

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Global Food Security and Hunger - Plant Systems

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	10%		0%	
111	Conservation and Efficient Use of Water	10%		0%	
132	Weather and Climate	10%		0%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		7%	
202	Plant Genetic Resources	5%		5%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	10%		5%	
204	Plant Product Quality and Utility (Preharvest)	0%		6%	
205	Plant Management Systems	20%		33%	
206	Basic Plant Biology	0%		1%	
211	Insects, Mites, and Other Arthropods Affecting Plants	5%		6%	
212	Pathogens and Nematodes Affecting Plants	5%		17%	
213	Weeds Affecting Plants	10%		9%	
215	Biological Control of Pests Affecting Plants	0%		1%	
216	Integrated Pest Management Systems	0%		10%	
403	Waste Disposal, Recycling, and Reuse	5%		0%	
601	Economics of Agricultural Production and Farm Management	5%		0%	
903	Communication, Education, and Information Delivery	5%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890

Plan	32.5	0.0	18.0	0.0
Actual Paid Professional	44.2	0.0	25.2	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
1131789	0	1789121	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1131789	0	1215018	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	7221342	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

2. Brief description of the target audience

- Commercial and non-commercial 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, 233 MSU employees are eXtension users, with 12 new registrations during this reporting period. Further, MSU Extension has 77 employees that serve on one or more of the 78 Communities of Practice (COPs); MSU Extension employees are members of 45 COPs. 13 MSU Extension employees serve as a leader for a COP, leading 9 COPs. 3 MSU Extension

personnel are members of the All About Blueberries COP with 1 being a leader. 3 MSU Extension personnel are members of the Bee Health COP with 1 being a leader. 6 MSU Extension personnel are members of the Consumer Horticulture COP. 3 MSU Extension personnel are members of the Cotton COP. 1 MSU Extension personnel is a member of the eOrganic COP. 1 MSU Extension employee is a member and leader of the Grapes COP. 2 MSU Extension personnel are members of the Invasive Species COP.

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	256653	765509	0	0

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

Patent Applications Submitted

Year: 2013
 Actual: 6

Patents listed

- 1.Crapemyrtle Plant named Neshoba
- 2.Crapemyrtle Plant named Pascagoula
- 3.Crapemyrtle Plant named Sequoyah
- 4.Crapemyrtle Plant named Shumaka
- 5.Crapemyrtle Plant named Tishomingo
- 6.Generation of Imazapic Resistant Switchgrass

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	7	144	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

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

Year	Actual
2013	170360

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 producers 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.
5	Number of producers adopting new practices based on research/extension recommendations.
6	Number of producers reporting increased income/decreased expenses based on practice change
7	Number of producers reporting increasing profitability levels.

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
2013	17036

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The tarnished plant bug is the most important insect pest of cotton in Mississippi. Producers in the Delta region of the state typically make an average of about 7 insecticide applications for this pest, and control costs exceed \$100.00 per acre annually. This is not sustainable and a more holistic approach that relies on other management strategies is needed for this insect pest.

What has been done

MSU research and Extension entomologists initiated research to evaluate multiple cultural practices to improve integrated pest management plans for tarnished plant bug. The research investigated normal agronomic practices such as planting date and variety selection, and their impact on tarnished plant bug infestations and damage in cotton. Additional research is currently being conducted to investigate the impact of infestation timing on cotton yields, the impact of irrigation timing, and the impact of hairy leaf and smooth leaf varieties on infestations.

Results

Cotton planted from mid-April through early-May required fewer insecticide application for tarnished plant bug and suffered less yield loss than cotton planted from mid-May to early-June. Early planting dates required 3 fewer insecticide applications compared to later planting dates. Additionally, an early maturing variety suffered less yield loss than a late maturing variety. Yield losses from tarnished plant bug ranged from 21% to 38% on the early maturing variety compared to 37% to 56% on the late maturing variety. Similarly, less damage was observed on a hairy leaf variety compared to a smooth leaf variety. Preliminary results suggest that irrigation timing can impact tarnished plant bug infestations in cotton. This research can reduce our reliance on insecticides.

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 producers increasing production levels.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	6815

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Variety selection is the key management decision each year for rice producers. Conventional rice acres in Mississippi declined in recent years in favor of the "Clearfield" rice system. However, with increasing costs of seed, declining control of grassy weeds like Barnyardgrass, and lodging problems associated with the better yielding "Clearfield" cultivars, growers have sought a better conventional rice option.

What has been done

The MSU Rice Breeding Program makes several new crosses each year. After a series of selections over a period of years, the most elite germplasm is identified. Every few years, a new

variety can be released to the public after it has shown qualities that are superior to previously released varieties. Upon release, a cooperative effort from MAFES and MSU Extension is needed to educate growers on the benefits of the new variety and practices that will help the grower succeed in its production.

Results

In 2010, MSU released its most recent conventional rice variety as "Rex." The Certified class of Rex seed was produced in 2012, thus allowing a major expansion of seed available to be planted in 2013. Rex increased to 15% of the acreage planted in Mississippi. This was the second most popular cultivar used in planting and the largest conventional pure line planted. In Mississippi, "Cocodrie," a Louisiana State University-developed variety, has held the largest share of conventional pure line acreage since 2001. Over the last three years, Rex has averaged 7 bushels per acre greater than Cocodrie. At the current value of rice, growers realized \$50 per acre more by planting Rex compared to Cocodrie. Furthermore, Rex is moderately resistant to lodging.

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
2013	6814

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In Mississippi, it has become routine for soybean producers to apply foliar fungicides to soybeans at the R3 growth stage for prevention of diseases. Over the last several years growers have begun to "piggy back" insecticides with the fungicide to save application cost, but in many instances there is no insect pest at economic threshold.

What has been done

MSU Extension has been conducting research and demonstration trials over the last several years to convince growers that scouting and treating on thresholds is more economically sound than automatic sprays and that automatic sprays killed beneficial insects that flared secondary caterpillar pests which actually required more applications.

Results

In 2013, MS farmers planted 2.2 million acres of soybeans. It is estimated that about 60% of those growers co-apply an insecticide with a fungicide at the R3 growth stage. Insect pressure was very light, and MSU Extension entomologists immediately began talking to consultants and producers about the consequences of this application. We feel that we were successful in convincing soybean consultants and growers to leave this automatic mix out of the tank. We estimate that at least 80% of the producers took this advice based on direct feedback, saving an estimated \$10,560,000 directly. It is likely that an early automatic pyrethroid application would flare secondary pests on an additional 50% of those acres treated requiring another application otherwise not needed. This is a total estimated savings of \$19,008,000.

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
2013	13629

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Irrigation is critical for the long-term sustainability of consistent, high-yielding soybean production in Mississippi. However, declining groundwater levels in the Mississippi Alluvial aquifer have raised concerns over the continued use of irrigation water from this natural resource. This aquifer supplies much of the groundwater supplies for agriculture and industry throughout the region. Estimates are that this aquifer is declining by roughly 300,000 to 350,000 acre feet per year in Mississippi.

What has been done

PHAUCET is a computer program that calculates pressure within the irrigation pipe and flow rates for each watered furrow. The program utilizes field schematics and user-defined information to calculate existing system performance and alternative hole-size designs for poly pipe-based delivery systems to improve distribution and uniformity without bursting the pipe. Research was conducted from 2010-2012, at the MSU Delta Research and Extension Center to evaluate PHAUCET-designed irrigation as compared to conventional irrigation practices.

Results

Results from these studies indicate that the implementation of PHAUCET resulted in an approximately 16% reduction in acre inches of water pumped per irrigation event and at least a 22% reduction in pumping times and/or cost. This research also reported no significant differences in soybean yields as compared to conventional irrigation practices. PHAUCET coupled with sound irrigation management practices will improve irrigation uniformity and increase water use efficiency while minimizing over-watering. Adoption of PHAUCET and additional conservation practices could help to reduce the current demand on the MS Alluvial Aquifer, while increasing irrigation efficiency and reducing pumping costs.

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

Outcome #5

1. Outcome Measures

Number of producers adopting new practices based on research/extension recommendations.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	17036

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

More information is available to row crop producers than ever before. In addition, this information is more easily accessible than ever before. However, not all information that is provided to row crop producers is reliable, nor is it all based on scientific, non-biased data. As a result, producers are often pressured to purchase a given product or service that may not have been fully researched to determine how effective it is or how it could benefit the producer.

What has been done

In 2009, MSU personnel enhanced the Cotton Short Course into a Row Crop Short Course. Since then, attendance and impact has increased each year. In 2013, approximately 492 people pre-registered for the Row Crop Short Course. Subject matter experts were brought in from 6 states in addition to MS to provide educational information covering all aspects of row crop production thus allowing anyone involved in row crop agriculture to get solutions to problems they face.

Results

Although an exact dollar figure is impossible to quantify, a conservative estimate of the value of the Row Crop Short Course could be placed at \$35 million. In addition to the monetary value placed on the Row Crop Short Course, it has proven to be one of the flagship meetings conducted by MSU Extension each year. Attendees documented a very high level of satisfaction with the quality of speakers, information presented, and additional amenities provided during the Row Crop Short Course.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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132 Weather and Climate
403 Waste Disposal, Recycling, and Reuse

Outcome #6

1. Outcome Measures

Number of producers reporting increased income/decreased expenses based on practice change

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	6815

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Industry seed companies regularly evaluate their products and compare them to competitive genetics to improve their marketability. These comparisons are often quite limited and rarely regulated. Furthermore, there is considerable incentive for each company to conduct and represent such evaluations in a partial manner to enhance marketability of their products. Thus, although industry-generated genetic information is readily available, its value for growers to identify and select optimal genetics from within the vast market is minimal.

What has been done

The MSU Variety/Hybrid Trials conduct annual, open, scientific-based, third-party performance evaluations of genetic performance of seed entries representing any company. MSU Extension crop specialists analyze these research results from corn, cotton, and soybean variety trials for yield performance annually to develop summaries of superior-yielding genetics expressly for various cropping cultures in MS, which are published and distributed to growers.

Results

MSU Variety Trial and genetic evaluation efforts enhance knowledge by delivering findings through numerous educational activities. Using superior genetics evaluated by MSU improved 2013 value of soybeans (4.3 bu/a)(\$13.2/bu) (1.98m acres) = \$112 million; Corn (11.4 bu/a) (\$4.4/bu) (.86m acres) = \$43 million; Cotton (100 lb/a) (\$.8/lb)(420,000 acres) = \$34 million; Wheat (5.2 bu/a) (\$6.82/bu) (.36m acres) = \$13 million. These activities increased raw value of these agronomic commodities over \$200 million. Utilization of improved genetics also often improves product quality, increases production efficiency, and reduces production input

resulted in at least \$40 million of additional benefit for Mississippi crop producers in 2013.

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate

Outcome #7

1. Outcome Measures

Number of producers reporting increasing profitability levels.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	6814

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Two populations of glyphosate-resistant (GR) Italian ryegrass were identified in field crops in Washington County, MS, in 2005. GR Italian ryegrass is now present in 32 counties in MS. Research to address management of GR Italian ryegrass has shown that a minimum of two herbicide applications are required for >90% control. However, herbicide programs that provide nearly complete GR Italian ryegrass control are costly, and growers are sometimes hesitant to invest the required money. Therefore, research is needed to demonstrate the yield loss associated.

What has been done

Research to address management of GR Italian ryegrass was initiated. Early research demonstrated two findings. Post-emergence options in the spring are limited and require two herbicide applications to approach complete control, and residual herbicides applied in the fall offer the best opportunity for controlling GR Italian ryegrass. The research emphases have transitioned to focus on programs for managing GR Italian ryegrass. Two studies were conducted from 2011-13 to determine the impact on yield of GR Italian ryegrass that survives.

Results

Average net returns for corn above treatment costs ranged from \$361.32 per acre where no control measure for GR Italian ryegrass was used to \$962.53 per acre where sequential fall and spring herbicide programs were utilized. This represented a gain of \$601.21 per acre based solely on controlling GR Italian ryegrass. This return to treatment would result in a positive economic impact of \$811.63 per acre to the MS Delta region's economy. For soybeans, the highest average net return of \$486.32 per acre was realized for the fall herbicide program. This compares with \$325.80 per acre with no control measures. This implies a gain of \$160.52 per acre for control of GR Italian ryegrass in soybeans and a positive economic impact of \$216.70 per acre to the MS Delta region's economy.

4. Associated Knowledge Areas

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems

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

{No Data Entered}

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 were initiated and utilized for collecting evaluation information to determine program outputs and outcomes (see impact statements for examples). In FY 2013, 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.

Our Planned Program Areas (PPAs) changed in 2013 - a reduction from over 20 PPAs in 2012 to 10 for this current reporting cycle. Previous PPAs of Agronomic Crops, Horticulture, Climate Change, Sustainable Energy, and Farm and Home Safety: Farm Safety were combined into Global Food Security and Hunger - Plant Systems. Given the time it takes to adapt an electronic reporting system and ensure all end-users are trained and understand how to report in new ways and new PPAs, our outcome data matching process

required modification for 2013. As a result, some of our numbers may appear skewed from previous ones. This reduction of PPAs and thus combination of outcomes led to some outcomes within each PPA being very similar for 2013. Our reporting system would not allow us to make detailed distinctions at this point in time, so numbers were evenly distributed across those similar outcomes when appropriate. As our data collection system evolves over the next year or two, we will be able to more clearly align the various data elements within the system to resolve this issue.

Key Items of Evaluation