PLAN OF WORK

Kentucky State University

Land-Grant Program

1890 Research

Frankfort, Kentucky

Federal Fiscal Year
2000-2004
Plan of Work for 1890 Research
Kentucky State University Land-Grant Program
Frankfort, Kentucky

Introduction

This Plan of Work (POW) for 1890 Research, Kentucky State University Land-Grant Program (KSU-LGP), provides a description of programs and their relevance to state and national goals.
The Statement of Issues for Kentucky are described in detail in the Kentucky Agricultural Experiment Station (KAES) POW and are not repeated; however, some issues unique to KSU-LGP and its stakeholders are described here.

Stakeholder Input Process

The Kentucky Agricultural Experiment Station (KAES) POW, Section II A, outlines the Kentucky Agricultural Advancement Council and will not be repeated here. In addition to that process, to facilitate the exchange of ideas and solicit stakeholder input, a series of monthly meetings was initiated in February 1997 sponsored in part by a Southern Region SARE grant. The meetings are held at the KSU Research and Demonstration Farm and are regularly attended by growers, researchers, extension personnel, state agency representatives, 1890 and 1862 representatives, and other interested persons. These meetings have been so successful that plans have been made to continue them after the initial grant has expired.

Program Review Process

All project-based research proposals must be peer-reviewed and funding decisions are based upon scientific merit and relevance to state, national, and regional priorities set by USDA and the KSU mission. Prior to submission to CSREES, all Evans-Allen supported proposals are sent by the Research Director for external peer-review by at least two scientists outside KSU. This ensures the relevance and quality of the science. University of Kentucky College of Agriculture faculty are often included in the proposal review panels.

Development of Human Capital

An outcome indicator shared by all performance goals at KSU-LGP is the development of human capital. Student involvement, including high school, undergraduate and graduate, is expected in all research projects. The success of any project can not be totally measured without the assessment of student advancement.

Collaboration Between 1862 and 1890

The partnership between KSU and UK is documented many times in this POW. In addition to being involved in our Stakeholder Input Process and Program Review Process, UK researchers collaborate with KSU researchers on formal and informal levels. The majority of KSU researchers have adjunct appointments in their respective departments at UK.

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GOAL 1 - AN AGRICULTURAL PRODUCTION SYSTEM THAT IS HIGHLY COMPETITIVE IN THE GLOBAL ECONOMY.

Statement of Issues

Kentucky is a state of small farms, ranking fourth nationally. Tobacco is the number one cash crop in Kentucky. One of the most critical issues facing these farms is the potential loss of tobacco as a

federally-supported crop. The Kentucky State University Land-Grant Program (KSU-LGP), which includes both research and extension, have put considerable energy and resources into small farm diversification and alternative crops. To facilitate the exchange of ideas and solicit stakeholder input, a series of monthly meetings was initiated in February 1997 sponsored by a Southern Region SARE grant. The meetings are held at the KSU Research and Demonstration Farm and are regularly attended by growers, researchers, extension personnel, state agency representatives, 1890 and 1862 representatives, and other interested persons. These meetings have been so successful that plans have been made to continue them after the initial grant has expired.

Performance Goal

Our goal is to discover, develop and deliver scientific information, analysis and educational programming which will enhance the competitive position of agricultural producers by promoting productivity, efficiency, diversity and sustainability of agricultural systems. The output indicators below are specific for 1890 Research; the outcome indicators are shared with our Cooperative Extension partners.

Output Indicators

1. Improved plant and animal genotypes, applications of biotechnology (in the broadest sense) for the benefit of farmers, food producers, and consumers.
2. Appropriate technology for application to production systems of all sizes (especially smaller scale) and for diverse commodities.
3. Enhanced, more efficient management systems for diversified agricultural opportunities.
4. Integration of economic and technical analyses as related to agricultural production systems in our region and the nation.
5. Development of publications, educational materials, and other material to document and extend research findings.

Outcome Indicators

1. Number of individuals reporting changes in knowledge, opinions, skills, or aspirations related to alternative/supplemental crops for small farm diversification and sustainable cropping practices.
2. Number of producers utilizing new sustainable cropping practices.
3. Number of farmers adopting one or more alternative/supplemental crops for small farm diversification.

Key Program Components

KSU-LGP was recognized by the Kentucky Legislature as the lead institution in Kentucky for research, extension, and teaching in aquaculture. Current projects are investigating (1) freshwater shrimp as an alternative aquaculture crop, (2) paddlefish as a reservoir ranching species and caviar producer, and (3) cage culture of channel catfish. Other species slated for research are hybrid striped bass, blue catfish, small mouth bass, and crappie.

In addition to the aquaculture species mentioned above, another alternative crop under intense research at KSU-LGP is the native tree fruit, pawpaw. KSU was named the USDA National Germplasm Repository for *Asimina* spp. Several other small fruits are being considered for investigation, such as gooseberry, grapes, and blueberry.

Many vegetable species are being examined for their potential in small farm diversification. Sweet corn, watermelon, peppers, potatoes and okra have demonstrated some suitability for Kentucky needs. The KSU research has focused on low input cropping practices for these crops using living mulches, colored plastic mulches, and compost.

Most of the fruits and vegetables under investigation as alternative crops for small farm diversification are linked by a common biological fact - they require pollination for fruit set. Kentucky is suffering, as are many states, by a drastic decline in populations of honey bees. KSU is investigating the impact of mites and disease on honey bees and searching for resistant hives in many parts of the state. The contribution of apiculture to the food and agricultural sciences is only now being fully realized.

Internal and External Linkages

Regional collaborations among 1890 and 1862 institutions is currently in process concerning the development of freshwater prawns as a new crop in Kentucky. Researchers at Kentucky State University, Mississippi State University and Delaware State Universit y are collaborating by using identical stocking densities to make comparisons across state lines. The Kentucky Department of Agriculture is providing some assistance to explore marketing alternatives for freshwater shrimp and to help construct a nursery f or supplying shrimp larvae for new growers.

Collaboration on the reproductive biology and gynogenesis of paddlefish has become an international endeavor. Research into the production of paddlefish caviar has necessitated the linkage of expertises from several institutions, including CNRS Station Marine, Villefranche, France; Research Institute of Fish Culture and Hydrobiology, Vonany, Czech Republic; All -Russia Institute of Pond Fisheries, Moscow, Russia; and the University of Oklahoma.

Considerable effort has also been placed in developing mulch systems to improve vegetable production. On-farm studies have been conducted in collaboration with the KSU Cooperative Extension Small Farm Program to involve limited resource farmers in the development process. By working directly with growers already enrolled in this Extension program, the feedback loop of needs and results is complete.

Target Audiences

The alternative crops and sustainable cropping systems under development are targeted for small farms and entrepreneurs. The needs of limited resource farmers are rarely addressed by the large institutions and ag companies. This is a serious problem in Kentucky due to the high percentage of small farms.

Evaluation Framework

This work will eventually be judge d by the future acceptance of the alternative crops and cropping systems and the contribution their adoption will make to the agriculture economy and the income of the targeted small farms.

Program Duration

The goal of identifying alternative/supplemental crops for small farm diversification has short - to long-term time lines. For example, some alternatives species like freshwater shrimp are ready for extensive grower testing now. Some other aquaculture species still require a greater research base and are considered intermediate term projects. Development of pawpaw into a commercially available crop is more of a long-term project. KSU-LGP has made long-term commitments to aquaculture and horticultural research.

The ongoing research on devising sustain able cropping systems for the most promising alternative crops has an intermediate time line. However, it is expected that as new crops are tested and accepted, the need for cropping systems research will continue.

Allocated Resources

Approximately 48% of SYs and 55% of Evans-Allen funds are targeted for this goal.

	Federal ($1000)	**State ($1000)**	**Total ($1000)**	**SY**
2000	981	0	981	5.8
2001	981	0	981	5.8
2002	981	0	981	5.8
2003	981	0	981	5.8
2004	981	0	981	5.8

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GOAL 2 - A SAFE AND SECURE FOOD AND FIBER SYSTEM.

Statement of Issues

A sustainable cropping system, especially for small farmers, can not be dependent upon expensive and environmentally unfriendly chemicals. KSU is working to develop integrated pest management (IPM) strategies for vegetables and stored grains which are based upon pest behaviors, biorational pesticides and biological controls. The safety of farm workers who must employ the se control strategies is also a primary concern.

Performance Goal

Our goal is to discover, develop and deliver scientific information, analysis and educational programming which will increase the availability of safe, nutritious, affordable foods while advancing our knowledge of human health and nutrition. The output indicators below are specific for 1890 Research; the outcome indicators are shared with our Cooperative Extension partners.

Output Indicators

1. Improved methods for storing grain on-farm for the benefit of farmers, food producers and consumers.
2. More efficient biochemical indicators for worker exposure to pesticides.
3. Development of publications, educational materials, and other material to document and extend research findings.

Outcome Indicators

1. Number of individuals reporting changes in knowledge, opinions, skills, or aspirations regarding the biochemical risk to applicators of exposure to ag-chemicals.
2. Number of farmers adopting safe and sustainable practices for on-farm storage of grain.

Key Program Components

KSU has one of the few stored-grain bin complexes on a university research farm. There are 30 steel grain bins on the KSU Research and Demonstration Farm, which provides the opportunity to do replicated research on the stored-grain ecosystem. The new wave of genetically engineered crops is here. Little if any data exists on the impact of this technology in the stored grain environment. Corn implanted with the gene for *Bacillus thuringiensis*, otherwise called Bt corn, will be tested for its impact on controlling pests and beneficial insects while in storage.

An often overlooked aspect of food safety and human health is the risk of the people producing the food. Farm workers are on the front lines of the chemical battle between man and pest. KSU is using animals models to access the impact of commonly-used agriculture chemicals on blood chemistry and health.

Internal and External Linkages

The Bt corn research is done in conjunction with the USDA/ARS Grain Marketing Research Laboratory in Manhattan, KS. The private companies of Mycogen Co., Monsanto Co., and Ecogen Inc. are also contributing grain and expertise. The primary Extension linkage for corn and stored grain in Kentucky is via the University of Kentucky Extension Service.

Some aspects of the pesticide exposure work is done in collaboration with the US Environmental Protection Agency (EPA) National Risk Management Research Laboratory in Cincinnati, OH.

Target Audiences

While targeted for small farmers, the stored-grain and worker exposure research is applicable to all scales of agriculture.

Evaluation Framework

This work will eventually be judged by the future acceptance of new management practices involving grain storage and ag-chemical application, and the contribution their adoption will make to the agriculture economy and the health and welfare of the targeted small farms.

Program Duration

The goal of investigating the impact of Bt corn on stored grain pests and beneficials has an intermediate-term time line. The goal of evaluating the biochemical risk to applicators of exposure to ag-chemicals has a long-term time line.

Allocated Resources

Approximately 17% of SYs and 17% of Evans-Allen funds are targeted for this goal.

	Federal ($1000)	**State ($1000)**	**Total ($1000)**	**SY**
2000	190	0	190	2.0
2001	190	0	190	2.0
2002	190	0	190	2.0
2003	190	0	190	2.0
2004	190	0	190	2.0

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GOAL 3 - A HEALTHY, WELL-NOURISHED POPULATION

Statement of Issues

Although tremendous strides have been made in improving the health and longevity of the American people, there is a persistent and distressing disparity in key health indicators among minorities. Modification of dietary management as a means of health maintenance and prevention of chronic diseases becomes increasingly important as health costs continue to rise.

Osteoporosis, one of the major nutrition-related health problems in the United States, is characterized by low bone mass and microarchitectural deterioration of bone tissue, which leads to bone fragility. Dieting represents a risk factor for osteoporosis because dieting and the associated body weight loss may reduce bone mass and strength.

A priority research area in the KSU-LGP is the well being of the rural elderly, limited resource families, and minorities. Several projects are designed to optimize the health of consumers by improving the quality of diets, the quality of food, and the number of food choices. Much of the laboratory research concerning diet and exercise is conducted with experimental models.

Performance Goal

Our goal is to discover, develop and deliver scientific information, analysis and educational programming which will increase the availability of safe, nutritious, affordable foods while advancing our knowledge of human health and nutrition. The output indicators below are specific for 1890 Research; the outcome indicators are shared with our Cooperative Extension partners.

Output Indicators

1. New and improved technology of processing and production of foods in Kentucky.
2. Analyses and improved understanding of nutritional practices and constraints as related to social, economic and technological trends.
3. Development of publications, educational materials, and other material to document and extend research findings.

Outcome Indicators

1. Number of individuals reporting changes in knowledge, opinions, skills, or aspirations regarding impact of diet with exercise on calcium metabolism and bone structure.
2. Number of individuals modifying their eating habits.

Key Program Components

The impact of diet with exercise on calcium metabolism and bone structure will be determined using rats as the experimental model. Varying levels of energy-restricted diets, soy protein-enhanced diets, and exercise will be controlled to measure calcium metabolism, histological properties of bones and several serum parameters.

Information pertaining to food choices and consumption practices among African Americans will be extracted from several USDA and 1890 Regional Project databases. Based upon this information, a feasibility test will be conducted for modification of undesirable aspects of food patterns using taste panels.

Internal and External Linkages

Much of the existing data on eating habits of African Americans was compiled by two previous 1890 Regional Projects. Scientists from the USDA/ARS Western Human Nutrition research center have

been consulted on the development of this work. A collaboration has also been established with the University of Kentucky to aid in the processing of some bone analysis.

Target Audiences

Diet, exercise, and osteoporosis are universal health concerns. The study of food choices and consumption patterns of African Americans is targeted to this under-studied, under-represented segment of the US population.

Evaluation Framework

This work will eventually be judged by its contribution to the scientific debates on eating and exercising behaviors.

Program Duration

The goals of investigating the impact of nutrition on bone mineral loss and the food choices and eating habits of African Americans has a long-term time line. Matching state funds will be used to hire a food scientist specializing in food safety to complement the existing program.

Allocated Resources

Approximately 23% of SYs and 14% of Evans-Allen funds are currently targeted for this goal. When state matching is available, additions will be made to approximately 25% of SYs and 17% of Evans-Allen and matching funds.

	Federal ($1000)	**State ($1000)**	**Total ($1000)**	**SY**
2000	148	0	148	2.7
2001	148	90	238	3.7
2002	148	90	238	3.7
2003	148	90	238	3.7
2004	148	90	238	3.7

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GOAL 4 - AN AGRICULTURAL SYSTEM WHICH PROTECTS NATURAL RESOURCES AND THE ENVIRONMENT.

Statement of Issues

Human life is dependent upon quality water. Agriculture has been characterized as the greatest non-point source of water pollutants, including sediments, salts, fertilizer, manure, and pesticides. In Kentucky, many urban and rural sources of water are influenced by groundwater contamination.

Kentucky is characterized by 50% Karstic topography which is particularly vulnerable to groundwater pollution.

Alternatives to synthetic insecticides are urgently needed for controlling pests of vegetables. Insec ts have developed resistance to many insecticides used for their control, and chemical companies are developing and registering fewer new chemicals due to the high costs of development and registration. Several naturally-occurring botanical pesticides are being examined as an alternative to synthetic pesticides. However, the environmental impact of these new products is not known.

Another prominent source of groundwater pollution in Kentucky is septic systems, especially for single-family dwellings. A n ew technology being developed is the use of constructed wetlands to naturally purify the effluent from septic systems to reduce movement into groundwater.

Performance Goal

Our goal is to discover, develop and deliver scientific information, analysis and e ducational programming which improves environmental quality by developing more effective approaches to the stewardship of natural resources, particularly as related to the management of land, air, and water. The output indicators below are specific for 1890 Research; the outcome indicators are shared with our Cooperative Extension partners.

Output Indicators

1. New and enhanced technology and management systems for minimizing adverse environmental impacts associated with pesticides.
2. Development of publications, educational materials, and other material to document and extend research findings.

Outcome Indicators

1. Number of individuals reporting changes in knowledge, opinions, skills, or aspirations regarding the influence of landscape features and soil amendments on the fate of pesticides in the field and in greenhouse experimental wetland environments.

Key Program Components

Selected pesticides will be applied to experimental plots equipped with tipping bucket runoff counters, and pan lysimeters. Soil and water samples will be examined for detectable pesticide residues and metabolites. Crops and sustainable cropping systems will be monitored for their impact on fate of pesticides. Synthetic and botanical formulations will be tested.

Internal and External Linkages

Faculty members in the Departments of Horticulture and Agricultural Engineering at the University of Kentucky are involved in the design and execution of this work. USDA/ARS laboratories at Ames, IA; Florence, SC; and Coshocton, OH have agreed to consult.

Target Audiences

The implications of this research are far reaching. The agricultural chemical industry has a vested interest in this type of research, as should all users of ag chemicals, which includes small farmers, traditional farmers, organic growers, and homeowners. The ultimate audience is the groundwater - drinking, general population of Kentucky.

Evaluation Framework

This work will eventually be judged by its contribution and influence on the use of agricultural chemicals and their fate in groundwater.

Program Duration

The goal of investigating the fate of agricultural chemicals has short - to long-term time lines. Each year several chemicals will be evaluated. As the use of new botanical pesticides becomes more widespread, these chemicals will require testing. Matching state funds will be used to hire a water quality scientist specializing in remediation of agricultural chemical to complement the existing program.

Allocated Resources

Approximately 8% of SYs and 8% of Evans-Allen funds are targeted for this goal. When state matching is available, additions will be made to approximately 13% of SYs and 13% of Evans - Allen and matching funds.

	Federal ($1000)	**State ($1000)**	**Total ($1000)**	**SY**
2000	90	0	90	1.0
2001	90	0	90	1.0
2002	90	0	90	1.0
2003	90	90	180	2.0
2004	90	90	180	2.0

GOAL 5 - ENHANCED ECONOMIC OPPORTUNITIES AND QUALITY OF LIFE FOR AMERICANS.

Statement of Issues

Once new crops, technologies and management strategies are developed, this information must be shared with and adopted by consumers and producers. We have begun to work more closely with stakeholders and Extension to implement these new developments. To facilitate the exchange of ideas and solicit stakeholder input, a series of monthly meetings was initiated in February 1997 sponsored by

a Southern Region SARE grant. The meetings are held at the KSU Research and Demonstration Farm and are regularly attended by growers, researchers, extension personnel, state agency representatives, 1890 and 1862 representatives, and other interested persons. These meetings have been so successful that plans have been made to continue them after the initial grant has expired.

Performance Goal

Our goal is to discover, develop and deliver scientific information, analysis and educational programming which improves marketing opportunities for growers and the capacity of communities, families, and individuals to improve their own quality of life. The output indicators below are specific for 1890 Research; the outcome indicators are shared with our Cooperative Extension partners.

Output Indicators

1. Increased and improved information on economic opportunity and development for Kentucky communities.
2. Integration of social, economic and technical analyses as related to agriculture, food and natural resource issues.
3. Development of publications, educational materials, and other material to document and extend research findings.

Outcome Indicators

1. Number of individuals reporting changes in knowledge, opinions, skills, or aspirations regarding the new marketing opportunities for farm products.
2. Number of families with an increased capacity improve their own quality of life via better decision making.

Key Program Components

One of the inherent risks of developing new or alternatives crops is the "chicken and egg" situation - markets are needed to sell the crop but markets are not developed until the crop is routinely available. The alternative crop work described under other goals have an objective to work with limited resources farmers, grower groups and other interested people to help develop markets for their crops.

The Human Nutrition Group of the KSU-LGP is working with African Americans and other under-represented groups to not only better understand their dietary habits but to improve those habits. Extension specialists are now involved in recruiting participants for research studies and providing training based upon research results.

Internal and External Linkages

Two keys components of the KSU-LGP, research and extension, is working cooperatively to make research more relevant and results more accessible to stakeholders. Food scientists are collaborating with nutritionists and child development specialists on this endeavor.

Target Audiences

The marketing objective is targeted to small and limited resources farmers but information is made available to who seek it. The nutrition and dietary information is targeted to African Americans and urban families that are traditionally omitted from national studies and initiatives.

Evaluation Framework

This work will eventually be judged by its contribution and influence to the development of new markets and modification of families to make better decisions concerning their nutrition and health.

Program Duration

The development of new markets will have small short term accomplishments but the effort will be long term one. This is also true for educating people on the benefits of modifying their diets.

Allocated Resources

Approximately 4% of SYs and 5% of Evans-Allen funds are targeted for this goal. When state matching is available, additions will be made to approximately 10% of SYs and 11% of Evans-Allen and matching funds.

	Federal ($1000)	**State ($1000)**	**Total ($1000)**	**SY**
2000	60	0	60	0.5
2001	60	0	60	0.5
2002	60	90	150	1.5
2003	60	90	150	1.5
2004	60	90	150	1.5