V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Global Food Security and Hunger

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	0%	0%	0%	2%
201	Plant Genome, Genetics, and Genetic Mechanisms	0%	0%	10%	10%
205	Plant Management Systems	57%	10%	7%	1%
211	Insects, Mites, and Other Arthropods Affecting Plants	0%	0%	20%	2%
212	Diseases and Nematodes Affecting Plants	0%	0%	13%	0%
215	Biological Control of Pests Affecting Plants	0%	0%	12%	2%
216	Integrated Pest Management Systems	0%	0%	1%	0%
301	Reproductive Performance of Animals	0%	0%	11%	0%
302	Nutrient Utilization in Animals	0%	0%	10%	0%
303	Genetic Improvement of Animals	0%	0%	0%	4%
304	Animal Genome	0%	0%	4%	0%
307	Animal Management Systems	38%	88%	3%	71%
311	Animal Diseases	0%	0%	9%	0%
401	Structures, Facilities, and General Purpose Farm Supplies	0%	0%	0%	1%
601	Economics of Agricultural Production and Farm Management	0%	1%	0%	7%
604	Marketing and Distribution Practices	5%	0%	0%	0%
704	Nutrition and Hunger in the Population	0%	1%	0%	0%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890

Plan	180.0	15.0	50.0	12.0
Actual Paid	164.0	15.5	115.7	17.4
Actual Volunteer	24803.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
2613971	468825	3523015	657132
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
2892479	212279	13157826	328045
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	52500	5800196	11313

V(D). Planned Program (Activity)

1. Brief description of the Activity

The development and transfer of technical resources is a critical dimension of a strategy to advance agriculture and the competitiveness of the state's agricultural economy.
•Field days, demonstration programs, plotwork and hands-on training by agents and specialists will continue to be important mechanisms for disseminating technical information on production agriculture and horticulture •Printed material, mass media, Web sites, audio, and electronic communications will be employed to disseminate the latest research findings on decision-making •Featured programs for this plan of work cycle will include: Grain Crops Academy, Master Grazer Program, Horse College and the Innovative Tobacco Producer Program •Goat Production and Management Programs •Small Farm Program at KSU will focus on needs of small and limited resource farmers, •The Kentucky Fruit and Vegetable Conference plays a major role in commercial horticultural producer education •Third Thursday programs will be conducted at KSU and their research and demonstration farms will attract small and limited resource farmers and will also serve as training for County Extension Agents and students •Aquaculture and Fish Disease/Management Programs •Master Cattlemen and advanced Master Cattlemen programs will be conducted •Educational programs qualifying producers to receive Tobacco Settlement funds in the areas of goats, forages, bull selection and hay storage will inprove producer skills in these areas •New Research findings from KSU's Aquaculture Research center, pawpaw, goats, and honeybees will be the subject of field days and meetings to bolster the expanding alternative in Kentucky and the Southern Region Demonstration and training for appropriate production and processing of pastured poultry and honey. •Home-based processing training •On-site food demonstrations
Ongoing research at UK supporting competitive agriculture includes: •improvements in plant pest and disease resistance •optimization of cropping system inputs for maximum cost/benefit • improvements in animal reproductive efficiency •vaccine and other intervention development to improve animal health •engineering solutions for sustainable plant and animal production •optimization of animal nutrition •interventions to improve access to healthy food in Appalachia • biological pest control •fundamental investigations of plant, animal and pathogen biology •new applications for unmanned vehicles and

sensors in crop management

KSU has active research areas in areas of: • Aquaculture projects are concerned with the commercialization of paddlefish, nutrition and diet formulation for freshwater crustaceans, and developing technologies for raising largemouth bass. • Doe and kid production evaluation for meat goats is a relatively new research and extension thrust for KSU. • Pawpaw and primocane blackberries are under development as niche crops in Kentucky. • The control of Nosema diseases is being researched as a potential cause of colony collapse disorder (CCD) of honey bees.

2. Brief description of the target audience

• Kentucky farmer operations with agents recruiting and selecting producers for participation in Grain Academy, Master Cattlemen, Innovative Tobacco Grower Program, Horse College, and Master Grazer Programs •Farm owners, operators, absentee land owners with a variety of backgrounds and experiences •Farmers' market members and potential members •Community and farm leaders •Consumers •Extension agents

3. How was eXtension used?

Webinars, printed materials, Extension personnel signed up for "ask an expert"

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1555682	11915182	70324	539036

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year:	2014
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	14	134	148

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Published research journal articles

Year	Actual
2014	112

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of families who gained knowledge about eating healthy foods
2	Number of families that reported eating more healthy foods
3	Number of families that reported supplementing their diets with healthy foods that they produced/preserved (utilizing community/backyard gardens, fishing, hunting, etc.)
4	Number of individuals adopting one or more recommended practices to increase access to food or make it more affordable
5	Availability of new targets for developing broad spectrum resistance to crop diseases
6	Availability of improved disease diagnostic tools

Outcome #1

1. Outcome Measures

Number of families who gained knowledge about eating healthy foods

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	146600

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Todays families lack the knowledge of basic nutrition education, lack skills in growing and preparing nutritious foods, and budgeting for food costs. Kentucky Extension has partnered with several local collaborators to address this issue.

What has been done
Lawrence County SNAP-Ed and EFNEP nutrition education programs (NEP) reach children, youth and families with basic nutrition education, skills in food preparation, gardening, and food budgeting. Both NEP assistants graduated 55 families at the end of the reporting year. Boyd County Extension has been working to raise money that supports homeless and low-income families. The Lee County Cooperative Extension Service offered nutrition education programs to low-income family groups in an effort to help them provide better nutrition to their children.

Kentucky State University Extension taught food shopping, nutritional labeling, unit pricing, and tips on eating healthy fast food to High School students in Lexington, KY.

Results
In Lawrence County, 100% of the enrolled families reported positive changes; 48% improved in resource management skills; and 63% improved on diet quality/nutrition. In addition to teaching enrolled families, NEP assistants taught LEAP (Literacy, Eating, and Activity) to approximately 400 Pre-K through 3 grade students at four (4) elementary schools; and also taught food safety to approximately 1700 K-8 grade students at three (3) elementary schools and one middle school. About 75% of the students reported gaining knowledge of food safety and correct hand washing

practices.

Boyd County Extension assisting in raising over $20,000 to combat hunger. Volunteers involved were able to witness firsthand the need for communities to work together to address critical issues.

KSU Extension contributed to students learning how to develop a shopping list; checking newspaper ads; reading food labels; using coupons; using unit pricing; and learning tips on eating healthy fast food. A lesson evaluation indicated that 70% of the students will use the shopping skills the next time they go shopping.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Diseases and Nematodes Affecting Plants
215	Biological Control of Pests Affecting Plants
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
307	Animal Management Systems
311	Animal Diseases
401	Structures, Facilities, and General Purpose Farm Supplies
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices
704	Nutrition and Hunger in the Population

Outcome #2

1. Outcome Measures

Number of families that reported eating more healthy foods

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	55645

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Todays families lack the knowledge of basic nutrition education, lack skills in growing and preparing nutritious foods, and budgeting for food costs. Kentucky has partnered with several local collaborators to address this issue. Extensions SNAP-Ed and EFNEP programs have also made significant strides.

What has been done
Jefferson County Extension helped education families on the importance of consuming fruits, vegetables, grains, protein or dairy foods. Anderson County conducted an Eating Around the World project.

Results
In Jefferson County, 100% of SNAP-Ed Program participants and 96% of Jefferson County EFNEP participants showed a positive change in their consumption of fruits, vegetables, grains, protein or dairy foods. Additionally, Jefferson County Cooperative Extension agents and program assistants completed 1,127 Snap-Education hours, reaching 7,908 people. In Anderson County, participants completed surveys which indicated that the cooking school helped them prepare healthier meals (14 out of 18), taught them food safety (11/18), encouraged them to try new local foods (18/18), how to read food labels (15/18) and how to adapt recipes to be lower in calories and fat (13/19).

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
216	Integrated Pest Management Systems
307	Animal Management Systems
401	Structures, Facilities, and General Purpose Farm Supplies
604	Marketing and Distribution Practices
704	Nutrition and Hunger in the Population

Outcome #3

1. Outcome Measures

Number of families that reported supplementing their diets with healthy foods that they produced/preserved (utilizing community/backyard gardens, fishing, hunting, etc.)

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	27836

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Good nutrition is important to individuals and families regardless of where they may be in the life cycle. Proper nutrition can often help alleviate and prevent many ailments common to Kentuckians. Many communities fall short of helping families prepare more nutritious meals.

What has been done
Lyon County worked with Hispanic families to improve on ways to preserve foods. Extension is working with the migrant program in Garrard County to teach families how to prepare healthier meals. The Boone County Cooperative Extension Service is teaching elementary students about growing food through a hands-on gardening project.

Results
In Garrard County, 100% of the participants learned how to create vegetable pizza using fresh raw vegetables with a spread and crust; 100% of participants have repeated the recipes and prepared the healthier alternatives at home. In Boone County, as the harvest is made, the students assisted a local food processor, to process and package the vegetables into salsa that is sold as a fundraiser. To date, over $45,000 worth of salsa has been sold.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
311	Animal Diseases

604	Marketing and Distribution Practices
704	Nutrition and Hunger in the Population

Outcome #4

1. Outcome Measures

Number of individuals adopting one or more recommended practices to increase access to food or make it more affordable

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	31950

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Throughout the US, it has been demonstrated that many of our urban centers and some rural communities have been declared Food Deserts. The ability to access healthy foods is difficult and the resulting health challenges place local citizens at risk for disease.

What has been done
Extension has worked with Appalachian Alternative Agriculture for Jackson County (3AJC) to operate the Jackson County Regional Food Center and Farmers Market. The food processing kitchen has been rented by approximately 30 to 35 local and regional producers to develop, process, package and label their products for market thus increasing revenues during this time.

KSU Extension assisted Minority farmers and veteran farmers to connect with local churches by providing high-quality produce at a cheaper cost to limited-resourced communities. KSU also produced the Thorobred Nutrition Kitchen and subsequently developed a plan for mobile market service.

Results
The Jackson County Regional food center has educated 150 families on developing skills in regard to producing and processing their home garden products.

In a western part of the state (Mammoth Cave area) that is still known as a food desert, there are more than 200 families being fed due to KSU Extension?s efforts to build networks between farmers and residents. These families now have access to healthy foods at a cost they can afford.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
307	Animal Management Systems
604	Marketing and Distribution Practices
704	Nutrition and Hunger in the Population

Outcome #5

1. Outcome Measures

Availability of new targets for developing broad spectrum resistance to crop diseases

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Plant diseases have a devastating impact on agricultural production every year and annual worldwide crop losses due to disease have been estimated in excess of $100 billion. Current strategies to protect plants from diseases involve the use of genetic resistance, chemical treatments, and farming practices. These methods generally offer partial protection often only against specific pathogen strains. Strategies involving the induction of intrinsic defense responses, or recognition of pathogen-specific elicitors, offer viable alternatives and have the potential to protect against a broad spectrum of pathogens. Developing such sustainable crop protection approaches requires knowledge of the signaling mechanisms involved in defense. Thus, the elucidation of signal transduction pathway(s) following pathogen recognition could eventually aid the targeted manipulation of defense responses without affecting crop yield.

What has been done
Research at UK aims to understand how plants perceive pathogens and how primary metabolic pathways interface with defense signaling. Studies are identifying and characterizing defense signaling components from soybean for pathogens, including Pseudomonas syringae pv. glycinea (Psg), Soybean mosaic virus (SMV), and Phytophthora sojae. Components of resistance protein-

derived pathways and the proteins interacting with pathogens are being identified and characterized. Further components of the low oleic acid-mediated defense pathway as well as biochemical activities contributing to glycerol-3-phosphate synthesis during defense are being studied.

Results
Critical results include the identification of soybean proteins that interact with effector proteins from bacterial pathogens and regulate their virulence as well as the proteins and mechanisms involved in the activation of the resistance protein Rpg1-b. This work has shown that nitric oxide and reactive oxygen species function as signals during the plant systemic immune response and that plant galactolipids are crucial for the generation of these signals during systemic immunity. Researchers have identified three soybean genes contributing to the synthesis of glycerol-3-phosphate. Identification of these factors can now be used to generate resistance to a variety of pathogens in crop plants without significantly affecting plant growth, development, and ultimately yields. Of special interest is the identification of precursors that generate a mobile inducer of systemic immunity in plants. This mobile inducer can now be developed as a treatment that provides broad spectrum and long lasting resistance in the field.

4. Associated Knowledge Areas

KA Code	Knowledge Area
212	Diseases and Nematodes Affecting Plants

Outcome #6

1. Outcome Measures

Availability of improved disease diagnostic tools

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Verticillium wilt affects 80 tree species and more than 300 plant species, and is responsible for substantial economic losses each year. The fungus survives for long time in the soil and symptoms of the disease in plants can mimic a number of other diseases or problems. Diagnosis of Verticillium wilt is further complicated by the difficulty of isolating the fungus in the laboratory. The disease is often spread by dispersing infected plants not yet showing disease sympotoms. Fungicides are often not effective against Verticillium, thus easrly diagnosis is critical to proper management or the disease.

What has been done
UK plant pathologists evaluated real-time PCR-based assays for rapid and accurate detection of Verticillium dahliae in different woody hosts. Researchers extracted DNA from Verticillium infected trees using shavings collected via drill press. Six published primer sets were evaluated against genomic DNA of V. dahliae as well as selected negative controls. Two sets of primers showed promise for further evaluation using DNA extracts from field samples.

Results
While both candidate primers amplified species-specific fragments, one primer set, VertBt, exhibited higher sensitivity in detection of V. dahliae even in asymptomatic trees. This finding provides plant diagnosticians with a new tool to accurately and quickly detect Verticillium in woody plants before signs of the disease occur. By detecting the disease early, its spread through the sale of asymptomatic plants can be avoided.

4. Associated Knowledge Areas

KA Code	Knowledge Area
212	Diseases and Nematodes Affecting Plants

V(H). Planned Program (External Factors)

External factors which affected outcomes
- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Programmatic Challenges

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Increase in knowledge of growing, purchasing and consuming healthy foods; Increased access to healthy foods

Key Items of Evaluation

Surveys, follow-up interviews, observations