

### V(A). Planned Program (Summary)

#### Program # 6

##### 1. Name of the Planned Program

Agricultural and Environmental Quality

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
101	Appraisal of Soil Resources	0%	0%	5%	0%
102	Soil, Plant, Water, Nutrient Relationships	0%	3%	35%	3%
104	Protect Soil from Harmful Effects of Natural Elements	0%	0%	3%	11%
112	Watershed Protection and Management	2%	22%	9%	8%
123	Management and Sustainability of Forest Resources	22%	25%	0%	4%
131	Alternative Uses of Land	0%	3%	0%	2%
132	Weather and Climate	0%	16%	0%	2%
133	Pollution Prevention and Mitigation	0%	0%	8%	6%
135	Aquatic and Terrestrial Wildlife	0%	3%	0%	0%
136	Conservation of Biological Diversity	0%	3%	0%	0%
201	Plant Genome, Genetics, and Genetic Mechanisms	0%	0%	0%	4%
205	Plant Management Systems	19%	0%	16%	10%
211	Insects, Mites, and Other Arthropods Affecting Plants	0%	0%	0%	4%
213	Weeds Affecting Plants	0%	0%	9%	0%
215	Biological Control of Pests Affecting Plants	0%	0%	0%	9%
302	Nutrient Utilization in Animals	0%	0%	6%	0%
401	Structures, Facilities, and General Purpose Farm Supplies	0%	9%	0%	37%
403	Waste Disposal, Recycling, and Reuse	3%	16%	9%	0%
605	Natural Resource and Environmental Economics	54%	0%	0%	0%
	<b>Total</b>	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
<b>Plan</b>	35.0	2.0	10.0	5.0
<b>Actual Paid</b>	25.0	3.2	31.5	11.3
<b>Actual Volunteer</b>	27975.0	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
421608	72687	737135	370147
1862 Matching	1890 Matching	1862 Matching	1890 Matching
466529	40619	3891831	173605
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	1827408	0

**V(D). Planned Program (Activity)**

**1. Brief description of the Activity**

The University of Kentucky and Kentucky State University are engaged in a wide range of programs geared towards achieving greater harmony between agriculture, people, and the environment. All components of the research and extension focus on the broader goal of practicing agricultural and related disciplines in a manner consistent with improving sustainability of resources and protecting ecosystem integrity. Program examples include:

- Master Gardener Program consisting of 12-15 three-hour sessions related to gardening, resource management, botany, soils, pesticides and pesticide safety
- Master Logger program consisting of three one-day sessions focusing on best management practices, safety, laws and regulations
- Integrated Pest Management programs including programs aimed at homeowner application of pesticides and fertilizers.
- Woodlot owner education program focusing on best management practices, harvesting, contracts, wood products and alternative forest products.
- Water quality, Water Pioneer, daycamps, and forestry camp programs aimed at developing a better understanding of stewardship between youth and the environment.

Agricultural and environmental research at UK included: •riparian management techniques for improving water quality in karst dominated landscapes •new production systems to improve animal agriculture sustainability •fundamental investigations of biodiversity and community structure in agricultural and forest ecosystems •methods for dealing with insect pests of urban landscapes •assessing the environmental benefits of organic farming •investigation of physical and chemical processes in soils that impact productivity and soil quality

- KSU Extension Programs will continue to support efforts related to policies to improve environmental quality
- Gardendata.org
- Organic Agricultural Programs

KSU research projects focusing on improving environmental quality include: soil conditioners and constructed wetlands for water quality improvement, the ecological impact of organic and conventional cropping methods are being evaluated.

**2. Brief description of the target audience**

- General public
- Community volunteers advanced in horticulture instruction and willing to give back to the community
- Individual commercial loggers in Kentucky and those out of state wishing to do business in Kentucky
- Woodlot owners
- Farm owners and operators
- Homeowners

**3. How was eXtension used?**

Data on websites, webinars, communities of practice

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	238833	645834	112449	282550

**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
<b>Actual</b>	1	25	26

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Published research journal articles

<b>Year</b>	<b>Actual</b>
2014	11

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Number of producers adopting resource management technologies (IRM, IPM, soil testing, soil fertility management) as a result of Extension programs
2	Number of individuals adopting practices (recommended by Extension) that ensure safe water
3	Number of individuals utilizing forest management practices recommended by Extension
4	Number of individuals who made a lifestyle change for the purpose of improving water and/or natural resources (due to recommendations from Extension)
5	Availability of optimized endophyte- tall fescue combinations for sustainable forage systems

## **Outcome #1**

### **1. Outcome Measures**

Number of producers adopting resource management technologies (IRM, IPM, soil testing, soil fertility management) as a result of Extension programs

### **2. Associated Institution Types**

- 1862 Extension
- 1890 Extension
- 1862 Research

### **3a. Outcome Type:**

Change in Action Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2014	21616

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

There is an increased demand in popular culture for local food, reduced chemical usage and preserving ones own (home or locally grown) food.

#### **What has been done**

Bullitt County Extension assisted the Orchard Production series to teach homeowners to grow and properly manage fruit trees, allowing residents to grow low impact (agriculturally sound practices) fruit, and increase production while minimizing chemical use. Using research based information from KSU and U of K and specialists in fruit production, this program employs a series of classes on topics such as pruning, spraying, grafting and others to educate participants in the most recent techniques in fruit and orchard production.

The Master Marketer program was organized, consisting of 5 sessions including topics on (1) Feeder cattle quality, price discovery, and sale day consideration, (2) Using the futures market to manage price risk, (3) Advanced futures and options strategies, (4) and assist in decision making for stocker operations.

Kentucky State University collaborated with organic seed suppliers and farmers affiliated with the Organic Valley cooperative to demonstrate successful regional production of organic corn, and to identify organic varieties that are well adapted to the Mid-East region. Twenty-six organic farmer collaborators in six states participated in on-farm comparisons of 34 organic corn varieties.

## **Results**

---

In Bullitt County, With an increased participation of 12%, this Orchard Production series continues to grow and develop. Having gained knowledge, participants now use fewer chemicals (23% reported reduction in chemical usage), produce more quality fruit (52% reported) and save time and effort. Some participants developed home based businesses (9%reported) based on fruit production and/or improved their business profit margin (by 32%) by utilizing learned techniques.

The Master Marketer program increased producer knowledge of basic marketing and price risk management skills.

In Jefferson County, KSU and UK Hort agents worked to organize the first Master Gardener class since 2009. A total of 10 master gardeners completed 30 or more volunteer hours within the last year. Many have shown great enthusiasm for volunteering and have sought out new volunteer opportunities in the city to engage and inform people about the wonderful work of Extension.

All 26 organic farmer collaborators (in the Organic Valley Collaborative) demonstrated excellent yields from a wide range of organic corn varieties. The average organic corn yield for the trial was 159 bushels per acre, equivalent to the average conventional corn yield for the region.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
133	Pollution Prevention and Mitigation

#### Outcome #2

##### 1. Outcome Measures

Number of individuals adopting practices (recommended by Extension) that ensure safe water

##### 2. Associated Institution Types

- 1862 Extension
- 1862 Research

##### 3a. Outcome Type:

Change in Action Outcome Measure

##### 3b. Quantitative Outcome

Year	Actual
2014	19069

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

There was a need for more agricultural professional training to educate landowners on environmental stewardship and water quality.

#### What has been done

Extension hosted projects that provided a comprehensive source of information on agriculture and water quality.

#### Results

Twelve trainings were held for a total of 18.5 instructional days throughout Kentucky, reaching approximately 188 agricultural service providers. Post-training evaluations indicated 85 percent of attendees understood the components of a nutrient management plan (NMP); 86 percent understood who could write a NMP; 87 percent understood how to incorporate additional Best Management Practices (BMPs) into Ag Water Quality Plans and NMPs to manage nutrients; and 87 percent knew what tools are available to assist with plan development.

In one Kentucky County, about 5 respondents said they installed a rain garden to help capture water/rain runoff.

KSU Extension assisted in building an Urban Demonstration farm in the heart of the African American community in Russellville Kentucky. The Project provides fresh Fruits and Vegetable, along with educational meetings on Aquaponics, High Tunnels, Marketing and Nutrition.

### 4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
133	Pollution Prevention and Mitigation

### Outcome #3

#### 1. Outcome Measures

Number of individuals utilizing forest management practices recommended by Extension

#### 2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2014	3962

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Kentucky's forests cover nearly half the Commonwealth but only scattered information had existed on the overall economic impact of Kentucky's forest and wood industry.

The Appalachian forests were forever changed when a fungus decimated the American Chestnuts in the 1930's. Prior to the arrival of the blight, chestnuts made up as much as 70% of the forest canopy in the Appalachian region. The wood of these trees was easy to turn for furniture-makers, easy to mill for lumber, light-weight, attractive in color and very rot resistant. Additionally, the tree bloomed in late spring; avoiding killing frosts and producing abundant annual crops that fed both wildlife and people with a highly sought-after nut. This was America's preeminent nut and lumber tree. The cost of its loss was beyond measure.

**What has been done**

Letcher County Extension has worked to promote a re-establishment of the American Chestnut species.

Extension specialists and agents worked together to create and/or revise new Extension publications as reference materials. Next, key publications from all disciplines were compiled into resource guides for agents. A team including specialists in plant pathology, entomology, and horticulture provided a series of six train-the-trainer workshops, each including one half-day intense classroom program and then one half-day field training.

Kentucky Extension assisted in a total of 4 multi-day workshops conducted for all Forest Inventory and Analysis crews operating in the 13 southern states.

Spencer County Extension hosted a series of webinars developed by the University of Kentucky Department of Forestry which focused on Tree Identification, Selling Timber, Waterfowl Identification, and Woodland Management.

**Results**

As a result of the efforts, Letcher County plot trees have attained 40 feet of growth and have reproduced. The seed has been planted to expand the plot. No sign of the blight has been observed in the plot.

In Spencer County, all participants reported that their knowledge had increased as a result of the webinars and one person who participated in both a previous field day and the webinar session on selling timber sold approximately 50,000 board feet for an economic return of nearly

\$17,000.00 for the timber, less costs for the harvesting company and mill.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
123	Management and Sustainability of Forest Resources
131	Alternative Uses of Land

#### Outcome #4

##### 1. Outcome Measures

Number of individuals who made a lifestyle change for the purpose of improving water and/or natural resources (due to recommendations from Extension)

##### 2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

##### 3a. Outcome Type:

Change in Action Outcome Measure

##### 3b. Quantitative Outcome

Year	Actual
2014	8583

##### 3c. Qualitative Outcome or Impact Statement

###### **Issue (Who cares and Why)**

Water quality is important for all Kentuckians. The University of Kentucky reports that 90% of the states rural population is self-supplied through wells and springs, and 226 public water supplies rely on groundwater. Curry's Fork and Floyds Fork are major watersheds for multiple counties in the Louisville area and have been noted as having waters that contain some contaminants including sedimentation (soil runoff).

###### **What has been done**

Using the Project WET curriculum and resources secured through a 4-H20 Community Project grant, Extension taught students the basics of water quality before allowing them to venture into water sources to determine the quality of the water.

In an effort to educate clients about protecting water, Oldham County Extension worked one on one with cost-share applicants to help them complete or update agriculture water quality plans for their farms. An Ag Water Quality field day was also held.

**Results**

In Morgan County, 25 students participated in the Project WET program. The evaluation summary revealed that 100% understood the importance of the need to help keep water sources clean and healthy. Sixty percent were able to identify how aquatic macro invertebrates are indicators of good, moderate, or poor water quality.

As a result of Oldham County Extension's contributing efforts, six people completed ag water quality plans for the first time. Ten people attended the workshop and learned techniques for managing mud and manure, best management practices and how to complete an ag water quality plan; 100% of those responding said they learned something new about how to protect water. Three people incorporated a new practice to protect water using what they learned. Two people updated their ag water quality plans. Four people said they gained information they will use to help or teach others about protecting water.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
131	Alternative Uses of Land
403	Waste Disposal, Recycling, and Reuse

**Outcome #5**

**1. Outcome Measures**

Availability of optimized endophyte- tall fescue combinations for sustainable forage systems

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
-------------	---------------

2014

0

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

Tall fescue covers greater than 15 million hectares within the United States and is considered one of the most desirable forage species for grazing livestock. Tall fescue has garnered a lot of attention because the shoot-specific fungal endophyte it harbors produces toxic alkaloids resulting in animal sickness and loss of productivity. As a result novel endophyte infected varieties have been produced that maintain the positive attributes of the resident fungus, but eliminates the alkaloids toxic to grazing animals. There is evidence from pastures dominated by common toxic endophyte infected tall fescue that there is a slower turnover of carbon and other nutrients. Research is needed to specifically addresses the influence that novel endophyte-tall fescue cultivar combinations have on plant root system architecture and root exudate composition or how these two act together to help the plant better resist abiotic stresses, and more broadly, to alter ecosystem structure and function, including nutrient availability.

#### What has been done

Studies were conducted to investigate the effects of different phosphorus concentrations on the biomass, P uptake and root system architecture of a cultivar of tall fescue without endophytes, infected with the common toxic endophyte, or infected with one of two novel endophyte types. A follow-up study investigated how the source of phosphorus and its degree of solubility influenced P uptake in the same endophyte-tall fescue combinations.

#### Results

Results indicated that plant biomass and P acquisition were influenced by the specific fungal endophyte-grass association. The fungal endophyte genotypes were found to interact with the host plant to alter the root system architecture to result in greater P acquisition, particularly under limited P conditions. Phosphorus source was found to influence the level of P uptake as well. Overall this study shows that morphological changes in the roots system of tall fescue due to endophyte infection are influenced by P source and concentration. The implications of these results are that endophyte infection enhances a plant's response under low P conditions by altering root system architecture and that the extent and ultimately the success (in terms of increased nutrient acquisition) of this response is governed by the P source and endophyte strain. Overall these studies indicate that some tall fescue and endophyte combinations may be better suited for certain soil types depending on the chemical form of nutrients present. This information will be used to develop recommendations for pasture management that optimize nutrient utilization for minimizing inputs and maximizing biomass production.

### 4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships

### **V(H). Planned Program (External Factors)**

#### **External factors which affected outcomes**

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Government Regulations
- Competing Programmatic Challenges

#### **Brief Explanation**

### **V(I). Planned Program (Evaluation Studies)**

#### **Evaluation Results**

Change in knowledge, skills and opinions; practice change

#### **Key Items of Evaluation**

Pre-post surveys, structured interviews, observations, analysis of secondary data