



*The Kentucky
Agricultural Experiment Station*

113th

Annual Report
2000



College of Agriculture
University of Kentucky • Lexington, Kentucky 40546

To His Excellency,
The Honorable Paul Patton
Governor of Kentucky

I herewith submit the one hundred and thirteenth annual report of the Kentucky Agricultural Experiment Station for the period ending December 31, 2000. This is done in accordance with an act of Congress, approved March 2, 1887, entitled, "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 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, 2001

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Purpose of the Kentucky Agricultural Experiment Station

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

The Kentucky Agricultural Experiment Station has been providing research results to farmers and rural residents for more than 100 years. The continued advancement of Kentucky agriculture attests to the benefits of applying new knowledge and technology. Much of the research leading to increased quantity and improved quality of Kentucky's agricultural output was performed by the Experiment Station. College researchers also have successfully addressed problems of agribusiness, consumers, international trade, food processing, nutrition, community development, soil and water resources, 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 2000. A faculty list is also provided.

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

Statewide Research

Research activities of the Kentucky Agricultural Experiment Station were conducted at Lexington, Princeton, Quicksand, and Owenton and in counties throughout the state in 2000.

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.

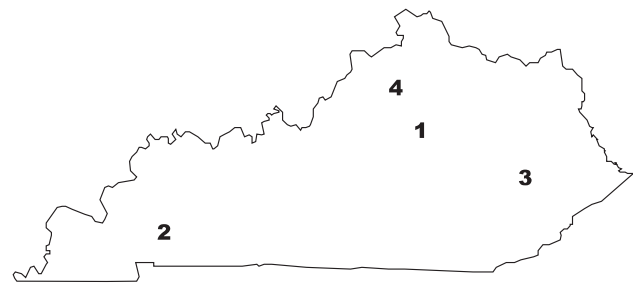
Campus—Laboratories and specialized equipment for all research program areas.

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.

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.



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.

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.

Regulatory Services

The Division of Regulatory Services administers state laws pertaining to the manufacturing, processing, labeling, and marketing of commercial feed, fertilizer, seed, and raw milk. Its purpose is to protect farmers and other consumers from poor quality, mislabeled, or misrepresented products and to protect agricultural businesses from unfair competition.

Feed, fertilizer, and seed are monitored in the manufacturing or retail channels for compliance with state laws through label review, product and facility inspections, and product sampling and analysis. Raw milk is monitored during marketing to assure an accurate and equitable exchange between producers and processor 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. Additionally, a specialty-products inspector checks and samples small-package and specialty feed, fertilizer, and seed products throughout the state.

The Division also offers to growers and homeowners seed testing, soil testing, poultry litter and animal manure testing, and water and nutrient solution analyses for greenhouse production and float-bed systems of seedling production.

Auditing Program

H.S. Spencer

Audits of sales and fee payments were made on 269 of 438 milk, seed, feed, and fertilizer businesses in Kentucky to verify check-off and tonnage fees. Fees assessed to help pay the costs of inspecting, sampling, and analyzing commodities in accordance with Kentucky laws are: fertilizer, 50 cents per ton; feed, 35 cents per ton; and seed, 4 to 24 cents per unit. During May, raw milk is assessed a check-off fee of 3 cents per 100 pounds.

Income from fees in 2000:

Feed	\$797,309
Fertilizer	645,410
Milk	68,594
Soil testing	144,587
Seed tags, testing, and licenses	408,295
TOTAL	\$2,064,195

These cash receivables were substantiated on 2,605 fertilizer tonnage reports, 2,864 feed tonnage reports, 684 seed reports, and 13 milk reports. These reports were checked for accuracy and compared with field audits of the firms submitting them. Additional fees of \$5,500 were found as a result of these audits.

Milk Regulatory Program

C.D. Thompson

The Kentucky Creamery License Law has been in effect since 1918. During the 2000 legislative session this law was revised. The new law is now known as the Kentucky Farm Milk Handlers Law and is administered by the milk regulatory program. The program's primary objective is to ensure that the raw farm milk produced and marketed in Kentucky is bought and sold using accurate weights and tests. The program provides a marketplace environment that is fair and equitable for all individuals and firms involved in Kentucky's dairy industry. In 2000, the Division:

- reviewed and issued licenses to 14 milk buyers, 64 testers, 388 sampler-weighers, and eight raw milk transfer stations.
- analyzed and administered action on 6,443 official samples.
- analyzed 648 samples submitted by licensed testers for comparison purposes.
- conducted 13 producer pay record audits.
- conducted 59 inspections at 15 milk laboratories.
- trained and examined 67 new sampler-weighers and 11 new testers.
- conducted 632 inspections of 225 sampler-weighers.
- conducted 36 inspections of raw milk transfer stations.

Feed Regulatory Program

Steve Traylor

The feed regulatory program provides consumer protection for the purchasers of livestock feed and pet foods, maintains a marketplace environment that promotes fair and equitable competition for the feed industry, and helps ensure the safety and wholesomeness of animal products as human food. In 2000, the program:

- administered actions on 4,330 official samples of commercial feed involving 25,614 official 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 19 feed mills that mix restricted drugs in feed and to inspect these mills for compliance with the FDA's national BSE Rule. The ruminant-to-ruminant feeding ban of certain mammalian proteins was promulgated to prevent the establishment and amplification of bovine spongiform encephalopathy (BSE) (i.e., mad cow disease) through animal feed. An additional 48 state inspections were conducted on mills that mix non-MFA drugs in feed to ensure compliance with medicated feed regulations. Thirty-eight mills that mix no drugs were inspected to

ensure compliance with labeling, manufacturing, and storage practices. In addition, 27 non-MFA mills were inspected to determine compliance with the BSE Rule.

- conducted 7,500 label reviews and maintained product registration for about 15,000 products from 900 companies.
- continued implementation of the revised feed labeling requirements for livestock and poultry feeds.

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. In 2000, the program:

- administered actions on 3,438 official and 87 unofficial samples of fertilizer involving 10,025 tests of the approximately 950,000 tons of fertilizer distributed in Kentucky.
- reviewed labels and registered 3,624 products from 530 firms, including 218 who manufactured custom blends of fertilizers.

Inspection Program

F. Herald

The inspection program aims to achieve industry compliance with the consumer protection laws that the Division is charged with administering. Inspectors strategically located throughout the state, each with an assigned area to cover, carry out this responsibility. They inspect manufacturing plants, processing facilities, storage warehouses, and retail stores; collect official samples of feed, pet food, fertilizer, milk, and seed; review records; and offer assistance to clientele in improving their operations to achieve compliance with the laws. In 2000:

- A team of nine inspectors performed 5,970 inspections of the processing, manufacturing, and marketing of feed, fertilizer, and seed. They inspected 19 feed mills for compliance with the FDA's regulation to prevent the establishment of bovine spongiform encephalopathy (BSE) in the United States. One inspector traveled throughout the state to inspect and sample small-package and specialty feed, fertilizer, and seed products in urban areas. Another inspector covered the state to administer the Creamery License Law.
- Inspectors collected the following numbers of official samples for laboratory verification of appropriate constituents and quality:

Feed	4,330
Fertilizer	3,438
Seed	2,971
Milk	6,443

Seed Regulatory Program

D.T. Buckingham

The seed regulatory program assures Kentucky farmers and urban consumers of quality seed and promotes fair and equitable competition among seed dealers and seedsmen. In 2000, the program:

- collected and tested 2,971 official seed samples.
- issued stop-sale orders on 598 official seed samples and 124 violative seed lots at seed dealer and seed processor locations.
- cooperated with the USDA-Seed Branch regarding shipments of seed into Kentucky that were in violation of the Federal Seed Act.
- issued 243 permits to label seed and registered 403 seed dealer locations. Performed inspections and sampling of agricultural, lawn, turf, and garden seeds during 1,873 visits to more than 600 wholesale and retail locations.

Seed Testing Services

Tina Tillery

The seed testing program provides the seed industry and seed growers of Kentucky with competent, reliable, and timely analyses of their seeds for labeling requirements and quality assurance. In 2000, the seed laboratory tested the following number of samples:

Official seed samples (regulatory)	2,971
Regular seed samples (service)	3,124
Certified seed samples (service)	288
Tobacco seed samples (service)	1,744
TOTAL	8,127

In addition to routine testing for purity, germination, and noxious weed seed, the laboratory offers testing for seed vigor (accelerated aging and cold test), seed moisture, seed size (seed count), Roundup-ready soybeans, and germination following fungicide application. The laboratory also provides tests to seedsmen and livestock farmers for the presence of the fungal endophyte in tall fescue seed and live fescue tillers.

Soil Testing Service

F.J. Sikora (Lexington)
Paula Howe (Princeton)

Soil testing provides farmers, homeowners, greenhouse operators, surface-mine specialists, 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 tests. We also offer analyses of poultry litter and animal wastes for farmers and farm advisors, water and nutrient solution analyses for greenhouse operators and float-bed seedling producers, and non-routine soil tests for University of Kentucky researchers.

Samples analyzed in 2000 were:

Type	Number	% Increase
Agriculture	25,975	-21
Home lawn and garden	6,213	1
Strip-mine reclamation	28
Commercial horticulture	541	-11
Greenhouse	87
Research	13,718	16
Atrazine residue in soil	127	108
Animal waste	784	-8
Nutrient solution	742	109
TOTAL	48,215	-7

Feed and Fertilizer Laboratory

Robert L. Beine

The goal of the Regulatory Services Feed and Fertilizer Laboratory is accurate analytical results in a timely fashion. In 2000, 4,522 feed and 3,531 fertilizer samples were reported, including official regulatory, service, and inter-lab check samples. The laboratory also assists the soil lab in the analysis of manure and litter samples.

Approximately 50 different types of feed tests and 24 different fertilizer tests were performed. The laboratory participates in several check sample programs, including the AAFCO Check Sample Program for feed, Magruder7 check sample program for fertilizer, and specialty programs for microscopy, mycotoxins, UAN, phosphate, minerals, etc.

For each of the past five years, the laboratory has coordinated with the Kentucky Fertilizer and Agriculture Chemicals Association and the Burley Tobacco Cooperative to survey the chloride content of the season's tobacco.

Kentucky Agricultural Experiment Station Projects

Agricultural Economics

Agricultural Industrialization and Globalization: Implications for Rural Economies—*Angelos Pagoulatos, David Debertin, and Ronald Fleming*

Analysis of Risk Management, Agricultural Policy and Field Crops-Related Issues—*Jerry Skees*

Analyzing Profits and Risk Potential of New Crop Varieties—*Kimberly Zeuli and Gregg Ibendahl*

Analyzing the Non-Agricultural Cooperative's Role in Rural Economic Development—*David Freshwater*

Analyzing the Use of Cooperatives to Improve the Profitability and Risk Exposure of Kentucky Corn Growers—*Gregg Ibendahl and Steve Isaacs*

Analyzing the International Competitiveness of the U.S. Agricultural Processing Industry—*Michael Reed, Loys Mather, and Mary Marchant*

Assessment of Trade and Foreign Direct Investment on U.S. Competitiveness in Asian Food Markets—*Mary Marchant*

Benefits and Costs of Resource Policies Affecting Public and Private Land—*Ronald Fleming*

An Economic Assessment of Precision Agriculture and Decision Aids—*Carl Dillon, Steve Isaacs, Ronald Fleming, and Gregg Ibendahl*

Enhancing Farmers' Income through Polyculture of Paddlefish with Catfish in the Southern Region—*Lee Meyer*

Enrichment Activities in Agricultural Education—*Charles Byers*

Expansion of GRP Crop Programs—*Jerry Skees*

Financing Agriculture and Rural America: Issues of Policy, Structure, and Technical Change—*David Freshwater*

Fruit and Vegetable Supply-Chain Management, Innovations, and Competitiveness—*Timothy Woods*

Impacts of Trade Agreements and Economic Policies on Southern Agriculture—*Mary Marchant*

International Agricultural Market Structures and Institutions, 2000—*Michael Reed*

Kentucky Center for Cooperative Development—*Timothy Woods*

Market Development of a Nutraceutical Butter Product—*Leigh Maynard*

Meat Processing and Marketing for Local and Direct Markets—*Lee Meyer*

Motivating Teams for Enterprise Facilitation—*Timothy Woods*

New Enterprise Results and Historic Production Patterns: Is There a Positive Correlation for Some Farms?—*Kimberly Zeuli and Jerry Skees*

Precision Agriculture: Precision Farming Adoption in Kentucky—The Role of Capital Costs and Farm Size—*David Debertin, Ronald Fleming, and Carl Dillon*

The Relation between Risk Management Policy and Natural Resource Use—*Jerry Skees*

Responding to Expressed Needs: SARE/ACE Regional Training with the Sustainable Dairy Systems Manual—*Steve Isaacs*

Rural Economic Development: Alternatives in the New Competitive Environment—*David Freshwater*

U.S. Consumer Demand for Dairy Products: Needs-Driven Methods and Analysis—*Leigh Maynard*

A U.S.-E.U. Multilateral Exchange and Training Program toward B.S. and M.S. Degrees in Agribusiness and Agricultural Economics—*Loys Mather*

Work Crew Performance Model in Vocational Agriculture—*Steve Isaacs*

Agronomy

319 Program Site-Specific Nutrient and Biosolids Management on Agricultural Lands—*R.I. Barnhisel*

Accelerated Development of Scab-Resistant Wheat Varieties—*D.A. Van Sanford*

Amount and Quality of Hbage Ingested by Cattle Grazing Tall Fescue Clover Grasslands—*C.T. Dougherty*

Analysis of mRNA Polyadenylation and Metabolism in Plants—*A.G. Hunt*

Analysis of Senescence-Specific Genes Using Arabidopsis Enhancer Trap Lines—*S. Gan*

Baled Silage School: Silage Production Techniques for Producers and Extension—*M. Collins*

Breeding for Fusarium Head Blight Resistance in Wheat for Kentucky—*D.A. Van Sanford*

Breeding Grasses for the Transition Zone—*T.D. Phillips*

Career: AGL 15 during Embryogenesis—*S. Perry*

Characterization, Classification, and Use Interpretations of Kentucky Soils—*A.D. Karathanasis*

Characterization of a Plant polyA Polymerase—*A.G. Hunt*

CHS Paducah Gaseous Diffusion Plant Oversight—*M. Coyne*

Cellular and Molecular Biology Initiative in Dark Tobacco—*G.B. Collins*

Cloning and Heterologous Expression of Cytochrome—*M. Barrett*

Cloning Epoxy Fatty Acid Genes—*D. Hildebrand*

Collection of Clover Germplasm in Mexico—*N.L. Taylor*

Corn Breeding and Genetics: White Endosperm Breeding, Genetic Variation in Food Quality and Hybrid Performance Tests—*C.G. Poneleit*

Corn Hybrid Response to Sulfonyleurea Herbicides—*W.W. Witt*

Dark Tobacco Breeding and Chemistry—*P. Legg*

Dark Tobacco Breeding Genetics and Management—*P.D. Legg*

Defining the Roles of Interactions between Plant Nuclear polyA Polymerases and Other Factors—*A.G. Hunt*

Demonstrating Commercial Potential of Zinc Finger Proteins for Generating Value-Added Crops—*D.F. Hildebrand*

Determining Rates of Several Nutrient Sources for Optimum Crop Production and Soil—*W.O. Thom*

Development of a Basic Soil Morphology Training Course—*A.D. Karathanasis*

Disease-Resistance Properties of Tobacco Cultivars That Express *E. coli*—*A.G. Hunt*

Early-Maturing Soybean Cropping System: Identifying Appropriate Cultivars—*L.J. Grabau*

Effect of Tillage and Land Use on Physical and Chemical Properties of Kentucky Soils—*G.W. Thomas*

Effect of Variable Rate Seeding and Nitrogen Rates, Based on Landscape Position on Corn—*R.I. Barnhisel*

Engineering Oilseeds for Epoxy Fatty Acids Accumulation—*D.F. Hildebrand*

Enhancing Soil Crop Management with an Electrical Conductivity Sensor—*T. Mueller*

Evaluate Red Clover for Agronomic Descriptions—*N.L. Taylor*

Evaluation of Burley Tobacco Varieties—*J. Calvert*

Evaluation of Fall-Applied Herbicides for Corn Weed Control—*W.W. Witt*

Evaluation of On-Site Wastewater Treatment Vertical Distance Separation Standards in Kentucky—*A.D. Karathanasis*

Evaluation of Perennial Forage Crop Varieties—*R. Spitaleri*

Evaluation of Soybean Varieties and Breeding Lines for Use in Kentucky—*T.W. Pfeiffer*

- Forage Crop Genetics and Breeding to Improve Yield and Quality—*N.L. Taylor*
- Forage for Advancing Livestock Production—*T.D. Phillips*
- Foreign Gene Introduction into Soybean—*G.B. Collins*
- Fragipan Influence on Hillslope Hydrology and Soil Water Quality—*J.A. Thompson*
- Genetic Engineering of Dark Tobacco—*J. Chappell*
- Genetic Engineering of Soybeans for Increased Oil Content and Epoxy Fatty Acid Accumulation—*D.F. Hildebrand*
- Grain Quality Laboratory—*C.G. Poneleit*
- Herbicide Persistence in Southern Soils Bioavailable Concentration and Effect on Sensitive Rotational Crops—*W.W. Witt*
- Integrated Grass Filter Strip-Permeable Reactive Barrier Systems for Groundwater Protection—*E. D'Angelo*
- Introgressing Alleles from the Wild Species *G. soja* into Soybean—*T. Pfeiffer*
- Isolation of Axillary Bud Specific Genes—*R. Dinkins*
- Kentucky Watershed and Water Quality Education Project—*W.O. Thom*
- Manipulation and Regulation of Oxylin Formation in Plant Tissues—*D.F. Hildebrand*
- Metabolic Engineering to Study the Regulation/Plasticity of and to Modify Diterpene Metabolism in Trichome Gland Cells—*G.J. Wagner*
- Microbial Ecology of Nitrate Reduction in Fragipan Soils—*M.S. Coyne*
- Mineralogical Controls on Colloid Dispersion and Solid-Phase Speciation of Soil Contaminants—*R.I. Barnhisel*
- Molecular Regulation of Isoprenoid Metabolism in Plant Pathogen Interactions—*J. Chappell*
- Molecular Regulatory Mechanism of Two Senescence-Specific Genes in Arabidopsis—*S. Gan*
- Multiplicative (Linear-Bilinear) Models for Genotype X Environment Interaction in Crop Cultivars—*P.L. Cornelius*
- Phenology, Population Dynamics, and Interference: A Basis for Understanding Weed Biology and Ecology—*W.W. Witt*
- Pilot Project for Yield Enhancement Synthetic Auxins—*C.A. Meurer*
- Plant Genetic Resources Conservation and Utilization—*N.L. Taylor*
- Potential Impact of Global Warming on Seed Germination Ecology of Summer Annual and of Winter Annual Weeds—*C.C. Baskin*
- Poultry Litter Management for Corn Production—*M. Rasnake*
- Precision Agriculture: Evaluating Nutrient Removal as a Basis for Nutrient Management—*J. Grove*
- Precision Agriculture: Evaluation of Topography Attributes on Corn Yield—*R.I. Barnhisel*
- Precision Agriculture: Explaining Spatial Variability in Grain Fields—*T. Mueller*
- Precision Agriculture: Quantitative Soil-Landscape Modeling to Define Landform Management Segments—*J.A. Thompson*
- Precision Agriculture: Remote Sensing of Pasture Mass and Quality—*M. Collins*
- Predicting Solute Transport Parameters from Pore Characteristics of Kentucky Soils—*E. Perfect*
- Relationship between Photosynthesis, Assimilate Supply and the Size of the Reproductive Sink—*D.B. Egli*
- Resilience of Nitrogen Availability and Retention in Soils of Kentucky Certified Organic Farms—*M. Coyne*
- The Role of Ammonium-Potassium-Calcium Exchange Interactions in Regulating Nitrification Rates in Soil—*M.S. Coyne*
- Seed Biology and Technology Investigations—*D.M. Tekrony*
- Significance of Loline Alkaloids in Ecosystems Predominated by Grass/Endophyte Associations—*L.P. Bush*
- Soft Red Winter Wheat Breeding and Variety Development for Kentucky—*D.A. Van Sanford*
- Soil and Crop Nitrogen Testing to Improve Nitrogen Management for Burley Tobacco—*R.C. Pearce*
- Soil Biogeochemical Indicators to Assess Water Quality in Wetlands—*E. D'Angelo*
- Soil Survey Characteristics and Environmental Impact—*A.D. Karathanasis*
- Somatic Cell Genetics of Crop Plants—*G.B. Collins*
- Soy 2000 Cellular and Molecular Biology of Soybean—*G.B. Collins*
- Soybean Genetic Engineering—*G.B. Collins*
- The Soybean Tissue Culture and Genetic Engineering Center—*G.B. Collins*
- Species and Crop Management Effects on the Yield and Quality of Round Bale Silage—*M. Collins*
- Structure and Function of Terpene Cyclase—*J. Chappell*
- Studies of and Efforts to Engineer the Metabolism in Plant Trichomes—*G.J. Wagner*
- Studies on Decreasing Tobacco-Specific Nitrosamines in Burley Tobacco during Curing—*H.R. Burton*
- Studies on Modified Air-Curing for the Production of Burley Tobacco Having Decreased Levels of Tobacco Specific Nitrosamines—*H. Burton*
- Switchgrass as a Biomass—*M. Rasnake*
- Technical Assistance for Data Analysis, Interpretation, and Manuscript Preparation in a Project on the Ecophysiology of the Mycorrhizal Symbiosis—*M. Barrett*
- Terpene Cyclases—*J. Chappell*
- Turfgrass Management Practices in Kentucky—*D.W. Williams*
- Understanding Recombination and Modifying its Frequency in Soybean and Corn—*T.W. Pfeiffer*
- Using Seeded Cultivars of Zoysia Grass for Sod Production—*D.W. Williams*
- Variable Rate Seedling: Corn Producers—*R.I. Barnhisel*
- Water We Doing with All That Water?—*W.O. Thom*
- Yield Potential/Long-Term Effects of No-Tillage-Wheat Production—*L. Murdock Jr.*

Animal Sciences

- Animal Manure and Waste Utilization Treatment and Nuisance Avoidance for a Sustainable Agriculture—*G.L. Cromwell and J.H. Grove*
- Breeding to Optimize Maternal Performance and Reproduction of Beef Cows in the Southern Regions—*F.A. Thrift and D.K. Aaron*
- Development of a Swine Model to Evaluate the Reduction of Antibiotic Resistant Enteric Bacteria in Domestic Livestock—*M.C. Newman*
- Development of Peptide Blockers to Enhance Cheese Production—*C.L. Hicks*
- Dietary Regulation of Cationic Amino Acid Transporter Protein Expression in Cattle—*J.C. Matthews*
- Effects of Dietary Fiber Type and Amount on Large Intestinal Volatile Fatty Acids and Water Balance in Horses—*L.M. Lawrence*
- Enhancing Food Safety through Control of Foodborne Disease Agents—*M.C. Newman*
- Evaluation of Supplemental Chromium on Glucose Tolerance and Performance of Swine—*M.D. Lindemann and G.L. Cromwell*
- Forage Protein Characterization and Utilization for Cattle—*E.S. Vanzant*
- Formation and Treatment of Ovarian Cysts in Dairy Cows—*W.J. Silvia*
- Interaction of Structurally Modified Food Proteins in Processed Meat Systems—*Y. Xiong*
- Introduction of Puberty Onset in Beef Cattle—*K.K. Schillo*
- Management Systems for Improved Decision Making and Profitability of Dairy Herds—*D.M. Amaral-Phillips*
- Mastitis Resistance to Enhance Dairy Food Safety—*R.J. Harmon*
- Metabolic Relationships in Supply of Nutrients for Lactating Cows—*D.L. Harmon*
- Modifying Milk Fat Composition for Improved Manufacturing Qualities and Consumer Acceptability—*S.T. Franklin*
- Molasses-Based Strategic Supplementation Program to Enhance Beef Cow Reproductive Performance and Calf Weaning Weight from Endophyte-Infected Tall Fescue Pasture—*D.G. Ely and D.K. Aaron*
- Molecular Characterization of Carbohydrate Utilization by Anaerobic Bacteria—*H.J. Strobel and K.A. Dawson*
- Nutrition and Health of Dairy Calves—*S.T. Franklin*
- Nutritional Systems for Swine to Increase Reproductive Efficiency—*M.D. Lindemann*
- Organic Chromium and Anionic Salt Supplementation in the Diet of Transition Dairy Cattle—*J.A. Jackson*
- Post-Harvest Biochemistry of Methods of Minimizing Methamethiol Dimethyl Trisulfide in Soy Protein Products—*W.L. Boatright*

Post-Thaw Status of Bovine Spermatozoa: Sperm Qualitative Measurements and Artificial Insemination—*P.M. Zavos*
Regulation of Carbohydrate Digestion and Absorption in the Ruminant Small Intestine—*D.L. Harmon and J.C. Matthews*
Strategies for Improving Ewe Lactational Performance and Predicting Preweaning Growth of Lambs Harvesting the Milk Produced—*D.K. Aaron and D.G. Ely*
Zinc Nutrition Endothelial Integrity—*B. Hennig*

Biosystems and Agricultural Engineering

Development and Application of Comprehensive Agricultural Ecosystems Models—*D.R. Edwards, R.C. Warner, and J.L. Taraba*
Fiber Optic Sensor Development for Cottage Cheese Processing—*F.A. Payne, C.L. Hicks, and R.S. Gates*
Light Backscatter Sensor Development for Measurement of Food Consistency—*F.A. Payne and M.P. Menguc*
Measuring and Predicting Soil Compaction by Machinery—*L.G. Wells, S.A. Shearer, and R.I. Barnhisel*
Mechanics of Granular Solids—*I.J. Ross, R.S. Gates, and T.C. Bridges*
Precision Agriculture: Development and Assessment of Integrated Practices for Kentucky Producers—*S.A. Shearer*
Precision Farming Technology and Its Economic and Environmental Impacts—*S.A. Shearer*
Quantification of Feeding and Drinking Behavior of Poultry for Enhancement Animal Well-Being—*R.S. Gates*
Residential Air Infiltration and Air Quality—*D.G. Colliver, R.S. Gates, and K.T. Priddy*
Systems for Controlling Air Pollutant Emissions and Indoor Environments of Poultry, Swine, and Dairy Facilities—*R.S. Gates, D.G. Overhults, and L.W. Turner*
A Systematic Approach to Enzyme Recovery from Solid State Fermentation—*S.E. Nokes*
Water and Solute Transport in Soils with Perched Water Tables—*S.R. Workman*

Entomology

Biological Control of Arthropod Pests and Weeds—*Kenneth V. Yeargan*
Biological Control of Selected Arthropod Pests and Weeds—*Kenneth V. Yeargan*
Biology and Management of Insects Attacking Turf and Woody Landscape Plants—*Daniel A. Potter*
Characterization of Selected Proteins Derived from an Insect Parasitoid—*Douglas L. Dahlman*
Consequences of Variation in Host Plant Resistance for the Evolution of Offspring Size in a Seed-Feeding Beetle—*Charles W. Fox*
Development of Pest Management Strategies for Forage Alfalfa Persistence—*B.C. Pass*
Development and Integration of Entomopathogens into Pest Management Systems—*Grayson C. Brown*
Development, Evaluation, and Safety of Entomopathogens for Control of Arthropod Pests—*Grayson C. Brown*
Dynamic Soybean Insect Management for Emerging Agricultural Technologies and Variable Environments—*Kenneth V. Yeargan*
Ecology and Management of European Corn Borer and Other Stalk Boring Lepidoptera—*Grayson C. Brown*
Evolutionary Genetics of Developmental and Age-Related Changes in Social Signals—*Charles W. Fox*
Field Evaluation and Implementation of Economic Injury Levels Incorporating Biological Control Agents in Two Cropping Systems—*Grayson C. Brown*
Functional Implications of Polydnavirus Genome Organization—*Bruce A. Webb*
Impacts of Spiders in Food Webs of Crop and Forest-Floor Ecosystems—*David H. Wise*
Integrated Management of Arthropod Pests of Livestock and Poultry—*Stephen L. Dobson*
Mating Disruption and the Evolution of Pheromone Communication in Moths—*Kenneth F. Haynes*
Molecular Dissection of Polydnavirus Functional Activities—*Bruce A. Webb*

Phytochemical and Physiological Effects of Herbivore Feeding Guild Interactions: The Impact of Bud Herbivory on Gypsy Moth Success—*Lynne K. Rieske-Kinney*
Systematics and Biodiversity of Biological Control Agents with Special Reference to the Braconidae—*Michael J. Sharkey*

Forestry

Conservation, Ecology, and Restoration of Large Mammals in Eastern Kentucky—*David Maehr*
Controls on Litter Decay and N Transformations: Effects of Tree Species, Microclimate, and Soil Mesofauna in Oak and Mixed Hardwood Stands—*Mary Arthur*
Developing a Digital Photogrammetric Method for Forest Density Estimation—*Calvin Liu*
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Patents

Agronomy

- Li, Q., J. Yang, and C. VonLanken. Use of yeast poly(A) binding proteins and their genes for broad range protection of plants against bacterial, fungal, and viral pathogens. U.S. Patent Number 6,018,106.

Biosystems and Agricultural Engineering

- Wells, L.G., and J.P. Fulton. Soil regeneration apparatus and method. U.S. Patent Number 6,056,066. Issued May 2.

Progress Reports

- PR-427: 1999 *Alfalfa Grazing Tolerance Variety Report*. R. Spitaleri, J.C. Henning, G.D. Lacefield, C.T. Dougherty, J.E. Roberts, and T.A. Hamilton.
- PR-428: 1999 *Cool-Season Grass Grazing Tolerance Variety Report*. R. Spitaleri, J.C. Henning, G.D. Lacefield, C.T. Dougherty, J.E. Roberts, and T.A. Hamilton.

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(In addition, members of the department published 7 abstracts.)

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(In addition, members of the department published 14 abstracts.)

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Ph.D. Dissertations

Agricultural Economics

Hasan, Mohamad Fadhil. Government interventions and competitiveness: The case of the Indonesian palm oil industry.

Johansson, Tulin Özdemir. Interactions between economic growth and environmental quality: A county-level analysis.

Agronomy

Devarenne, Timothy P. Molecular and biochemical characterization of squalene synthase from *Nicotiana tabacum*: A putative regulatory step in the sterol biosynthetic pathway.

Duan, Ran. Relationship between yield and number of recombination events in soybean breeding.

Teutsch, Christopher D. Soil, plant, and animal interactions on reclaimed mine-land pastures in southeastern Kentucky.

Wei, Xiaochen. Studies on the biosynthesis and metabolites of pyridine alkaloids in *Nicotiana* species.

Yang, Xintong. Genetic diversity among parents and performance of single and three-way crosses in winter wheat.

Animal Sciences

Imwalle, Dennis Bradley. Endocrine control of bull sexual behavior.

Gill, Amy Michelle. Effect of feeding frequency on behavior, feed digestibility, and cecal fermentation pattern in stabled horses and ponies.

Slim, Rabih. Effects of polychlorinated biphenyls on vascular endothelial cell dysfunction: Modification by dietary lipids.

Swanson, Kendal Carl. Mechanisms regulating pancreatic *a*-Amylase expression and secretion in ruminants.

Tabeide, Zahra. Effect of immunoglobulin and milk fat globule membrane on culture agglutination.

Traylor, Steven Leon. Assessment of nutrient bioavailability in meat and bone meal for pigs and chicks.

Warren, Lori Kay. The effect of level and type of dietary fiber on the hydration status of horses in response to dehydration and endurance exercise.

Washburn, Brian Eric. Ecological relationships among eastern cottontail rabbits, tall fescue, and native warm-season grasses.

Biosystems and Agricultural Engineering

Gholamimerhabadi, Abolfazl. An Assessment of Factors Affecting the Competency of Agricultural Mechanization Programs and Teachers in the Islamic Republic of Iran.

Entomology

Blank, Kenneth W. Identification, isolation, and characterization of *Clostridium bifermentans* Strain 10-A, a mosquito larvicidal bacterium.

Lawrence, Kendra Lynn. Role of spiders and other generalist predators in the trophic dynamics of the forest-floor leaf-litter food web.

Raymond, Charles Britt. Predatory interactions within a guild of predateous heteroptera common in soybean, and their effect on survival of a soybean pest.

Spohn, Bryan Gordon. Factors influencing the evolution of pheromone communication in the cabbage looper, *Trichoplusia Ni* (Hübner) (Lepidoptera: Noctuidae).

Nutrition and Food Science

Ibrahim, W. Studies on the mechanism of oxidative damage: Role of superoxide and iron.

O'Brien, M.L. Effects of peroxisome proliferators on antioxidant enzymes, vitamins, and redox-sensitive transcription factors in rats and hamsters.

Zhao Y. Modulation of tumor necrosis factor- α expression by eicosapentaenoic acid.

Plant Pathology

Wang, Jinghong. *dmaW* encoding tryptophan dimethylallyltransferase in ergot alkaloid biosynthesis from Clavicipitaceous fungi.

Rural Sociology

Veeraghanta, S. Life on the margins: The Jenu-Kuruba and their forests.

Redlin, M. Living on the dragon's back: Agriculture, environment, and rural identity in deep rural Montana.

Veterinary Science

Burnett, S. Hale. Development of a competitive reverse transcription polymerase chain reaction assay for quantitation of equine interferon gamma, interleukin-2, interleukin-4, and glyceraldehyde-3-phosphate dehydrogenase.

Holland Jr., R.E., Effect of passive transfer of maternal antibodies on early foal vaccination with inactivated equine influenza antigen.

Lin, C.B. Mechanism of equine influenza virus mediated cytotoxicity.

McManus, C.J. Effect of food restriction and pharmacological repartitioning of energy intake on reproductive activity in the mare.

M.S. Theses

Agricultural Economics

- Botts, Aleta Gale. Approaches and effects of two farm reorganization projects in Ukraine.
- Cruz, Stefanie Beth. An economic analysis of Kentucky dairy farm abatement cost.
- Hancock, Samuel Jesse. Limiting risk through agricultural cooperatives.
- Harvey, Andrew G. The simultaneous occurrence of changes in poverty, income, educational attainment, and employment: An endogenous model of regional progress.
- Kumako, Kuami Mawunyo. Applying rainfall insurance in developing countries: The case of Morocco; a feasibility analysis.
- Miriti, M'Kiara Kimathi. Sub optimality: The economic dilemma of public welfare relief and its relevance to recent welfare reform—a market perspective on poverty and income transfer programs.

Agronomy

- Ewing, Justin M. Effects of weed management strategies on winter wheat in Kentucky.
- Ferrell, Jason A. Comparison of glyphosate with other herbicides for in-season weed control in corn.
- Ipsilantis, Ioannis. Chromium effects on bulk soil and rhizosphere microbial communities and Cr bioremediation in the rhizosphere of *Brassica juncea* and by Cr reducing bacteria.
- Munshaw, Gregory C. Management strategies during the establishment year enhance production and fitness of seeded bermudagrass stolons.
- Peyyala, Rebecca. The value of increased pubescence density for yield and resistance to SMV in soybean.
- Pinkston, Warren W. Effect of nozzle size and pressure on coverage of artificial targets and tobacco leaves.
- Ruiz-Diego, Carmen. Groundwater and crop response to poultry litter application on reclaimed surface-mined land.
- Settles, Joseph E. Response of native plant communities one year after herbicide treatment, mowing, or burning in powerline rights-of-way.

Animal Sciences

- Anandappa, Marianne Angela. Trans-2-Hexenal: Its antibacterial activity and its potential as an alternative fumigant for produce.
- Edgington, Charlie B. Effects of copper supplementation on immune function in holstein heifers fed endophyte-infected or endophyte-free tall fescue hay.
- Funk, Dona Lee. Investigations into the use of gonadotropin-releasing hormone in estrus synchronization protocols for fixed-time inseminations of beef cattle.
- Howell, Julie Ann. Tissue distribution of Na⁺-dependent glutamate transporters in sheep and cattle and differential tissue expression of GLT-1 and EAAC1 in growing versus non-growing lambs.
- O'Connor, Cara Irene. The effect of fish oil supplementation on exercising horses.
- Portocarrero, Susana Maria. Evaluation of microbial population and shelf stability of country-cured ham.
- Smith, Roger Dwayne. Effects of social conditions on sexual behavior, luteinizing hormone concentrations, and testosterone concentrations in yearling beef bulls.
- Wolf, Charlie. The effectiveness of "Good-Fry" (a frying oil containing rice bran oil and sesame seed oil) on the percent trans fatty acids formed during restaurant frying.

Biosystems and Agricultural Engineering

- Camenisch, Gregory A. A mechanical harvesting and housing system for small burley tobacco crops.
- Carter, Seaborn B. Effects of temperature and substrate water content on phytase production in solid state fermentation.

- Chinn, Mari S. Temperature control of a solid state cultivation deep bed reactor for the production of xylanase by *Trichoderma Longibrachiatum*.
- Collins-Camargo, Francis. Evaluation of enhanced water quality through passive dewatering systems utilizing sand filters: A field and large scale laboratory study.
- Dawal, Eric. Evaluation of sediment basin effectiveness using a laboratory scale basin and field basins.
- Hallany, Jihad. Evaluation of passive dewatering system for small storms using a laboratory sediment basin.
- Mach, Christian. Design, implementation, and evaluation of an algorithm to control crop to air vapor pressure deficit in a sunlit plant growth chamber.
- Weber, Diana. Relative contribution of sediment from upland and channel erosion.

Entomology

- Adams, Aaron Scott. Interactions between prescribed fire and herbivory: Effects on oak regeneration.
- Griffin, Marisa Lynn. Ovipositional behavior of the 12-spotted lady beetle, *Coleomegilla maculata*: Choices among plant species and potential factors affecting those choices.
- Held, David Wayne. Evaluation of controlled atmosphere anoxia treatments as a potential control tactic for greenhouse propagules.
- Hemmann, Daniel John. Evolution of behavioral response to a mutant sex pheromone blend in the cabbage looper moth, *Trichoplusia ni*.
- Hoy, Heather Lynn. Continuous *in vitro* culture of *Microplitis croceipes* teratocytes and the role of larval secretory products.
- Huang, LingKang. Identification and isolation of genes related to the replication of *Campoletis sonorensis* ichnovirus.
- Morrison, Cynthia B. Effects of transplant date and management strategies on selected tobacco pests.
- Newton, Blake L. The ecology of the harvestman *Phalangium opilio*, a predator of lepidopteran eggs in central Kentucky soybean.

Horticulture

- Wilson, Tina. Influence of film coatings on germination of shrunken-2 sweet corn.

Plant Pathology

- Chaky, Jennifer L. The influence of spore attachment and surface wettability and rigidity on germination in *Colletotrichum graminicola*.
- Craven, Kelly D. Evolution of *Epichloë/Neotyphodium* species, fungal symbionts of grasses.
- Heist, E. Patrick. Development of tissue culture systems with *Peronospora tabacina* and various *Nicotiana* species to study growth of pathogen in callus and to examine interactions with host roots.

Rural Sociology

- Jao, J. Ethnic inequalities and educational attainment in Taiwan.
- Kershaw, D. Spirit and the farm: Sustaining the legacy in a new millennium.

Veterinary Science

- Holtz, Cedric. Weight distribution on an equine hoof: The postural signature device.
- Smith, Kimberly. The relationship between oxytocin and prostaglandin PGF_{2α} at the expected time of luteolysis in mares.

Financial Statement

Statement of Current General Fund
Income and Expenditures
Fiscal Year 2000

INCOME

<i>Federal Funds:</i>	
Hatch Amended	\$3,941,624.00
Hatch Multistate	869,791.00
McIntire-Stennis	418,946.00
Animal Health	61,254.00
<i>Total Federal Funds</i>	\$5,291,615.00
<i>State Funds</i>	24,518,338.00
Total Funds	\$29,809,953.00

EXPENDITURES

	<i>Federal</i>	<i>State</i>	<i>Total</i>
Personal Services	\$4,133,806.00	\$15,776,377.00	\$19,910,183.00
Travel	97,469.00	203,536.00	301,005.00
Equipment	420,226.00	688,074.00	1,108,300.00
Other Operating Expenses	640,114.00	7,850,351.00	8,490,465.00
Total Expenditures	\$5,291,615.00	\$24,518,338.00	\$29,809,953.00

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