

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

**Program # 8**

**1. Name of the Planned Program**

Climate Change

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%	39%	0%
121	Management of Range Resources	0%	0%	13%	0%
123	Management and Sustainability of Forest Resources	0%	0%	26%	0%
141	Air Resource Protection and Management	0%	0%	9%	0%
403	Waste Disposal, Recycling, and Reuse	0%	0%	13%	0%
601	Economics of Agricultural Production and Farm Management	0%	100%	0%	100%
604	Marketing and Distribution Practices	100%	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: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	3.0	0.0	1.0	0.0
Actual Paid Professional	1.0	0.0	1.5	0.2
Actual Volunteer	0.0	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
0	4102	34267	15289
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	3174	399487	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

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

#### 1. Brief description of the Activity

- Emergency preparedness plans were implemented and prepared for all Extension offices
- The Agricultural Weather Center supplies information on temperature and moisture conditions to guide agricultural operations
- Economists, plant pathologists and agronomists conducted educational programs for Extension agents and agricultural producers on ways to reduce risks and manage systems during weather extremes as well as in response to longer-term changes in climate
- Research on the impact of climate change on the ecology of plant pests and diseases was conducted
- Creation of new technologies and best management practices for mitigating greenhouse gas emissions was explored
- KSU offered a floating science lab to show students the impact of climate and human use on aquatic systems

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

- extension agents
- extension office staff
- agricultural producers
- community leaders
- general public

#### 3. How was eXtension used?

Publications were used

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

#### 1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	345	16185	6	330

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

**Patent Applications Submitted**

Year: 2012

Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2012	Extension	Research	Total
Actual	1	9	10

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

**Output Target**

**Output #1**

**Output Measure**

- Peer-reviewed Journal Articles

Year	Actual
2012	8

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

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

O. No.	OUTCOME NAME
1	Number of producers utilizing new marketing opportunities
2	Number of incidences of when accurate weather information assisted producers in avoiding crop and livestock damage or loss
3	Increased knowledge of agroecosystem adaptations to improve management strategies for climate change

## **Outcome #1**

### **1. Outcome Measures**

Number of producers utilizing new marketing opportunities

### **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>
2012	4724

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

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

As prices for corn and soybeans have been increasing, and in many cases dictating farm management decisions, many farmers have purchased equipment and started raising grain crops instead of hay on most of the farms. This has opened opportunities for farmers to rent out property to increase income and for ones that have equipment to increase their acreage. It has also created challenges for marketability.

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

Twenty-five tractor trailers with an average load of 1000 bushels of corn were marketed this year in Clay County. Producers utilized direct marketing techniques to identify buyers for their corn.

Also, KSU provided GIS training and support and The Nature Conservancy provided expertise in land management to develop a prioritization plan and data analyses to document gaps in the currently protected land base (easements, etc).

KSU and UK collaboratively conducted trainings using web technology to address direct marketing, budgets and economics of livestock enterprises, animal health issues, crossbreeding and selection, and nutrition.

#### **Results**

With corn selling for an average price of \$6.25 per bushel, over \$156,250 was brought into the Clay County agricultural economy. With corn acreage in Clay County expanding over 25% since 2011, producers had flooded local markets. Nine producers worked together to identify brokers and local markets that could purchase more corn. Three producers expanded their operations to

allow for tractor-trailer trucks to come to their farms to be loaded. Three combines were purchased and two producers added grain bins to allow for easier harvesting and more holding capacity. Several producers rented more land for corn production this year.

Evaluations from the KSU and UK trainings indicated that producers are willing to utilize web capabilities to conduct producer meetings as an alternative to costly and time-consuming travel.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

#### Outcome #2

##### 1. Outcome Measures

Number of incidences of when accurate weather information assisted producers in avoiding crop and livestock damage or loss

Not Reporting on this Outcome Measure

#### Outcome #3

##### 1. Outcome Measures

Increased knowledge of agroecosystem adaptations to improve management strategies for climate change

##### 2. Associated Institution Types

- 1862 Research

##### 3a. Outcome Type:

Change in Knowledge Outcome Measure

##### 3b. Quantitative Outcome

Year	Actual
2012	0

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

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

Tall fescue occurs on >15 million hectares within the United States and is considered invasive in some native grasslands. As a forage species it has significant agronomic and economic importance to our nation. The endophyte-tall fescue relationship has received considerable attention because of the negative animal health consequences of eating high concentrations of

fungal-produced ergot alkaloids. However, recent research has begun to demonstrate that this symbiotic relationship can have other significant ecological impacts, such as altering productivity-diversity relationships, community invasibility, trophic dynamics, and carbon sequestration rates. Ecosystem effects of the endophyte-plant symbiosis are known to vary depending on environmental factors, particularly drought, which is significant given that climate models predict alterations in precipitation and temperature resulting from global change for much of the range in which tall fescue is currently grown.

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

Research was conducted to determine if reported ecosystem effects of endophyte infection on soil nutrient pools and microbial communities in tall fescue pastures in Georgia are observed across a broader geographic range of sites. In addition, research was conducted to determine whether endophyte infection status alters the ability of tall fescue to respond to changes in climate. Activities included field experiments that illustrated the effects of endophyte infection on tall fescue's ability to respond to climate change and evaluated the effects of common toxic endophyte infection on tall fescue pasture carbon sequestration, soil nutrient pools, litter decomposition, and soil microbial communities.

#### **Results**

This project has contributed substantial new knowledge about the ecological effects of fungal endophyte symbioses in grasses within the primary discipline and related fields. For example, we have shown that the fescue-endophyte story is not as straightforward as it is widely represented in the literature to be. Although there are negative animal effects of common toxic endophyte infection, the presence of this organism in fescue pastures increases their carbon sequestration capacity. We have shown for the first time that novel endophytes have the ability to affect soil processes differently than the common toxic endophyte. We have demonstrated in the field that warming associated with climate change is likely to increase the concentration of toxic alkaloids in fescue infected with the common toxic strain of the endophyte, which has significant animal health and production implications for much of the eastern U.S. Our work conclusively illustrates that, similar to other grasses, the fescue-endophyte relationship varies in its degree of mutualism, depending on the genetics of the host and endophyte and the surrounding environmental conditions. This knowledge will be critical for developing new management strategies for pastures.

#### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
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**

The nature of climate change poses challenges for researching its effects on production systems due to the difficulty of simulating conditions in the field and the need for long-term observation of experimental systems. While the University of Kentucky has had a dedicated field facility for studying the impact of higher temperatures and altered precipitation on pasture systems for several years, the results of those studies are just starting to be revealed.

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

##### **Evaluation Results**

See outcome 1 for evaluation results

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

Follow-up, testimonials