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UK AGRICULTURAL EXPERIMENT STATION
UNIVERSITY OF KENTUCKY—COLLEGE OF AGRICULTURE

The Kentucky
Agricultural Experiment Station

114th Annual Report 2001

UK

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 fourteenth annual report of the Kentucky Agricultural Experiment Station for the period ending December 31, 2001. 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 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, 2002

Contents

Contents

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 2001. 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 2001.

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.

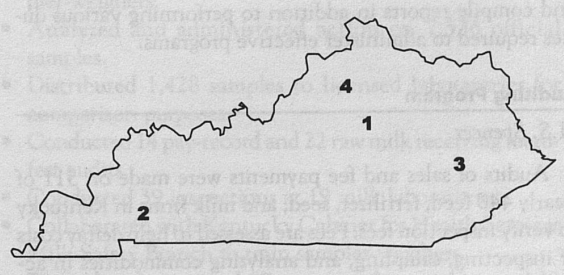
Campus—Laboratories and specialized equipment for all research program areas.

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 is charged with administering state laws pertaining to manufacturing, processing, labeling, and marketing of commercial feed, fertilizer, seed, and raw milk. The Division's primary objectives are to protect farmers and consumers from poor quality, mislabeled, or misrepresented products and to protect agricultural 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 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. One specialty-products inspector is dedicated to monitoring and sampling small-package and specialty feed, fertilizer, and seed products throughout the state. Another inspector is dedicated to the milk regulatory program, auditing records and monitoring activities of sampler-weighers, haulers, testers, and lab facilities.

In addition to regulatory programs of the Division, service testing is available 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 required to administer effective programs.

Auditing Program

H.S. Spencer

Audits of sales and fee payments were made on 311 of nearly 440 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 2,428 fertilizer reports, 2,964 feed reports, 840 seed reports, and 38 milk reports. Reports were checked for accuracy and compared to field audits of the submitting firms. Additional fees of $12,900 were found as a result of the audits.

2001 fee schedule 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 2001 income from fees, licenses, and testing services.

Industry	2001 Income
Feed	717,012
Fertilizer	596,011
Milk	63,187
Seed tags, licenses, and service testing	365,231
Soil Service Testing	143,722
Total	$1,885,163

Feed Regulatory Program

Steve 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 wholesomeness of animal products used for human consumption, and it participates in a nationwide effort by state and federal agencies to ensure food safety and promote consumer confidence in our food supply. The feed program and the FDA are working on a ruminant-to-ruminant feeding ban of certain mammalian proteins, promulgated to prevent establishment and amplification of Bovine Spongiform Encephalopathy (BSE or "Mad Cow Disease"). Activities in this area include inspection of renderers, manufacturers, and distributors to ensure regulation compliance.

2001 highlights:

- Administered actions on 3,807 official samples of commercial feed involving 23,889 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 17 feed mills that mix restricted drugs in feed and to inspect these mills for compliance with FDA's national BSE Rule. An additional 196 BSE inspections were contracted with FDA for mills not required to be licensed with FDA. Approximately 90% are complete.
- Conducted 7,500 label reviews and maintained product registration for about 15,000 products from 900 companies.
- Participated in FDA Good Manufacturing Practices and BSE inspection training.

Fertilizer Regulatory Program

D.L. Terry

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

2001 highlights:

- Administered actions on 3,491 official and 178 unofficial samples of fertilizer involving 10,382 tests of approximately 852,000 tons of fertilizer distributed in Kentucky.
- Reviewed labels and registered 3,600 products from 527 firms, including 212 who manufactured custom blends of fertilizers.

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 2001, 3,807 feed and 3,669 fertilizer samples were reported, including official regulatory, service, and inter-lab check samples. The laboratory also assists the soil lab in analysis of manure and litter samples.

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

Inspection Program

F. Herald

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.

2001 highlights:

- Nine inspectors completed 5,511 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.
- One inspector visited and sampled small-package specialty feed, fertilizer, and seed products in urban markets.
- Six inspectors made 313 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	3,807
Fertilizer	3,491
Seed	2,691
Milk	7,536

Milk Regulatory Program

C.D. 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 payments are calculated. The program provides support to the producers and processors of the state's $248 million dairy industry. Industry participants are licensed by the Division and monitored accordingly to maintain compliance with the law.

In addition to regulatory functions, the milk program cooperates with other agencies in educational projects to provide additional services to Kentucky dairy producers and processors. Additionally, the milk program operates a laboratory that is available for Kentucky producer and handler service testing.

2001 highlights:

- Reviewed and issued licenses to seven transfer stations, 19 milk handlers, 19 laboratories, 63 testers, and 363 sampler-weighers.
- Analyzed and administered action on 7,536 official samples.
- Distributed 1,428 samples to licensed laboratories for comparison purposes.
- Conducted 14 pay-record and 22 raw milk receiving manifest audits.
- Conducted 39 inspections at 19 milk laboratories.
- Collaborated with Kentucky Cabinet for Health Services Milk Safety Branch to train sampler-weighers.
- Trained and examined 69 new sampler-weighers and 14 new testers.
- Conducted 21 inspections of raw milk transfer stations.
- Conducted 780 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 in-

cludes 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.

2001 highlights:

- Performed 1,742 inspections and sampled agricultural, lawn, turf, and garden seeds at more than 600 wholesale and retail locations.
- Collected and tested 2,691 official seed samples.
- Issued stop-sale orders on 541 official seed samples and 114 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 184 agricultural permits and 54 vegetable and flower permits to label seed.
- Registered 399 seed dealers and 28 non-certified custom conditioners.
- Conducted one regulatory hearing for serious infractions of the Kentucky Seed Law.
- Provided training to firms on labeling requirements, mixing procedures, and batching records.

Seed Lab

C. Finneseth

The Division maintains the only seed testing facility in Kentucky. This seed laboratory conducts all official testing and provides service testing for producers, dealers, retailers, and homeowners. Lab 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. More than 14,000 different tests were performed in 2001, a 21% increase from the previous year.

2001 highlights:

Sample Type	2001 Completed Samples
Official samples	2,691
Service samples	6,214
Tobacco	1,914
Other certified crops	408
Total samples	8,905

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, surface-mine specialists, and others with scientific information about the fertility status of their soils. In partnership with the University of Kentucky Cooperative Extension Service, the soil laboratories—located on the Lexington campus and at the Research and Education Center in Princeton—perform routine tests and chemical analyses on soil samples from across the state. Subsequent unbiased lime and fertilizer recommendations are made based on nutrient need for specified crops, using fertilizer response data determined by years of research conducted by the University of Kentucky College of Agriculture.

The lab also offers 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.

2001 highlights:

- Developed a new computer program for county Extension offices for receiving, printing, and managing soil test data. Installed the program in 54 counties and conducted seven training sessions for 125 agents and county office support staff in use of the new system. Presented information about the computer program at the Cooperative Extension Service Conference and to the American Society of Agronomy.
- Provided information through five radio broadcasts with University of Kentucky Agricultural Communications Services, a Kentuckiana Crop Production Seminar on soil testing, and a presentation at the Southern Soil Fertility Conference on nitrogen and soil fertility.
- Participated in field days and various meetings giving programs on agricultural nutrient effects on water quality and provided assistance in six training sessions offered throughout the state on nutrient management planning.
- Soil laboratory analysis included the following types and number of samples in 2001 as compared to the previous year:

Type	Number	% Increase from 2000
Agriculture	32,872	27
Home lawn and garden	6,578	6
Strip-mine reclamation	57	104
Commercial horticulture	601	11
Greenhouse	46	-47
Research	14,363	5
Atrazine residue in soil	40	-69
Animal waste	194	-5
Nutrient solution	30	-55
Total	54,781	14

Kentucky Agricultural Experiment Station Projects

Agricultural Economics

Agricultural Industrialization and Globalization: Implications for Rural Economies—*Angelos Pagoulatos*
Analyzing the Industrial Organization and Financial Economic Performance of the Global Agribusiness Sector—*Steve Vickner*
Analyzing the International Competitiveness of the U.S. Agricultural Processing Industry—*Michael Reed*
Benefits and Costs of Resource Policies Affecting Public and Private Land—*Ronald Fleming*
Cooperative Partnership for Small to Medium-Sized Beef Producers in the Eastern Cornbelt: Phase II—*Lee Meyer*
Economist for State Development Board—*Timothy Woods*
Electric Utility Deregulation and Rural America—*David Freshwater*
Enhancing Farmers' Income through Polyculture of Paddlefish with Catfish in the Southern Region—*Lee Meyer*
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*
Marketing Systems Approach to Removing Distribution Barriers Confronting Small Volume Fruit/Vegetable Growers—*Timothy Woods*
Meat Processing and Marketing for Local and Direct Markets—*Lee Meyer*
Responding to Expressed Needs: SARE/ACE Regional Training with the Sustainable Dairy Systems Manual—*Steve Isaacs*
Risk Management and Profit Potential of Alternative Production Practices, Enterprises and Technologies—*Carl Dillon*
Rural Economic Development: Alternatives in the New Competitive Environment—*David Freshwater*
Rural Labor Markets: Workers, Firms and Communities in Transition—*David Freshwater*
Technological Progress in Agriculture, Farmers and Rural Communities—*David Debertin*
U.S. Consumer Demand for Dairy Products: Needs-Driven Methods and Analysis—*Leigh Maynard*
Wages, Jobs, and the Environment: Policy Choices for Rural Areas—*Angelos Pagoulatos*
Work Crew Performance Model in Vocational Agriculture—*Steve Isaacs*

Agronomy

319 Program Site-Specific Nutrient and Biosolids Management on Agricultural Lands—*R.I. Barnhisel*
Accelerating Development of Scab-Resistant Wheat Varieties—*D.A. Van Sanford*
Amount and Quality of Herbage 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*
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*
Cellular and Molecular Biology Initiative in Dark Tobacco—*G.B. Collins*
Characterization, Classification, and Use Interpretations of Kentucky Soils—*A.D. Karathanasis*
CHS Paducah Gaseous Diffusion Plant Oversight—*E. D'Angelo*
Cloning and Heterologous Expression of Cytochrome P450 Genes from Maize (*zea mays*)—*M. Barrett*
Cloning Epoxy Fatty Acid Genes—*D. Hildebrand*
Comprehensive Guide to Corn Production in Kentucky—*M. Bitzer*
Consortium for Plant Biotechnology Research Inc.—*A.G. Hunt*
Corn Breeding and Genetics: White Endosperm Breeding, Genetic Variation in Food Quality and Hybrid Performance Tests—*C.G. Poneleit*
Dark Tobacco Breeding and Chemistry—*P. Legg*
Defining Optimum Seeding Dates for Establishing Bermudagrass and Zoysiagrass Fairways in the Transitional Climatic Zone—*D. Williams*
Defining the Roles of Interactions between Plant Nuclear poly(A) 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 for On-Site Sewage Disposal Treatment System Personnel—*A.D. Karathanasis*
Disease-Resistance Properties of Tobacco Cultivars That Express *E. coli*—*A.G. Hunt*
Dow Chemical Company Research Agreement—*J. Chappell*
Effect of Tillage and Land Use on Physical and Chemical Properties of Kentucky Soils—*G.W. Thomas*
Engineering Oilseeds for Epoxy Fatty Acids Accumulation—*D.F. Hildebrand*
Engineering Soybeans for Increased Value—*D.F. Hildebrand*
Enhancing Soil Crop Management with an Electrical Conductivity Sensor—*T.G. Mueller*
Epoxy Fatty Acid Accumulation in Soybean Oil—*D.F. Hildebrand*
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*
Fusarium Graminearum Infection in the Morphological Components of Wheat Spikes—*D. TeKrony*
Genetic Engineering of Soybeans for Increased Oil Content and Epoxy Fatty Acid Accumulation—*D.F. Hildebrand*
Genetic Engineering of Dark Tobaccos—a Sub-Project of Cellular and Molecular Biology Initiative in Dark Tobacco—*J. Chappell*
Grain Quality Laboratory—*C.G. Poneleit*
Herbicide Persistence in Southern Soils Bioavailable Concentration and Effect on Sensitive Rotational Crops—*W.W. Witt*
Identification and Characterization of Genes Regulated by AGL-15, an Embryo-Expressed MADS-Box—*S.E. Perry*
Identification of Plant Genes That Confer Enhanced Capacity to Tolerate Oxidative Stress—*D. Falcone*
Indirect Benefit of No-Till Wheat: Enhanced Yield of Rotational No-Till Corn and Soybean—*L. Murdock Jr.*

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*
Investigating and Improving Dense Pubescence Germplasm—*T. Pfeiffer*
IPM of Weeds, Clover, and Endophyte in Tall Fescue Grassland—*C.T. Dougherty*
Isolation of Axillary Bud Specific Genes—*R. Dinkins*
Kentucky Watershed and Water Quality Education Project—*W.O. Thom*
Livestock and Poultry Environmental Stewardship—*M. Rasnake*
Making No-Till Wheat Production Profitable—*L. Murdock Jr.*
Manipulation and Regulation of Oxylipin 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*
Non-Transgenic Methods to Create Mutations in Specific Protein and Oil Genes—*D.F. Hildebrand*
Nutrient Management Booklet for Land Users—*W.O. Thom*
Phenology, Population Dynamics, and Interference: A Basis for Understanding Weed Biology and Ecology—*W.W. Witt*
Philip Morris Tobacco Curing—*G. Palmer*
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*
Plant Genetic Resources Conservation and Utilization—*N.L. Taylor*
Precision Agriculture: Explaining Spatial Variability in Grain Yields—*T. Mueller*
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: 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*
Precision Agriculture: Variable Rate Nitrogen Using Yield Maps—*L. Murdock Jr.*
Reduction of Saturated Fatty Acid Content of Soybean Oil—*D.F. Hildebrand*
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*
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*
Soil Biogeochemical Indicators to Assess Water Quality in Wetlands—*E. D'Angelo*
Soft Red Winter Wheat Breeding and Variety Development for Kentucky—*D.A. Van Sanford*
Soybean Genetic Engineering for Increased Disease Resistance—*G.B. Collins*
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 Biofuels Crop for the Upper Southeast—*M. Rasnake*
Technical Assistance for Data Analysis, Interpretation, and Manuscript Preparation in a Project on the Ecophysiology of the Mycorrhizal Symbiosis—*M. Barrett*
Turfgrass Management Practices in Kentucky—*D.W. Williams*
Use of Yeast Cell Wall Preparations to Absorb Toxins Present in Endophyte-Infected Tall Fescue—*L.P. Bush*
Yield Potential and Long-Term Effects of No-Tillage on Wheat Production—*J. Martin*

Animal Sciences

Animal Manure and Waste Utilization Treatment and Nuisance Avoidance for a Sustainable Agriculture—*G.L. Cromwell*
Breeding to Optimize Maternal Performance and Reproduction of Beef Cows in the Southern Regions—*F.A. Thrift*
Detection of Estrus in Gilts and Sows—*L.A. Edgerton*
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*
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*
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*
Molecular Characterization of Carbohydrate Utilization by Anaerobic Bacteria—*H.J. Strobel*
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 Methanethiol Dimethyl Trisulfide in Soy Protein Products—*W.L. Boatright*
Proteomic Analysis of Anaerobic Bacterial Metabolism—*H.J. Strobel*
Regulation of Carbohydrate Digestion and Absorption in the Ruminant Small Intestine—*D.L. Harmon*
Strategies for Improving Ewe Lactational Performance and Predicting Preweaning Growth of Lambs Harvesting the Milk Produced—*D.K. Aaron*
Zinc Nutrition Endothelial Integrity—*B. Hennig*

Biosystems and Agricultural Engineering

Cattle Production Practices in Grazed Watersheds of the Humid Region—*S.R. Workman, J.R. Bicudo, E.S. Vanzant, and D.R. Edwards*
Comparison of Two NIR Monitors for Specialty Grains—*S.G. McNeill*
Drying and Storage Properties of Selected Specialty Grains—*S.G. McNeill*
Integrating IPM Strategies in On-Farm Stored Grain in Tennessee and Kentucky—*S.G. McNeill*
Odor Control Technology Evaluation—Geotextile Covers—*José R. Bicudo*
Optimization of Aeration Systems for Value-Added Crop Preservation—*M.D. Montross*
Optimization of Geotextile and Gravel Pads for Heavy Livestock Traffic Areas—*José R. Bicudo*
Post-Harvest Physical Properties of Corn Stover—*M.D. Montross*
Riparian Restoration Techniques for Improving Wildlife Habitat and Stream Water Quality in Kentucky—*S.R. Workman*
Spatial Variability of Value-Added Components of Corn, Soybeans and Wheat in Kentucky—*S.G. McNeill*
Systems for Controlling Air Pollutant Emissions and Indoor Environment of Poultry, Swine, and Dairy Facilities—*L. Turner*
Toward a Dynamic System for Controlling Mist Propagation of Softwood Cuttings—*R. Gates*
Use of Near Infrared Reflectance to Determine Flour Quality—*M.D. Montross*
Variability of Value Added Components in Corn during Handling—*M.D. Montross*

Entomology

Administration and Evaluation of Southern Region IPM—*Bobby C. Pass*
Aggressive Chemical Mimicry in Bolas Spiders—*Kenneth F. Haynes*
Biological Control of Arthropod Pests and Weeds—*K.V. Yeargan*
Biology and Management of Insects Attacking Turf and Woody Landscape Plants—*D.A. Potter*
CAPS—Cooperative Agricultural Pest Survey—*Bobby C. Pass*
Characterization of Selected Proteins Derived from an Insect Parasitoid—*D.L. Dahlman*
Consequences of Variation in Host Plant Resistance for the Evolution of Offspring Size in a Seed-Feeding Beetle—*C.W. Fox*
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Controlled Water Table Irrigation for Container Plant Production—*J.W. Buxton*

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A Planning Model for Assessment of Agricultural Potential in Appalachia Using Information Technology Tools—*Thomas J. Nieman*

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Agronomy

Afitlhile, Meshack. Regulation of *in planta* jasmonic acid and methyl jasmonate synthesis.

Diaz-Zorita, Martin. Towards the interpretation of soil structure in agricultural soils.

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

Liu, G. Bayesian computations for general linear-bilinear models.

Mubiru, Drake N. Water dispersible soil colloid properties and their role in the adsorption and transport of *Escherichia coli* through intact soil columns.

Ralston, Jennifer L. Promoter analysis and herbicide metabolism capabilities of a safener-inducible cytochrome P450 from corn.

Ralston, Lyle. Cloning, heterologous expression, and functional characterization of 5-*EPI*- Aristolochene-1,3-Dihydroxylase and a related gene from tobacco (*Nicotiana tabacum*).

Sukop, Michael C. Porosity, percolation thresholds, and water retention behavior of random fractal porous media.

Animal Sciences

Akay, Veysel. Nutritional evaluation of Nutridense™ and waxy corn hybrids for ruminants.

Amako, Donatus Emerenini Ndubuisi. Numerical modeling of a food analog and heat transfer parameters and nutrient retention of selected foods thermally processed in retortable semi-rigid plastic trays.

Jamikorn, Uttra. Influence of processing temperature and time on nutrient quality of canned dog food.

Jones, Chris R. Physiology and molecular biology of sugar utilization by *Thermoanaerobacter ethanolicus* 39E.

Lei, Qingxin. Chemistry of odor-impact volatiles from soy protein concentrates.

Paton, Neil Duncan. Organic selenium in the nutrition of laying hens: Effects on egg selenium content, egg quality and transfer to developing chick embryo.

Paton, Sara Jean. Evaluation of maturity, marker, and duodenal cannula on the characterization of endophyte-infected tall fescue and the effect of prazosin and thiamin on fescue toxicosis.

Tricárico, Juan M. Influence of exogenous enzyme preparations on *in vitro* digestion and activities of ruminal microbial populations.

Biosystems and Agricultural Engineering

Crofcheck, Czarena L. Characterization of milk by light scattering for fiber optic sensor applications.

Tarhan, Sefa. Fermentation kinetics and modeling of non-growing *Clostridium thermocellum* JW20.

Entomology

Cesak, Mary Ellen. Evolutionary genetics of egg size and number in a seed beetle, *Stator limbatus*.

Hilgarth, Roland Sebastian. Identification and analysis of the repeat element gene family in the *Campoletis sonorensis ichnovirus*.

Forestry

Larkin, J.L. Demographic characteristics of a reintroduced elk herd in eastern Kentucky.

Veterinary Science

Breathnach, C.C. Mucosal humoral and cellular immune defense mechanisms of the horse's upper respiratory tract against equine herpesvirus-1 infection.

Dirikolu, L. Detection, quantification, and pharmacokinetics of triazine-based antiprotozoal agents for the treatment of equine protozoal myeloencephalitis.

Gallagher, P. Repetitive DNA sequences in the horse genome.

Lieto, Louis. Characterization of *Epitheliogenesis imperfecta* in *Equus caballus*.

Nally, J.E. Temperature regulated antigens of *Leptospira interrogans*.

Terry, R.R. Investigations of candidate genes for Appaloosa coat color in horses.

M.S. Theses

Agricultural Economics

Bernardi, Adrienne. Analyzing the Dow Jones sustainability group index: A club theory perspective.

Burke, Victoria. The impact of state prisons on the economy of Kentucky.

Coffey, Brian. New input and output risk management strategies for livestock producers.

Ferguson, Meagan. Valuing ultrasound predictions on carcass quality grade.

Godley, Janet. An analysis of the economic impacts of agriculture and its related sectors on the Kentucky economy.

Green, Daniel. A farm-level analysis of specialty crop production in Kentucky.

Hoagland, Warren. A multiple case study approach to entrepreneurial agriculture.

Long, James. Using variography to better understand spatial correlation and systematic risk in U.S. corn yields.

Orr, Nolita. Black farmer's transition from tobacco in Kentucky.

Subramaniam, Vijayaranta. A benefit-cost spreadsheet analysis of precision farming technologies for grain producers of varying sizes.

Agronomy

Abnee, Amanda C. Landscape influences on soil respiration rates of southeastern Kentucky forest soils.

Coulter, Christopher B. Water quality implications of urban development in mixed use watersheds.

Hartsock, Nathaniel J. In situ soil electrical conductivity variability in several Kentucky agricultural fields.

Potter, Cora L. Vegetation effects on the performance of constructed wetlands treating domestic wastewater.

Sandefur, Brian C. Geochemical, hydrologic and vegetation characteristics of three southern Appalachian mountain wetlands.

Animal Sciences

Behrends, Jason Monroe. Microbial, chemical, and visual characteristics of whole muscle beef steaks from the round with different USDA grade groups as affected by high oxygen case-ready packaging.

Broaddus, Brent Allen. Impact of season and heat stress on somatic cell counts.

Janicki, Kristen Michelle. The effect of dietary selenium source and level on broodmares and their foals.

Jose, Nancy S. Effect of receptor blockers on bacteriophage proliferation.

King, Amy Lynn. Effects of transforming growth factor-ß2 on development of bovine embryos *in vitro*.

Nugent, Amelia Marie. The effects of the intramammary infusion of *Escherichia coli* endotoxin on ovulation in lactating dairy cows.

Woods, Chad Ashley. Substrate recognition and regulation of canine pept1 function using a MDCK cell model.

Yamka, Ryan Michael. Evaluation of soybean meal, low ash poultry meal, and corn gluten meal in canine diets.

Biosystems and Agricultural Engineering

Danao, Mary-Grace C. Determining product transitions in a liquid piping system using a transmission sensor.

Entomology

Collins, Joseph T. A survey for red imported fire ant, *Solenopsis invicta* Buren (Hymenoptera: Formicidae), in selected Kentucky counties.

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McNabb, Denise M. Using stable isotopes to infer trophic connections of generalist predators in a detritus-enriched agroecosystem.

Pucci, Thomas M. A revision of *Agathirsia* (Hymenoptera: Braconidae) with an analysis of its adult feeding.

Forestry

Blackwell, Kyle A. Hardwood sawmill performance comparison.

Brosi, Sunshine Liberty. Controls on American chestnut establishment in Kentucky's Cumberland Plateau Region.

Kirillova, Natalia V. Optimal financial management of yellow-poplar-oak stands in the Central Appalachian Region.

Shouse, Scott. Implementation costs of Kentucky's erosion control Best Management Practices for skid trails.

Wichrowski, M. Activity and habitat use of a reintroduced elk herd in Eastern Kentucky.

Horticulture

Vires, Jennifer. Biomass and total phenolic content of purple coneflower (*Echinacea* sp.) grown in Kentucky, U.S.A., as influenced by genotype and cultural practices.

Rural Sociology

Kershaw, D. Nebraska farm women: Contributions to the survival of the small family farm.

Veterinary Science

Donofrio, J.C. Examination of T-lymphocyte tolerance in foals vaccinated against equine influenza in the presence of maternal antibodies.

Ward, M.M. Development of a perifusion culture system to examine oxytocin and prostaglandin $PFG_{2\alpha}$ interaction in the mare.

Financial Statement

Statement of Current General Fund Income and Expenditures Fiscal Year 2001

INCOME

Federal Funds:	
Hatch Amended	$3,932,333
Hatch Multistate	865,931
McIntire-Stennis	416,686
Animal Health	60,984
Total Federal Funds	$5,275,934
State Funds	$24,173,759
Total Funds	**$29,449,693**

EXPENDITURES

	Federal	*State*	*Total*
Personal Services	$4,245,701	$15,639,094	$19,884,795
Travel	130,762	184,119	314,881
Equipment	181,047	336,431	517,478
Other Operating Expenses	718,424	8,014,115	8,732,539
Total Expenditures	**$5,275,934**	**$24,173,759**	**$29,449,693**

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January 1, 2001—December 31, 2001

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COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF KENTUCKY • COLLEGE OF AGRICULTURE

Accomplishments and Impact of the Cooperative Extension Service

Last year, Extension agents and specialists made over 6 million contacts with Kentucky citizens.

A Presence in Every County

Each of Kentucky's 120 counties has a Cooperative Extension Service office. These offices are an educational resource to help all Kentuckians improve their quality of life. Last year, Extension agents and specialists made over 6 million contacts with Kentucky citizens. Nearly a quarter of a million Kentucky youth—235,627—participated in Extension 4-H/Youth Development programs, and the state's Extension Homemakers had a membership of about 22,000. Also last year, 12,868 Kentucky citizens served on local Extension advisory councils to establish program priorities at the grass-roots level.

Growing Agricultural Revenues

In the past year, the Kentucky Cooperative Extension Service made 911,464 contacts with clientele to improve production, processing, and marketing of agricultural products. An additional 171,020 people were contacted about adopting resource management technologies. Together, these efforts resulted in 20,110 farmers adopting one or more new Extension-recommended practices, resulting in $25,730,385 in additional profits.

Keys to Great Parenting

The Kentucky Cooperative Extension Service has created *Keys to Great Parenting,* a parent education program designed for an audience including those of low literacy and limited resources. Designed to promote optimal development among infants and toddlers, the flexible curriculum is built around seven research-based keys that enable a parent to unlock a child's potential. In-depth teaching guides accompany publications that focus on the seven keys. Over 100 Extension agents and other professionals have already been trained in using the program, and a comprehensive Web site will soon be operational.

These publications are in response to the latest research on the brain's development. That research indicates brain development is profoundly affected by a child's early environment. Infants and toddlers make trillions of brain connections every day that are the basis for language, problem solving, and other skills.

Character Counts

The Extension 4-H/Youth Development program Character Counts is making a difference in the lives of Kentucky youth. Built on six core values—trustworthiness, respect, responsibility, fairness, caring, and citizenship—the program encourages young people to pursue ethical behavior. Since its start in the mid-1990s, the program has grown to the point that it now reaches nearly 36,000 young Kentuckians each year. In an evaluation of the program, young people indicated that their peers obeyed rules, showed respect for authority, helped others, treated others fairly, and were truthful more often as a result of the program. Conversely, they said their peers now used put-downs, made threats, and assigned blame to others less often.

Wildcat Way to Wellness

More than half of Kentucky adults are overweight and participate in no physical activity during their leisure time. Cardiovascular disease continues to be the leading cause of death, and the incidence of diabetes has increased by a third over the past six years. Consequently, promoting wellness has become an important program thrust in the Kentucky Cooperative Extension Service. Since 1999, a new program called the Wildcat Way to Wellness has reached over 25,000 Kentuckians with a preventive health message.

The program provides a wide variety of current research-based information to help consumers make well-informed choices about behaviors related to health and well-being. This

Promoting wellness has become an important program thrust in the Kentucky Cooperative Extension Service.

fresh approach to achieving better health promises to have a significant impact on the social and economic status of Kentucky citizens. Follow-up data indicate that more than three-quarters of participants have made positive behavioral changes as result of this program.

Agricultural Diversification

Over the past year, Extension specialists have used on-farm demonstrations, agent training, industry workshops and tours, newsletters, Web sites, and Extension publications to assist in the expansion of established and emerging horticultural enterprises, which offer significant opportunities for diversification of Kentucky's agricultural businesses.

One area of focus has been promoting the use of bell pepper varieties reported to have resistance to bacterial leaf spot. As a result of an intense Extension program, over 90 percent of bell pepper acreage is now planted according to Extension recommendations. Pepper acreage has increased by nearly a third in the past two years, resulting in bell peppers becoming an important and profitable enterprise for both new and expanding produce marketing cooperatives.

Profitability of cabbage and apple production has also increased through use of integrated pest management practices taught through on-farm demonstrations, workshops, and manuals. Certification programs for nursery industry personnel and arborists are increasing professionalism of these groups and the quality of their services.

Getting More for Your Food Dollar

More than 70 percent of the 8,000 people who participated in the University of Kentucky Food Stamp Nutrition Education Plan (FSNEP) said they gained knowledge as a result of their participation in that program, and 66 percent said they had adopted new practices, evaluation data showed. The program was implemented in 1997 to help food stamp recipients make the most of their food dollar. It is conducted in conjunction with the USDA Food and Nutrition Service and The Commonwealth of Kentucky's Cabinet for Families and Children. Extension agents who participate in FSNEP receive two "waves" of promotional and educational materials, including food demonstration kits, teaching guides, and social marketing tools. Local program partners included Headstart, workforce training programs, social service agencies, senior citizen centers, Community Action Councils, housing authorities, and Family Resource/Youth Service Centers.

Women in Agriculture

More than 400 women participated in the second annual Women in Agriculture conference cosponsored by the Kentucky Cooperative Extension Service and Kentucky Department of Agriculture. The conference addressed such issues as policy development, farm labor, creating niche markets, use of best farm management practices, and financial planning. Ninety percent of participants said the conference helped them gain knowledge that will make their farms more profitable. Several area- and county-based programs help women engage in value-added enterprises, explore niche and specialty crop opportunities, and expand their role in agricultural policy development.

Science Education

According to the Kentucky Science and Technology Corporation, Kentucky ranks 47th in the nation in number of scientists and engineers in the work force. It is unlikely that Kentucky will produce many more scientists and engineers in the near future, since fewer than 43 students per 100,000 residents are enrolled in science and engineering programs. Because of this identified need for more scientists and engineers, science has become one of three major focus areas for the Kentucky 4-H/Youth Development program. Three new science curricula were introduced this year to Kentucky 4-H/Youth Development agents. They are Aerospace, Rockets Away, and In-Touch Science.

The In-Touch Science program was introduced to the state through an in-service training conducted by Cornell University Extension specialists. Participants in this training included 4-H agents, volunteers, and elementary school teachers. A special grant provided funding for the development and printing of 1,000 4-H science program flyers, which were inserted into Kentucky Agriculture and Environment in the Classroom packets that were distributed to public and private school teachers throughout the Commonwealth.

Extension has played a key role in helping farmers develop and submit their water quality protection plans.

Improving Forage Yields

More than 7 million acres of Kentucky land, or more than half of all arable land, is used for forages. One of the most effective ways to increase forage yields is by planting new and improved forage varieties. Extension forage specialists and county Extension agents provide a wide range of tools for producers to help them improve forage yield, including training, publications, and up-to-date grazing tolerance variety information. Improved alfalfa varieties, for example, have been shown to increase annual hay yields by at least 1 ton per acre. Other benefits of planting improved varieties are increased stand persistence, forage quality, and pest resistance. The value of these improvements has been calculated to be between $700 and $1,400 an acre over the life of the stand. Similar benefits have been observed from planting improved red clover varieties as well.

Protecting Against Food-borne Pathogens

The elderly and school-age children are the age groups most susceptible to food-borne pathogens. To address this concern, the Kentucky Cooperative Extension Service conducted educational programs on the safe preparation and handling of food for both youth and seniors. More than 11,000 youth and nearly 300 seniors participated. Ninety-five percent of the participants said they planned to make behavioral changes as a result of newly learned skills in food preparation and food handling safety. Long after many of the programs ended, students were heard singing the song suggested for measuring the proper length of time for washing their hands—proof that food safety can be fun as well as life changing.

Keeping Our Water Clean

In 1994, the Kentucky General Assembly passed the Agriculture Water Quality Act. Through this legislation, each Kentucky landowner with 10 or more contiguous acres in agriculture or silviculture production is required to develop and implement a water quality protection plan by October of 2001. Since the passage of the act, Extension has played a key role in helping farmers develop and submit their plans. Working with three state agencies, two federal agencies, and one farm organization, Extension staff planned and conducted 15 training sessions for agency professionals between 1995 and 1998. More than 1,000 people participated in these sessions. Since 1996, these agency professionals have conducted hundreds of informational meetings, water quality field days, and workshops in plan writing. By the beginning of the year, these efforts had resulted in more than 16,000 plan certifications being filed with local conservation districts.

Elite Heifer Sales

Producers in several regions of Kentucky have begun to enhance profitability of their operations by marketing optimally developed commercial heifers. Last year, approximately 1,500 heifers were marketed in six different sales throughout Kentucky. All heifers in these sales were reared under guidelines established by the Kentucky Cooperative Extension Service. Heifers in these sales averaged approximately $940, and sale averages ranged from $850 to $1,065. Producers in these sales are likely to increase their profits by $100 to $250 per head, an increase statewide of almost $300,000.

Expanded Food and Nutrition Education Program

Extension's Expanded Food and Nutrition Education Program (EFNEP) helps limited resource homemakers improve the nutritional quality of meals while maximizing food-related resources. Of the 2,732 EFNEP graduate families, more than 90 percent made changes in their food intake. These behavioral changes are estimated to produce annual savings of more than $600,000 in health care and other costs. The program also helped more than 500 limited resource families grow gardens that produced more than $300,000 worth of food.

Kentucky Master Logger Program

The Kentucky Master Logger Program was initiated in the fall of 1992 to provide broad-based training for loggers. The program consists of an initial three-day course for first time participants and four one-day follow-up workshops for individuals who have completed the initial training. To date 4,301 loggers have completed the course. The program teaches loggers to use best management practices (BMPs) to bring hardwood timber out of the forest with minimal environmental impact. Loggers also learn about safety in the forest and how to stay in compliance with federal and state laws. The program

is the result of a cooperative partnership between the Kentucky Cooperative Extension Service, the Kentucky Division of Forestry, and the Kentucky Forest Industries Association. It receives financial support from the timber industry. The program has been so successful that the Kentucky General Assembly has passed a law requiring that at least one Master Logger be on each timber harvesting site. Kentucky Master Loggers currently harvest approximately 1 billion board feet of timber on 300,000 acres. This resource is worth $120 million to Kentucky landowners.

EFNEP assistants provided information to 1,316 families about the Earned Income Tax Credit.

AgrAbility

Kentucky AgrAbility provides direct services to farmers with disabilities and educational programs for health care providers about farming with disabilities. Special emphasis has been placed on serving traditionally underserved populations such as older farmers, children, minorities, and farmers with limited resources. Since its inception, the Kentucky AgrAbility Project has built a solid reputation for providing reliable information and realistic service to its clients. Over the past seven years, the Kentucky AgrAbility project has provided direct service to 400 farmers with disabilities. Each year of the program, the number of requests for information from the AgrAbility office has doubled.

Money 2000+

Consumer debt continues to increase every year. Personal bankruptcies continue to increase. In late 2000, consumer savings rates were negative for the first time ever. Extension's MONEY2000+ is a financial management program that encourages families to set written financial goals to save money and/or reduce their debt. For the first six months families are enrolled in the program, they are mailed monthly lessons that help them look at their money management practices, set goals, and establish a budget. Families then receive a quarterly newsletter that contains additional information to support them in achieving their money management goals. By the end of last year, families enrolled in the program had saved $65,110 of the $97,960 they planned to save. These same families had reduced their debt of $189,000 by $55,190. One family reduced its debt to a level at which it could qualify for a consolidated bank loan at a lower interest rate. Many families reported eliminating the use of credit cards, and others reported having money in savings to meet emergency expenses for the first time in their lives.

Preparing Young People for Employable Futures

Surveys completed by employers across the state indicate workers are not prepared to go to work when they get out of school. In Louisville, 3,500 employers who were surveyed said that two-thirds of their workers need improvement in the basic skills of reading, writing, and math. In 1996, 14 out of every 100 Kentucky teens (ages 16 to19) dropped out of high school. In response to these statistics, the Cooperative Extension Service is helping local communities administer a dose of reality to young people across the state through an innovative simulation activity called the *Reality Store*. Last year more than 16,000 youth participated in the program. One county's evaluation shows that kids are getting the message. More than 90 percent of the youth who participated said they learned that the type of job they obtain will determine how much money they will make and consequently the lifestyle they will live. As a result, more than two-thirds of the participants said they will try harder in school as a result of the experience.

Earned Income Tax Credit

The Earned Income Tax Credit is a special tax benefit for working people with low or moderate incomes. It helps these workers reduce the tax burden and supplement their wages. Workers within certain income guidelines are able to receive a check from the IRS by filing an earned income credit when filing their taxes. Workers can also receive free assistance on filing taxes. The IRS has sought numerous outlets for spreading the word to workers about the credit. In Kentucky, EFNEP assistants provided information to 1,316 families about the Earned Income Tax Credit, and 611 people filed for it as a direct result. It is estimated that more than $1,083,350 was received by these families as a result of learning about the Earned Income Tax Credit.