

V(A). Planned Program (Summary)

Program # 10

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
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	10%	10%	8%	15%
204	Plant Product Quality and Utility (Preharvest)	10%	25%	21%	10%
205	Plant Management Systems	15%	25%	30%	10%
211	Insects, Mites, and Other Arthropods Affecting Plants	25%	0%	8%	10%
212	Diseases and Nematodes Affecting Plants	10%	0%	17%	10%
213	Weeds Affecting Plants	20%	0%	4%	0%
216	Integrated Pest Management Systems	0%	20%	4%	10%
601	Economics of Agricultural Production and Farm Management	5%	20%	8%	30%
701	Nutrient Composition of Food	5%	0%	0%	5%
	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	33.0	3.0	13.8	2.0
Actual Paid	29.0	8.0	27.3	2.0
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
1500342	323284	1506234	253155
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1500342	271926	1733275	203456
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	92053	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Clemson University has a large number of global food research studies underway. Some examples are research that develops and demonstrates integrated micropropagation systems that capture several values of the process including superior clonal material, vigor in nursery conferred by nutrient charge in plant tissue, cleanliness of packaged plantlets, transportability of small unit mass, and rapid finish of young plants under environmental control.

Researchers are also developing and refining strategies for managing insect pests of cotton and soybeans, including research into electronic monitoring and detection methods for insects and/or population indices, research on thrips control, and research into monitoring and/or management of resistance development, treatment thresholds, and overall fit of Bt technologies for bollworm. Research was conducted to survey corn, soybean, and cotton producing areas of South Carolina to determine the extent of herbicide-resistant weed problems. Success was found in the control of herbicide resistant Palmer amaranth in corn, cotton, and soybeans.

Research also developed sensors, controls and instrumentation technologies for site-specific application of pesticides, nutrients and water for precision agriculture and to demonstrate use, benefits and effectiveness of such technologies in the southeastern United States.

A current study is looking at spatial ecology of key pests of field crops (cotton, soybean, corn, wheat) and their natural enemies, and developing environmentally friendly management practices. Available peach germplasm has been evaluated for fruit quality and disease resistance using phenotypic and molecular approaches. Sources of new fruit quality traits as well as disease resistance have been acquired and incorporated into newly developed hybrids. Markers associated with bacterial resistance in peach fruit and red fruit skin coloration have been developed, validated and are in use in marker-assisted selection.

Extension's Agronomic Crop Production programs impact the management and production of agronomic crops on over 1,330,000 acres in South Carolina each year. This includes all corn, cotton, peanuts, small grains, sorghum and tobacco. Total value of these crops was \$658,351,000 in 2013. The largest acreage for a single crop is the 440,000 acres planted to soybean but the cotton crop has the greatest total value at \$131,501,000. Research and Extension programs addressed issues ranging from proper variety selection to protecting crops from weeds, insects and diseases as well as developing more efficient irrigation and harvest equipment. All of these programs resulted in millions of dollars of increased profits for growers and improved food quality and safety.

Federal law requires that pesticide applicators be trained for competency in order to reduce pesticide misuse and enhance environmental protection. In South Carolina, Clemson Extension provides the training needed to obtain a private applicator license for purchasing and applying restricted use pesticides. In order for individuals to obtain a private applicator license in 2013-2014, attendees received training and took the private applicator exam. In January of 2014, updated training materials were produced by the Clemson University Extension Pesticide Safety Education Program Coordinator. The new initial private applicator training highlighted updated DVD training and a more extensive fifty question exam.

An 1890 research project looked at the proper implementation and usage of traceability technology as an important aspect in allowing the attainment of Good Agricultural Practices (GAP) certification for South Carolina farmers. The project selected a group of South Carolina farmers and value-added producers to purchase, implement and utilize the RFID (Radio Frequency Identification) equipment necessary to provide traceability throughout their food product supply chains. Training was provided for proper use of the equipment. Data collected was conducted on seasonal crops. Paper presentations were developed and presented at conferences, meetings, etc. One article was submitted to the International Organization of Scientific Research Journal of Engineering.

In addition, another 1890 researcher focused on the impact of the Panama Canal Expansion on corn exports in the Southeastern Region of the United States. The study examined the potential impact of the Panama Canal Expansion on exports and job opportunities related to rural farmers and transportation systems. A basic Ordinary Least Square (OLS) model was developed to predict regional corn exports. Also, a time series regression model was built. Both the OLS and time-series models were run and the results compared. The time-series model appeared to be a better model. The transportation model was built to forecast corn exports by several major ports: Savannah, Mobile, New Orleans, Los Angeles and San Francisco. A database was built with all variables collected from the USDA official website and other resources.

2. Brief description of the target audience

Research in this program has the potential to benefit growers, state, federal and international agencies dealing with food production and distribution and with end users in countries around the world.

The target audience includes producers, Limited-Resource Farmers and Extension personnel, agency personnel, transportation system authorities, producers, master gardeners, and growers.

3. How was eXtension used?

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V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	37419	582724	3758	135

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

Patent Applications Submitted

Year: 2014
 Actual: 3

Patents listed

Methods and Compositions For The Inhibition Of Meristematic Growth on Cucurbit Rootstock
 Impact Flow Sensor for Monitoring Peanut Harvest Yields
 Chemical Control of Terminal Buds in Cucurbit Rootstock Seedlings Used for Grafting

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	0	31	31

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Disclosures

Year	Actual
2014	5

Output #2

Output Measure

- Licenses

Year	Actual
2014	1

Output #3

Output Measure

- Number of people completing educational workshops

Year	Actual
2014	15426

Output #4

Output Measure

- New Variety Releases

Year	Actual
2014	0

Output #5

Output Measure

- Number of youth participating in 4-H food systems programs

Year	Actual
2014	3549

Output #6

Output Measure

- Number of farmers educated on the importance of soil/nutrient management through soil testing.

Year	Actual
2014	744

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of people reporting increased knowledge
2	Number of youth gaining knowledge of food systems
3	Number of producers indicating adoption of recommended agronomic crop production practices
4	Number of Master Gardeners reporting activities.

Outcome #1

1. Outcome Measures

Number of people reporting increased knowledge

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	1788

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Small commercial vegetable producers and home gardeners are interested in the most up to date production practices and techniques to improve the production and quality of their crops. Producers are realizing changes in the fresh market as it relates to improved varieties, productivity and shelf life of new crops. In order to keep pace and grow crops more productively, the producers and gardeners need updated information and training.

What has been done

Production meetings, group meetings, training sessions, workshops and field demonstrations were conducted to train producers and gardeners on updated crop production practices to include sustainable practices and variety trials.

Results

One hundred two (102) adults received training in the area of vegetable production and home gardening. The updated production practices were adopted by 90 participants. One hundred two producers/gardeners gained knowledge and increased skills, while 50% increased production and 40% increased income. One success story is a small farm operator was a part-time vegetable vendor at roadside markets, prior to participating in the 1890 Small Farm Program. He joined the Outreach Program and began participating in commercial vegetable production and marketing training sessions. He wanted to increase his marketing skills. There was a need to grow his own produce rather than purchase from the State Market and other farms. He followed up on recommended practices and utilized best practices. He is now a proud vegetable producer & vendor.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
212	Diseases and Nematodes Affecting Plants
213	Weeds Affecting Plants
601	Economics of Agricultural Production and Farm Management

Outcome #2

1. Outcome Measures

Number of youth gaining knowledge of food systems

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	3549

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food

Outcome #3

1. Outcome Measures

Number of producers indicating adoption of recommended agronomic crop production practices

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	14327

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Sustainable agronomic and horticulture crop production programs will develop and implement production systems in South Carolina that are economically sustainable, safe and environmentally sound.

What has been done

Research and Extension programs in agronomic crops address issues ranging from proper variety selection to protecting crops from weeds, insects and diseases as well as developing more efficient irrigation and harvest equipment. Agents assisted farmers by conducting peanut maturity clinics and farm visits. Specialists demonstrated the Weed Wiper as a method of controlling Johnsongrass in fescue hay fields.

Results

The Extension Agronomic Crop Production programs impact the management and production of agronomic crops on over 1,330,000 acres in South Carolina each year. This includes all corn, cotton, peanuts, small grains, sorghum and tobacco. Total value of these crops was \$658,351,000 in 2013. The largest acreage for a single crop is the 440,000 acres planted to soybean but the cotton crop has the greatest total value at \$131,501,000. Information generated from Official Variety Trials allows growers to select varieties that perform best in their region of the state. Increasing yields just 5% through proper variety selection results in an additional \$26,777,400 in revenue for South Carolina producers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Diseases and Nematodes Affecting Plants
213	Weeds Affecting Plants
216	Integrated Pest Management Systems
601	Economics of Agricultural Production and Farm Management

Outcome #4

1. Outcome Measures

Number of Master Gardeners reporting activities.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	333

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Horticultural Program at Clemson University seeks to inform consumers on environmentally sound horticultural practices that will improve communities.

What has been done

Some 88,523 people received information from Master Gardeners through telephone calls, office visits, workshops, and activities. These volunteers conducted school programs, oral presentations, newsletters, radio programs, and TV appearances. An online course was created as supplemental material for the Master Gardener program. The Master Gardener Facebook page serves 6569 viewers.

Results

Master Gardeners contributed over 61,106 hours of service at a value of \$1,231,286 in program support.

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
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Of the 14,327 persons participating in educational programs, 86% indicated that they gained knowledge.

Key Items of Evaluation