows of various ages.
- Xavier, Eduardo G. Effects of phytase in diets containing low-phytate corn and soybean meal on performance, bone traits, and phosphorus excretion of pigs and chicks.
- Yamka, Ryan M. Evaluation of low-oligosaccharide and low-oligosaccharide low-phytate whole soybeans and soybean meal in canine foods.

### Biosystems and Agricultural Engineering

- Chinn, Mari. The production of a solid substance cultivation deep bed reactor for the production of xylanase by *trichoderma longibrachiatum*.
- Fulton, John. A spatial model for evaluating variable-rate fertilizer application accuracy.

### Entomology

- Held, David W. Basic and applied aspects of flower-feeding by the Japanese beetle (Coleoptera: Scarabaeidae).
- Rogers, Michael E. Biology, behavior, and conservation of the parasitic wasps *Tiphia pygidialis* and *Tiphia vernalis*, natural enemies of turf-infesting scarabaeid grubs.

### Forestry

- Cox, John J. Community dynamics among reintroduced elk, white-tailed deer and coyote in southeastern Kentucky. (Ph.D. is in Animal Sciences.)
- Dzialak, M.R. Peregrine falcon, *Falco peregrinus*, reintroduction in cliff habitat in Kentucky. (Ph.D. is in Animal Sciences.)

### Horticulture

- Koslanund, Rumpham. Ethylene production, fruit softening, and their manipulation during pawpaw ripening.

### Plant Pathology

- Craven, Kelly D. Coevolution and genetic diversity in grass-endophyte symbioses.
- Heist, E.P. Interactions of the tobacco blue mold pathogen, *Peronospora tabacina*, with wild and commercial *Nicotiana* species.
- Lushia, Warren A. Investigation of the disassembly of tobacco mosaic virus in protoplasts inoculated by electroporation.

### Veterinary Science

- Bosken, J.M. Isoxsuprine in human and veterinary medicine: Investigation of efficacy, metabolism, and regulation.
- Myka, J.L. Comparative gene mapping for *Equus przewalskii* and *E. hemionus onager* with investigation of a homologous chromosome polymorphism in equidae.

## M.S. THESES

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### Agricultural Economics

- Burdine, Kenneth. A detailed sector analysis of the Holstein beef market.
- Gearhardt, Matt. Evaluating hedging strategies as a price risk management tool for dairy farmers with different levels of risk aversion.
- Gramig, Ben. Regulation of concentrated animal feeding operations: An application of economic theory to firm decision making and considerations for public policy.

### Agronomy

- Freytag, Ann Marie. Genetic control of chlortoluron selectivity in corn and wheat.
- Makris, Konstantinos C. Soil and colloidal phosphorus dynamics in three Kentucky soils: Bioavailability, transport, and water quality implications.
- McChesney-Wehr, Stephanie. Biogeochemical indicators for assessing the water quality improvement function of mitigated wetlands.
- Richard, Ashley C. Soil microbial community structure indices for site-specific management.
- Stefaniak, Thomas R. A comparison of recombination rates between random lines and adapted cultivars.

### Animal Sciences

- Agyare, Kingsley K. Rheological, baking and sensory properties of soft wheat flour dough: Effect of structured lipid.
- Burden II, Barry T. Potential of spray-dried porcine blood cells to replace soybean meal in growing-finishing lamb diets.
- Martin, Kimberly R. Characteristics of the immune system of neonatal, juvenile and adult Holsteins.
- Reinowski, Andrea R. Voluntary dry matter intake of big bluestem, eastern gamagrass, indiagrass, and timothy grass hays by mature horses.

Rhinehart, Justin D. Effects of fat supplementation on reproductive parameters of beef heifers fed endophyte-infected fescue seed.  
 van Rensburg, Laurentia J. Effect of increasing level of soybean hulls on intake and utilization of tall fescue hay.  
 Zaffarano, Jennifer I. Minimum inhibitory concentrations of two common food phenolic compounds and their effect on the microbial ecology of swine feces *in vitro*.

### Biosystems and Agricultural Engineering

Coleman, Nicholas P. The effects of growth medium pH and reaction water activity on the reduction of acetophenone by immobilized yeast in Hexane.  
 Derbyshire, Eleanor. Measurement of microbial concentration using a ratio of light scattered wavebands.  
 Goode, Gowan. Seepage quality of geotextile and gravel pads used in heavy livestock areas.  
 Simpson, Andrew. Development of an unmanned aerial vehicle for low-cost remote sensing and aerial photography.  
 Sobolik, Christopher. Assessment of yield monitor system accuracy on varying field slopes.

### Community and Leadership Development

Roberts, Jeffrey. Social predictors of mental health: A comparative analysis of metro and non-metro gay men aged 18-25.  
 Yu, Lei. Interprovincial migration in China, 1985-1990: An approach to China's post-reform spatial restructuring.

### Entomology

Allard, Cora M. Diel activity patterns and distribution of *Phalangium opilio* in soybean and the effect of diet on female reproduction. Price, Bryan D. Effects of CRY3 *Bacillus thuringiensis* isolates and products on coleopteran pests of stored grains.  
 Rucker, Charlene N. Factors affecting blend discrimination and mating success in the cabbage looper moth, *Trichoplusia ni*.

### Forestry

Carter, K.M. Food habits, reproductive status, habitat use, and behavior of peregrine falcon in Kentucky.

Note: Programs in the College of Human Environmental Sciences (Family Studies; Interior Design, Merchandising and Textiles; and Hospitality and Dietetic Administration) joined the College of Agriculture in July 2003. Graduate student enrollment and graduation figures are reported by graduate program.

	Enrollment		Net Change	2001-2002 Degrees Awarded			2002-2003 Degrees Awarded			Net Change
	2001-2002	2002-2003		Master's	Doctoral	Total	Master's	Doctoral	Total	
	Agricultural Economics	56	59	+3	10	2	12	9	1	10
Animal Sciences	75	69	-6	9	7	16	9	2	11	-5
Biosystems and Agricultural Engineering	26	27	1	3	1	4	1	2	3	-1
Crop Science	17	14	-3	2	1	3	0	3	3	0
Entomology	40	42	+2	4	2	6	5	2	7	1
Family Studies	50	59	+9	11	0	11	9	0	9	-2
Forestry	16	18	+2	3	0*	3	7	0*	7	+4
Hospitality and Dietetic Management	13	18	+5	1	0*	1	1	0*	1	0
Interior Design, Merchandising and Textiles**	11	10	-1	5	0*	5	3	0*	3	-2
Plant Pathology	17	17	0	1	0	1	1	1	2	1
Plant Physiology	19	21	+2	0*	2	2	0*	3	3	+1
Plant and Soil Science	31	34	+3	3	0*	3	10	0*	10	+7
Rural Sociology/Vocational Education	53	71	+18	19	1	20	21	2	23	+3
Soil Science	9	8	-1	0*	0	0	0*	2	2	+2
Veterinary Science	26	26	0	1	5	6	1	0	1	-5
<b>Total</b>	<b>459</b>	<b>493</b>	<b>+34</b>	<b>72</b>	<b>21</b>	<b>93</b>	<b>77</b>	<b>18</b>	<b>95</b>	<b>+2</b>

\* Degree type not offered.

\*\* Includes graduate student numbers in the joint School of Design Interior Design, Merchandising and Textiles program.

# Financial Statement

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Statement of Current General Fund  
Income and Expenditures  
Fiscal Year 2003

## INCOME

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<i>Federal Funds</i>	
Hatch.....	\$3,894,260
Hatch Multistate .....	\$856,263
McIntire-Stennis .....	\$441,987
Animal Health .....	\$57,607
<i>Total Federal Funds</i> .....	<i>\$5,250,117</i>
<i>State Funds</i> .....	<i>\$27,503,757</i>
<b>Total Funds</b> .....	<b>\$32,753,874</b>

## EXPENDITURES

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	<b>Federal</b>	<b>State</b>	<b>Total</b>
Personal Services .....	\$4,179,441 .....	\$16,524,389 .....	\$20,703,830
Travel.....	\$77,612 .....	\$213,694 .....	\$291,306
Equipment .....	\$218,170 .....	\$1,051,946 .....	\$1,270,116
Other Operating Expenses.....	\$774,894 .....	\$9,713,728 .....	\$10,488,622
<b>Total Expenditures</b> .....	<b>\$5,250,117</b> .....	<b>\$27,503,757</b> .....	<b>\$32,753,874</b>



# Staff

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## Agricultural Experiment Station January 1, 2003-December 31, 2003

### Administration

Lee T. Todd Jr., President  
Michael T. Nietzel, Provost  
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Linus R. Walton, Associate Dean for Administration  
Lisa Collins, Assistant Director  
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W. O. Peterson, Director of Management Operations

# Departments

Experiment Station personnel lists for calendar year 2003 as reported by departments follow. (R) denotes Experiment Station appointment.

## Agricultural Communications

Craycraft, C.G., Director & Professor  
Fehr, R.L., Professor  
Ragland, K., Associate Professor  
Wood, C.H., Associate Director and Professor

## Agricultural Economics

Robbins, L.W., Professor and Chair (R)  
Debertin, D.L., Professor (R)  
Dillon, C., Associate Professor (R)  
Fleming, R., Associate Professor (R)  
Freshwater, D., Professor (R)  
Infanger, C.L., Extension Professor  
Isaacs, S., Extension Professor  
Jones, L.D., Extension Professor (R)  
Marchant, M.A., Professor (R)  
Mather, L.L., Associate Professor (R)  
Maynard, L., Assistant Professor (R)  
Meyer, A.L., Extension Professor  
Pagoulatos, A., Professor (R)  
Reed, M.R., Professor (R)  
Riggins, S.K., Extension Professor  
Scorsone, E., Assistant Extension Professor  
Skees, J.R., Professor (R)  
Snell, W.M., Extension Professor  
Trimble, R.L., Extension Professor  
Vickner, S., Associate Professor (R)  
Williamson, L., Extension Professor  
Woods, T., Associate Extension Professor

## Agronomy

Barrett, M., Chair & Professor  
Bailey, W.A., Assistant Professor  
Barnhisel, R.I., Professor (R)  
Baskin, C., Professor\* (R)  
Bitzer, M.J., Professor (R)  
Burton, H.R., Associate Professor (R)  
Bush, L.P., Professor (R)  
Calvert, J., Research Specialist  
Chappell, J., Professor (R)  
Collins, G.B., Professor (R)  
Collins, M., Professor (R)  
Cornelius, P.L., Professor (R)  
Coyne, M., Associate Professor (R)  
D'Angelo, E.M., Assistant Professor (R)  
Davies, M., Professor and Director, KTRDC  
Dinkins, R.D., Assistant Professor (R)  
Ditsch, D., Associate Professor  
Dougherty, C.T., Professor (R)  
Egli, D.B., Professor (R)  
Falcone, D.L., Research Specialist  
Grabau, L.J., Professor (R)  
Green, J.D., Professor  
Grove, J.H., Associate Professor (R)  
Herbek, J.H., Professor  
Hildebrand, D.F., Professor (R)  
Hill, R., Research Specialist  
Hunt, A.G., Professor (R)  
Jack, A.M., Research Specialist  
Karathanasis, A.D., Professor (R)

Kennedy, B.S., Research Specialist  
Kumudini, S., Assistant Professor (R)  
Lacefield, E., Research Specialist  
Lacefield, G.D., Professor  
Lee, C.D., Assistant Professor  
Legg, P.D., Professor (R)  
Marshall, M., Research Specialist  
Martin, J.R., Professor  
Matocha, C.J., Assistant Professor (R)  
Miller, R.D., Professor (R)  
Mueller, T.G., Assistant Professor (R)  
Mullen, M.D., Associate Professor (R)  
Murdock, L.W., Professor  
Palmer, G.K., Associate Professor  
Pearce, R.C., Associate Professor  
Pearce, W.L., Research Specialist  
Perry, S.E., Assistant Professor (R)  
Pfeiffer, T.W., Professor (R)  
Phillips, T.D., Associate Professor (R)  
Powell, A.J., Professor  
Rasnake, M., Associate Professor  
Ritchey, E., Research Specialist  
Schwab, G.J., Assistant Professor  
Siminszky, B., Assistant Professor (R)  
Slack, C.H., Research Specialist  
Spitaleri, R.F., Research Specialist  
Stefaniak, T., Research Specialist  
Stewart, A.J., Research Specialist  
TeKrony, D.M., Professor (R)  
Thom, W.O., Professor  
Tomes, L., Research Specialist  
Van Sanford, D.A., Professor (R)  
Wagner, G.J., Professor (R)  
Williams, D.W., Associate Professor (R)  
Witt, W.W., Professor (R)  
Yuan, L., Assistant Professor (R)

\*Joint Biological Sciences

## Animal Sciences

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Amaral-Phillips, D.M., Associate Extension Professor  
Anderson, L.H., Associate Extension Professor  
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Boling, J.A., Professor (R)  
Bullock, K.D., Associate Extension Professor  
Burris, R., Extension Professor  
Cantor, A.H., Associate Professor (R)  
Coffey, R.D., Associate Extension Professor  
Coleman, R.J., Assistant Extension Professor  
Cromwell, G.L., Professor (R)  
Dawson, K.A., Adjunct Professor  
Edgerton, L.A., Associate Professor (R)  
Ely, D.G., Professor (R)  
Franklin, S.T., Assistant Professor (R)  
Harmon, D.L., Professor (R)

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Hennig, B., Professor (R)  
Hicks, C.L., Professor (R)  
Jackson Jr., J.A., Associate Professor (R)  
Johns, J.T., Extension Professor  
Lawrence, L.M., Professor (R)  
Lindemann, M.D., Professor (R)  
Matthews, J.C., Associate Professor (R)  
McAllister, A.J., Extension Professor  
McLeod, K.R., Assistant Professor (R)  
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Newman, M.C., Assistant Professor (R)  
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Pescatore, A.J., Extension Professor  
Schillo, K.K., Associate Professor (R)  
Silvia, W.J., Professor (R)  
Strobel, H.J., Associate Professor (R)  
Thrift, F.A., Professor (R)  
Tidwell, J., Adjunct Assistant Professor  
Vanzant, E.S., Assistant Professor (R)  
Wang, C., Adjunct Assistant Professor  
Webster, Carl, Adjunct Assistant Professor  
Xiong, Y., Professor (R)

## Biosystems and Agricultural Engineering

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Crofcheck, C., Assistant Professor (R)  
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Edwards, D.R., Professor (R)  
Fehr, R., Professor (R)  
McNeill, S.G., Associate Extension Professor (R)  
Montross, M.D., Assistant Professor (R)  
Nokes, S.E., Associate Professor (R)  
Norikane, J., Assistant Professor (R)  
Overhults, D.G., Associate Extension Professor (R)  
Payne, F.A., Professor (R)  
Shearer, S.A., Professor (R)  
Stombaugh, Timothy D., Assistant Extension Professor (R)  
Taraba, J., Extension Professor (R)  
Warner, R.C., Extension Professor (R)  
Wells, L.G., Professor (R)  
Workman, S., Associate Professor (R)  
Byers, M., Adj. Assistant Professor (R)  
Carey, D., Adj. Assistant Professor (R)  
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Garkovich, L., Professor (R)

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Maurer, R., Extension Professor  
Nall, M., Extension Professor  
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Zimmerman, J., Associate Extension Professor

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Potter, M.F., Extension Professor  
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Sharkey, M.J., Associate Professor (R)  
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Hill, D.B., Extension Professor  
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Stringer, J.W., Associate Professor (R)  
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Dunwell, W.C., Professor  
Durham, R.E., Assistant Professor  
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Geneve, R.L., Professor (R)  
Houtz, R.L., Professor (R)

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Kemp, T.R., Professor (R)  
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Brown, D.O., Associate Professor (R)  
Chen, L., Professor (R)  
Chow, C.K., Professor (R)  
Cook-Newell, M., Lecturer  
Gaetke, L., Associate Professor (R)  
Glauert, H.P., Professor (R)  
Ham, S., Assistant Professor (R)  
Roseman, M.G., Assistant Professor (R)  
Wesley, M., Associate Professor (R)

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Bachi, P.R., Ag. Research Specialist  
Beale, J.W., Ag. Research Specialist  
Farman, M.L., Associate Professor (R)  
Ghabrial, S.A., Professor (R)  
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Hartman, J.R., Extension Professor  
Hendrix, J.W., Professor (R)  
Hershman, D.E., Extension Professor  
Kachroo, P.R., Assistant Professor (R)  
Kachroo, A.P., Ag. Research Specialist  
Nagy, P.D., Associate Professor (R)  
Nesmith, W.C., Extension Professor  
Nuckles, E.M., Ag. Research Specialist  
Pogany, J., Ag. Research Specialist  
Schardl, C.L., Professor (R)  
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Vaillancourt, L.J., Associate Professor (R)  
Vincelli, P., Extension Professor  
Wang, R., Ag. Research Specialist

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Barrow, M., Regulatory Specialist Inspector  
Bartos, J., Regulatory Specialist  
Bryant, M., Feed/Fertilizer Laboratory Coordinator  
Buckingham, D.T., Seed Regulatory Coordinator  
Coffey, D.S., Regulatory Specialist Inspector  
Finneseth, C.H., Seed Testing Coordinator  
Flood, J.S., Regulatory Specialist Inspector  
Hickerson, R.R., Regulatory Specialist Inspector  
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Sikora, F.J., Soil Testing Coordinator & Professor  
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Traylor, S.L., Feed Coordinator  
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Whitehouse, W.J., Regulatory Specialist Inspector

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