

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% | 24% | 0% | 0% |
| 201 | Plant Genome, Genetics, and Genetic Mechanisms | 0% | 0% | 6% | 0% |
| 205 | Plant Management Systems | 56% | 47% | 7% | 40% |
| 211 | Insects, Mites, and Other Arthropods Affecting Plants | 0% | 0% | 19% | 0% |
| 212 | Pathogens and Nematodes Affecting Plants | 0% | 0% | 12% | 0% |
| 215 | Biological Control of Pests Affecting Plants | 0% | 0% | 9% | 0% |
| 216 | Integrated Pest Management Systems | 0% | 0% | 2% | 0% |
| 301 | Reproductive Performance of Animals | 0% | 0% | 12% | 0% |
| 302 | Nutrient Utilization in Animals | 0% | 0% | 13% | 0% |
| 303 | Genetic Improvement of Animals | 0% | 0% | 2% | 0% |
| 304 | Animal Genome | 0% | 0% | 5% | 0% |
| 307 | Animal Management Systems | 37% | 23% | 4% | 35% |
| 308 | Improved Animal Products (Before Harvest) | 0% | 2% | 0% | 5% |
| 311 | Animal Diseases | 0% | 0% | 7% | 5% |
| 401 | Structures, Facilities, and General Purpose Farm Supplies | 0% | 0% | 0% | 5% |
| 402 | Engineering Systems and Equipment | 0% | 0% | 2% | 5% |
| 601 | Economics of Agricultural Production and Farm Management | 0% | 2% | 0% | 5% |
| 604 | Marketing and Distribution Practices | 7% | 2% | 0% | 0% |
| | Total | 100% | 100% | 100% | 100% |

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

| Extension | Research |
|-----------|----------|
|-----------|----------|

| Year: 2013 | 1862 | 1890 | 1862 | 1890 |
|--------------------------|---------|-------|-------|------|
| | Plan | 180.0 | 15.0 | 55.0 |
| Actual Paid Professional | 155.0 | 11.0 | 107.2 | 23.0 |
| Actual Volunteer | 31830.0 | 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 |
| 2788247 | 482447 | 3383216 | 744673 |
| 1862 Matching | 1890 Matching | 1862 Matching | 1890 Matching |
| 2625423 | 57541 | 13556002 | 406498 |
| 1862 All Other | 1890 All Other | 1862 All Other | 1890 All Other |
| 0 | 0 | 7434733 | 0 |

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 improve 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

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?

Resource to contact colleagues, webinars, access to secondary data

V(E). Planned Program (Outputs)

1. Standard output measures

| 2013 | Direct Contacts Adults | Indirect Contacts Adults | Direct Contacts Youth | Indirect Contacts Youth |
|---------------|------------------------|--------------------------|-----------------------|-------------------------|
| Actual | 1546790 | 8620813 | 47503 | 266623 |

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

Patent Applications Submitted

Year: 2013
Actual: 2

Patents listed

Chappell, J. Systems and methods for the production of linear and branched-chain hydrocarbons. #20130198896

Stills, Jr.; Harold F.; (Horohov; David W.; Page; Allen E. Method and System for Diagnosis of Lawsonia Intracellularis #20130164765

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

| 2013 | Extension | Research | Total |
|---------------|-----------|----------|-------|
| Actual | 15 | 117 | 132 |

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Graduate research assistants engaged in research
Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Published research journal articles

| Year | Actual |
|-------------|---------------|
| 2013 | 127 |

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 | Access to new management strategies for reducing economic impact of endophyte-infected fescue in livestock production |
| 6 | Availability of organic production methods for improved disease control |

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
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

| Year | Actual |
|-------------|---------------|
| 2013 | 177041 |

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The obesity epidemic threatens the quality and years of life of Kentuckians. The obesity rate in Kentucky increased 90 percent over the last 15 years. Increased consumption of unhealthy food is one of the factors. Families need healthy options and advice about ways to prepare fruits and vegetables.

What has been done

The Plate It Up! Kentucky Proud program is a joint program with the University of Kentucky Cooperative Extension Service and the Kentucky Department of Agriculture that targets consumers to buy local and increase their fruit and vegetable intake with the goal of creating a healthy lifestyle. Kentucky State University also worked with migrant farmers to educate them on how to grow their own food in the United States.

Results

After participating in the Plate It Up program, participants indicated aspirations to consume healthier foods. Over 8,000 noted plans to consume more fruits and vegetables.

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 | Pathogens 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 |
| 308 | Improved Animal Products (Before Harvest) |
| 311 | Animal Diseases |
| 401 | Structures, Facilities, and General Purpose Farm Supplies |
| 402 | Engineering Systems and Equipment |
| 601 | Economics of Agricultural Production and Farm Management |
| 604 | Marketing and Distribution Practices |

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 |
|-------------|---------------|
| 2013 | 61304 |

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The obesity epidemic threatens the quality and years of life of Kentuckians. The obesity rate in Kentucky increased 90 percent over the last 15 years. Increased consumption of unhealthy food is one of the factors. Families need healthy options and advice about ways to prepare fruits and vegetables.

What has been done

The Plate It Up! Kentucky Proud program is a joint program with the University of Kentucky Cooperative Extension Service and the Kentucky Department of Agriculture that targets consumers to buy local and increase their fruit and vegetable intake with the goal of creating a healthy lifestyle.

Results

As a result of the program, nearly 1000 participants reported increasing their consumption of fruits and vegetables. Over 600 reported consuming 4-6 servings of fruits and 4-6 servings of vegetables after participating in the program.

4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|----------------|---|
| 205 | Plant Management Systems |
| 216 | Integrated Pest Management Systems |
| 307 | Animal Management Systems |
| 308 | Improved Animal Products (Before Harvest) |
| 401 | Structures, Facilities, and General Purpose Farm Supplies |
| 604 | Marketing and Distribution Practices |

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 |
|-------------|---------------|
| 2013 | 28890 |

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

With so many Kentuckians having limited access to fresh healthy food, there has been a movement to educate clientele on ways to grow their own food. There are significant food deserts in the state. Extension is making an effort to assist in this matter.

What has been done

Programs on Gardening in Small Spaces and raised bed gardening has gained popularity in Kentucky. the Master Gardener program remains prominent. KSU worked with USDA Natural Resources and Conservation Service to conduct classes on organic gardening, traditional gardening, high tunnels, and watering for youth and adults in an urban/suburban community.

Results

Multiple counties provide over 1500 hours of volunteer service in the name of UK Extension yearly. According to IndependentSector.org, the cost per hour of volunteer time is \$21.79. This equates to more than \$32,685.00 of value to Extension. KSU in collaboration with UK reintroduced the Master Gardener Program and graduated 33 leaders to support the growing interest in urban gardening and horticulture in the Louisville Metro area. Students in Trigg County promoted the importance of good nutrition by using a breakfast cart that highlighted the importance of eating breakfast. The percentage of students eating breakfast increased from 18% to 57%.

4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|----------------|--------------------------------------|
| 205 | Plant Management Systems |
| 311 | Animal Diseases |
| 604 | Marketing and Distribution Practices |

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
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

| Year | Actual |
|-------------|---------------|
| 2013 | 37264 |

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

With so many Kentuckians having limited access to fresh healthy food, there has been a movement to educate clientele on ways to grow their own food. There are significant food deserts in the state. Extension is making an effort to assist in this matter.

What has been done

Production systems for alternative and organically grown fruit and vegetable crops were developed for small local growers in Kentucky. A 10-county area of the University of Kentucky Cooperative Extension Service, in partnership with Louisville Farm to Table and the Kentucky Department of Agriculture, planned a workshop that allowed buyers and school food services to present their need for large volumes of produce, livestock and specialty grain.

Results

KSU demonstrated the economic potential of growing primocane-fruited blackberries for sale at farmers markets, CSAs, and restaurants over an extended harvest season for limited resource farmers. Small farmers now know which varieties to plant and how to grow them, making locally grown fresh fruit high in antioxidants available to consumers. Findings from the multi county farm to table initiative revealed All school food service directors attending said they were interested in buying local food and 80% made a connection with a local food producer. Approximately 89% of hospitality industry representatives indicated interest in purchasing locally grown products and 86% connected with a buyer.

4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|----------------|--------------------------------------|
| 205 | Plant Management Systems |
| 307 | Animal Management Systems |
| 604 | Marketing and Distribution Practices |

Outcome #5

1. Outcome Measures

Access to new management strategies for reducing economic impact of endophyte-infected fescue in livestock production

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

| Year | Actual |
|-------------|---------------|
| 2013 | 0 |

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Tall fescue, and its associated endophytic fungi, is a common cool season grass in the eastern and northwest regions of the United States. Endophyte-infected fescue is the primary forage consumed, either through grazing or incorporation into total mixed rations, by cattle in these regions. The nutritive quality of fescue is relatively high; however, the nutritional benefits are offset by the endophyte-derived alkaloids which severely reduce animal performance and productivity. Although numerous studies have documented the correlation between consumption of endophyte-infected fescue and decreased milk production in various species, including cattle, there is a paucity of research directed at understanding the mechanisms by which ergot alkaloids affect milk production. Understanding of these mechanisms is needed to develop solutions for mitigating the impact of fescue-derived alkaloids on mammary gland development and function in heifers and pre/post-partum dairy cows.

What has been done

Studies were conducted to evaluate the effects of feeding mature dairy cows a diet containing endophyte-infected fescue on milk production during the two months prior to calving and the first week after calving. The impact of fescue-derived alkaloids on mammary development and function was studied by supplying fescue seed as a source of alkaloids to dairy cattle and examining mammary tissue for changes in cellularity and morphology by immunohistochemical analysis. Additionally, expression of genes involved in mammary gland proliferation and differentiation were measured. Differential expression of candidate genes were identified with a bovine mammary gland microarray and quantified by quantitative real-time PCR (qRT-PCR).

Results

Results of the lactating cow project demonstrate that endophyte-infected fescue consumption decreases milk production through mechanisms that are independent of mammary development and that following cessation of alkaloid consumption milk production is enhanced above that of cows consuming endophyte-free fescue. Analysis of epithelial cell proliferation and novel mammary stem cell markers, support the observation that fescue toxicosis does not significantly impact mammary growth and development at the times evaluated. The deleterious effect of endophyte-infected fescue on milk production is not mediated through retardation of mammary tissue development. This information has immediate impact in terms of providing producers with a management tool for determining critical times when exposure of cows to endophyte-infected fescue must be limited in order to avoid or minimize the deleterious effects of endophyte-derived alkaloids on milk production. Moreover, results indicate that controlled administration of ergot alkaloids may be useful as a management tool for increasing milk production. By incorporating this new information into dairy herd management programs, farmers can help off-set the \$600 million in estimated annual losses in livestock production caused by endophyte-infected fescue consumption.

4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|----------------|---------------------------------|
| 302 | Nutrient Utilization in Animals |
| 307 | Animal Management Systems |

Outcome #6

1. Outcome Measures

Availability of organic production methods for improved disease control

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

| Year | Actual |
|-------------|---------------|
| 2013 | 0 |

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Cucurbits have developed into a good cash crop for many Kentucky conventional vegetable growers with about 2,773 acres planted in the state in 2007. Cucurbits such as muskmelon, seedless watermelons, and slicing cucumbers offer high net returns per acre, and have high consumer demand. Based on several years of failed production efforts on our research farm due to bacterial wilt, and through discussions with Kentucky organic growers, it is clear that cucurbits are one of the most - if not the most - difficult crops to grow organically in the state. Considering that cucurbits are a critical crop for many of the direct marketing outlets typically used by organic growers (community supported agriculture programs (CSAs), farmers markets, restaurants), developing a production system that will provide efficacious control of cucumber beetles is essential.

What has been done

Four experimental treatments comparing the use of extended duration rowcovers with alternative pollinators (bumble bees) were evaluated. The focus was on developing a system that can exclude cucumber beetles but still have effective pollination. All treatments utilized a raised-bed plasticulture system and drip irrigation. Research was conducted on muskmelon, but since pollination in cucurbits is completely insect-dependent, results from this study should be applicable to other cucurbit species. All production system inputs were uniformly applied to all treatments in accordance with organic certification guidelines. Melons were harvested and assessed for appearance and visible defects, and graded according to current USDA commercial standards. Striped and spotted cucumber beetle populations were closely monitored using yellow sticky traps in conjunction with pheromone attractant pouches. Bacterial wilt was positively identified using current molecular techniques such as real-time PCR confirmation. All yields were multiplied by current average wholesale market prices to determine gross returns from each system. Input and production practice costs were recorded for a partial budget analysis

comparing each production system.

Results

During this project an organic production system was developed capable of reducing the incidence of bacterial wilt in cucurbits, which is a major impediment to organic production in the eastern United States. This system utilizes spun-bonded row covers placed over the crop to exclude the insect vectors of the disease that feed on the crop and transmit the bacteria into the plants. The system that was demonstrated to have good potential for farmers was the use of row covers for the entire growing season, with a two-week window where they were removed to allow pollination. Organic insecticides are needed during the two-week window, but the use of the extended duration row cover allows the insecticide sprays to be eliminated for the remaining part of the season. This technique allowed for a positive economic return on the melons produced during the project. This system is scalable and can be used throughout the growing season. Considering the difficulty that bacterial wilt poses for organic growers, the adoption of this technique will greatly improve the economic feasibility of organic cucurbit crop production.

4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|----------------|--------------------------|
| 205 | Plant Management Systems |

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

See outcomes/results

Key Items of Evaluation

Surveys, follow up interviews, observations