V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Global Food Security and Hunger - Agronomic Crops

☑ 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%		1%	
102	Soil, Plant, Water, Nutrient Relationships	10%		3%	
111	Conservation and Efficient Use of Water	15%		4%	
121	Management of Range Resources	0%		2%	
132	Weather and Climate	5%		0%	
135	Aquatic and Terrestrial Wildlife	0%		2%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		15%	
202	Plant Genetic Resources	5%		1%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	10%		4%	
204	Plant Product Quality and Utility (Preharvest)	30%		12%	
205	Plant Management Systems	0%		25%	
206	Basic Plant Biology	0%		1%	
211	Insects, Mites, and Other Arthropods Affecting Plants	10%		2%	
212	Pathogens and Nematodes Affecting Plants	5%		13%	
213	Weeds Affecting Plants	10%		8%	
402	Engineering Systems and Equipment	0%		3%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	0%		4%	
	Total	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	18.0	0.0	18.0	0.0
Actual Paid Professional	15.9	0.0	16.8	0.0
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**
426901	0	1493247	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
426901	0	604171	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	5421214	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Short courses, Workshops or Training Seminars
Field Consultations
Demonstration and Verification Programs
Newsletters and Publications
Web-based information and E-mail
Distance Learning Programs
Field Manuals or Guides
Farm Management Software/Components
Direct Technical Assistance/Recommendations/Interpretation/Analysis
Research Programs to Enhance Yield, Efficiency, Profitability and Stewardship

2. Brief description of the target audience

Crop producers
Non-traditional crop producers (wildlife food plots, tourist farms, etc.)
Agricultural consultants
Agricultural retail suppliers and dealers
Agricultural businesses and financial institutions
Agricultural industry representatives and research and development personnel
Agricultural applicators
Extension Service personnel
Research faculty and personnel

3. How was eXtension used?

The resources provided through eXtension were used to supplement and enhance our public learning experiences provided by MSU Extension agents and specialists. eXtension was also used as a resource in state-based planning processes. Overall, 212 MSU employees are eXtension users, with 15 new registrations during this reporting period. Further, MSU Extension has 64 employees that serve on one or more of the 72 Communities of Practice (COPs); MSU Extension employees are member of 33

COPs. Twelve MSU Extension employees serve as a leader for a COP, leading 9 COPs. MSU Extension personnel are members of the Cotton COP.

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	48227	147920	0	0

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	9	42	0

V(F). State Defined Outputs

Output Target

<u>Output #1</u>

Output Measure

- Number of producers attending seminars, workshops, short courses, and demonstrations.

Year	Actual
2012	32691

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Documentation and effect of producers adopting recommended practices, technologies, strategies, or systems.
2	Documentation of growers increasing production levels.
3	Documentation of producers minimizing inputs/expenses associated with crop production.
4	Documentation of efforts and activities which have improved environmental stewardship.

Outcome #1

1. Outcome Measures

Documentation and effect of producers adopting recommended practices, technologies, strategies, or systems.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	4184

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Sweetpotatoes have a total economic impact of over $130 million in MS. One of the biggest problems is protecting quality while in storage, which is directly influenced by skinning during harvest. A skinned sweetpotato loses more moisture and is more susceptible to rot. The traditional practice of mechanically defoliating the plant prior to harvest is not compatible with modern bulk harvesting systems because of plant residue conveyed into storage. A new system to toughen the skin prior to harvest would create a higher quality product.

What has been done
It was hypothesized that cutting the growth root of the sweetpotato plant and leaving the storage root intact would allow the skin to toughen in the field prior to harvest. Two new systems, using off-the-shelf components, were created to undercut the plant. One system, the Razor Plow, was based on a root plow produced by Roll-A-Cone Manufacturing. This system features multiple wide horizontal blades connected to vertical shanks. The second system was a modified sweetpotato digger fabricated by Easley Manufacturing.

Results
During field testing, both systems entered the soil easily, maintained depth, were pulled with equipment available to growers, experienced minimal vine entanglement, and did not damage roots. At 6 days after treatment, undercutting significantly increased skin strength for roots on which the vine had been left on, allowing roots to cure in the ground. Testing, refinement, and on-farm demonstration are ongoing. In 2011, storage losses accounted for $22.2 million in lost revenue. A 10% reduction in storage losses would result in a savings of $10.5 million. This technology could improve sweetpotatoes' profitability and ensure continued growth. A higher quality product which is more stable in storage could encourage value-added processors to locate operations in the region which would stimulate economic development.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
132	Weather and Climate
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants

Outcome #2

1. Outcome Measures

Documentation of growers increasing production levels.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	5231

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
A major decision producers make is nitrogen (N) fertility management. They seek to maximize profitability by optimizing yield relative to input costs. The closer N applications are made to the time plants can efficiently utilize the nutrient, the better for overall crop production efficiency. Research has shown that N application, delayed until just before tassel emergence, has been effective in increasing yields. The greatest response has been at lower standard N rates (less than 180 lb N/acre) with less response at levels above 210 lb N/acre.

What has been done
Research was initiated at the Delta Research and Extension Center to evaluate pre-tassel N management for corn in a corn/soybean rotations system. Standard N rates were established at

120, 150, 180, 210, 240 and 270 lb N/acre with 120 lb N/acre applied prior to planting as urea-ammonium nitrate solution (32% N) and the remainder applied as a sidedress (0 to 150 lb N/care). Pre-tassel nitrogen (PTN) as urea was then hand-applied at rates from 0 to 60 lb N/acre as a broadcast followed by irrigation or rainfall to incorporate.

Results
Replicated field studies at the Delta Research and Extension Center have shown a significant response to pre-tassel N (PTN) applications in an irrigated multi-year corn/soybean rotation. The response to PTN was greatest at lower standard N rates (120-180 lb N/acre) compared to higher N rates (210-270 lb N/acre). Grain yields increased with both 20 and 40 lb N/acre broadcast applied as urea. This research shows corn plants continue to take up N from the soil into reproductive growth as long as adequate soil water is available from irrigation or rainfall. This could increase grain yields on many fields where N loss during the early growing season could limit productivity. Higher nutrient utilization efficiency also reduces offsite loss and nutrient transport to adjacent primary water bodies, enhancing water quality.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
202	Plant Genetic Resources
205	Plant Management Systems

Outcome #3

1. Outcome Measures

Documentation of producers minimizing inputs/expenses associated with crop production.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	2615

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Grain production in the Mid-South has increased, especially corn, as cotton production has decreased. Twin-row production systems are relatively new with most efforts in soybean and peanut. Being able to use the same equipment across more acres decreases the cost per acre of the equipment. The major factors considered in corn have been seeding rates and nitrogen (N) rates as a means of increasing yields on the raised-bed production system of the area.

What has been done
Research has shown that in the twin-row (TR) production system, seeding rates could be increased to 35,000 to 40,000 plants/acre from the more common 30,000 to 32,000 plants/acre and significantly increase grain yields. While increasing N rates has significantly increased the grain yield, the increase was often not sufficient to cover the cost of the additional N.

Results
The N response, while significant, is not always economical. Increasing the seeding rate by 10-15% has significantly increased grain yield in the TR system with most cultivars. These advantages have been accomplished under irrigated conditions in wide-row (38-40 in spacing) bedded plantings. Comparisons of twin-row and single-row production in most years have shown an advantage to the TR system, especially in high yield environments evident in 2012. The overall impact is increased yields and profitability and a spreading use of the system as cotton acreage decreases. By using the planters on more acres the fixed cost of the planter can be spread across more acres.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants

Outcome #4

1. Outcome Measures

Documentation of efforts and activities which have improved environmental stewardship.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	2354

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The overdraft of the shallow well aquifer in the Mississippi Delta should be a concern of all producers who irrigate. Water conservation is one means to help balance our water supply. Better knowledge of soil moisture within the effective rooting zone is some of the information needed to improve irrigation scheduling. Successful application of wireless technology, dataloggers and soil moisture sensors at a reasonable cost will give producers better information to schedule irrigations which can save water and fuel.

What has been done
Beginning in 2011, an on-farm irrigation initiation demonstration on cotton has successfully integrated soil moisture sensors, dataloggers, and wireless communication into a commercial cotton farming operation. Two different soil moisture sensors and their associated communications systems were installed each year. After two years, the producer is confident that use of this soil moisture data for irrigation scheduling saved an irrigation event as compared to his normal irrigation scheduling without reducing yield.

Results
Reducing pumping by 2-3 inches will help reduce the overdraft on the aquifer and sustain our water resources. Saving water and reducing fuel costs without reducing yields will increase the bottom line of the producers. Although, there are producers that tend to not irrigate enough, collection of soil moisture data to help schedule irrigations should increase their yields and their bottom line.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
132	Weather and Climate
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

MSU Extension agents and specialists, as well as MAFES faculty, used a variety of recommended methods to gather needed information. Specific strategies will be initiated and utilized for collecting evaluation information to determine program outputs and outcomes (see impact statements for examples).

In FY 2012, MSU Extension agents and specialists were required to submit four quarterly reports (January, April, July, and September). This quarterly report collects information about the number of contacts, types of contacts, and number of programs conducted in each Priority Planning Area. In addition, two narrative Accomplishment Reports are required from each MSU Extension employee each year. Finally, a specific request for impact statements is also made. The evaluation results are a combination of this quantitative and qualitative data.

MAFES scientists operate research programs under an approved Hatch or Hatch-Multistate CRIS project plan of work. Outputs, outcomes, target audiences, and impacts are reported annually through the CRIS (REEport) system. Annual and project termination reports are developed by scientists and reviewed by Department Heads and the Director's office before submission to USDA-NIFA through REEport.

Key Items of Evaluation