V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Global Food Security and Hunger - Plant Production 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%		10%	
202	Plant Genetic Resources	5%		3%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	10%		4%	
204	Plant Product Quality and Utility (Preharvest)	0%		6%	
205	Plant Management Systems	20%		30%	
206	Basic Plant Biology	0%		4%	
211	Insects, Mites, and Other Arthropods Affecting Plants	5%		9%	
212	Diseases and Nematodes Affecting Plants	5%		17%	
213	Weeds Affecting Plants	10%		6%	
215	Biological Control of Pests Affecting Plants	0%		1%	
216	Integrated Pest Management Systems	0%		8%	
403	Waste Disposal, Recycling, and Reuse	5%		0%	
601	Economics of Agricultural Production and Farm Management	5%		0%	
901	Program and Project Design, and Statistics	0%		1%	
903	Communication, Education, and Information Delivery	5%		1%	
	Total	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	32.5	0.0	18.0	0.0
Actual Paid	43.6	0.0	38.7	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**
1112906	0	1925504	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
1112906	0	1197407	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	5050998	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, 230 MSU employees are eXtension users. Further, MSU Extension has 71 employees that serve on one or more of the 66 Communities of Practice (COPs); MSU Extension employees are members of 39 COPs. 10 MSU Extension employees serve as a leader for a COP, leading 7 COPs. 3 MSU Extension personnel are members of the All About Blueberries COP. 6 MSU Extension personnel are members of the Consumer Horticulture 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. 4 MSU Extension personnel are members of the Community, Local, and Regional Food Systems COP. 2 MSU Extension personnel are members of the Garden professors CoP COP. 1 MSU Extension employee is a member of the Youth Agriculture COP.

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	370168	731929	0	0

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

Patent Applications Submitted

Year:	2014
Actual:	4

Patents listed

1.Soybean cyst nematode resistance gene and methods of use
2.Engineering the production of a conformational variant of occidiofungin that has enhanced inhibitory activity against fungal species
3.Use of Burkoldaria contamins MS14 and Occidiofungin as a fungicide against plant pathogens
4.Generation of imazapic resistant switchgrass population

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	6	167	173

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
2014	183683

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Documentation of producers increasing production or profitability levels.
2	Number of producers minimizing inputs/expenses based on practice change.
3	Documentation of efforts and activities which have improved environmental stewardship.
4	Number of producers adopting new practices, technologies, strategies, or systems based on research/extension recommendations.

Outcome #1

1. Outcome Measures

Documentation of producers increasing production or profitability levels.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	15282

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
With seven brands of Upland cottonseed available for Mississippi and approximately 75 varieties, it is apparent that growers are faced with an overload of cotton varieties to choose from for planting every year. With an overload of varieties, it clear that a variety testing program planted locally will help with the process of selecting the correct variety for that particular soil in that particular county.

What has been done
A large scale, on-farm variety trial was conducted in Noxubee County because of the growing interest in cotton production. Large scale trials are intended to compliment the small plot official variety trials conducted through our research. Trials are conducted to increase awareness of new cottonseed varieties and further evaluate their performance compared to other commercial varieties across Mississippi. Most trials consist of 5 varieties with lint yield and quality as the primary testing criteria. Trial data is provided to growers, consultants, dealers, and university personnel.

Results
Plot results indicated final lint yields ranged from 1,373 to 1,508 pounds per acre across five varieties replicated twice within a grower's field. Final crop value based from the lint yield and net loan price ranged from $759 to $832 per acre or a difference of $73 per acre. Noxubee County had approximately 13,500 cotton acres for the 2014 cropping season. Looking at the economic impact of this trial Extension efforts could influence the growers of Noxubee County by $985,500 through the proper selection of cotton varieties.

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
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
206	Basic Plant Biology
213	Weeds Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems
901	Program and Project Design, and Statistics
903	Communication, Education, and Information Delivery

Outcome #2

1. Outcome Measures

Number of producers minimizing inputs/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
2014	14107

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Downy mildew is a devastating disease of roses that discolors flowers and causes severe leaf drop. It kills the plant in a short time if not controlled. Many plants remain infected after symptoms disappear and explode with the disease when favored by weather. Fungicides are used to control

rose downy mildew. Because downy mildew is a water mold with moderate-high risk pathogen for developing resistance to fungicides, fungicide choice is limited and expensive. The fungicides must be constantly rotated to prevent resistance from developing, so expensive inventory must be maintained.

What has been done
Extension aided a commercial rose grower in selecting a rotation of three fungicides to address a downy mildew problem. Spraying required about one day to two weeks. An extensive and expensive inventory was necessary. Reentry periods affected worker schedules. Downy mildew control was good but not excellent. Using USDA-NIFA IPM funds, Extension purchased a bag of sulfur and three sulfur burners. One burner was for a 42' X 20' greenhouse, and the other two were for a 20' X 96' greenhouse. The burners were set to work 3-5 hours nightly.

Results
In the sulfur-smoked greenhouses, reentry periods no longer applied, so flexibility was restored to worker schedules. No downy mildew developed in either of two houses treated with the sulfur smokers but did develop in other greenhouses. The sulfur controlled mite pests. Mites were a problem in other greenhouses, and their control is expensive. Blackspot disease was reduced in the sulfur-treated greenhouses. An estimated $300 savings in pesticide expenses led to a total savings of $665 per month. Since downy mildew is a risk in Mississippi for six months, estimated yearly monetary savings are 6 x $665 = $3,990. Labor savings from not spraying are not included. Replacing water mold fungicides with sulfur reduced environmental risks of pesticide runoff, reduced the risk of fungicide resistance, and produced healthier plants.

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
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
206	Basic Plant Biology
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Diseases and Nematodes Affecting Plants
213	Weeds Affecting Plants
216	Integrated Pest Management Systems
903	Communication, Education, and Information Delivery

Outcome #3

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
2014	14695

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Plant-parasitic nematodes cause substantial yield losses in Mississippi agricultural production systems. With the lack of resistant varieties most of our producers rely on the use of chemicals for nematode management.

What has been done
Using molecular techniques we have identified over 150 genes that are involved in the resistance reaction of the soybean plant to the Soybean Cyst Nematode. The functionality of these genes to better understand the sequence of events that are involved to prevent nematode infection is determined. Currently plants have been engineered with specific genes and examined for nematode resistance under controlled greenhouse conditions. Until specific genes are incorporated into crop varieties we examine chemically- and biologically-derived products for nematode management.

Results
Preliminary results from plants engineered with specific genes have shown significant reductions in the ability of the nematode to establish infection sites, or infect the plant and successfully complete all life developmental stages. In specific cases 95% of the nematode population was reduced. These genes will be instrumental in the development of nematode resistant varieties. Nematode resistant varieties will reduce the amount of chemicals that are currently used, thus providing a more environmental safe crop production practice. Until resistance is available there is a shift away from the broad spectrum chemical nematicides and toward the biologically target-specific products. These products are providing good nematode management combined with high returns to our agricultural producers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
206	Basic Plant Biology
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Diseases and Nematodes Affecting Plants
216	Integrated Pest Management Systems
903	Communication, Education, and Information Delivery

Outcome #4

1. Outcome Measures

Number of producers adopting new practices, technologies, strategies, or systems 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
2014	36737

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The fungus responsible for frogeye leaf spot, an important yield-limiting disease of soybean, has been determined to be resistant to the strobilurin fungicide chemistry across much of MS. The strobilurin fungicides (e.g., Headline, Quadris) have been the main class of fungicides used in soybean production to prevent yield loss. Strobilurin fungicides are preventive in that they prevent infection from occurring on leaf material post-application. Additional curative fungicide mode-of-actions exist but haven?t been as widely applied as a specific, timed growth stage application.

What has been done

Rather than apply a fungicide that will not produce a positive response in the presence of disease, research trials were conducted to determine the effectiveness of fungicides which are more curative to frogeye leaf spot. Pre-mix fungicides that contain a strobilurin and a curative fungicide, either a triazole or carboximide, in addition to several other modes-of-action were screened at multiple trial locations to determine the placement in frogeye leaf spot susceptible soybean varieties. Results from the trials have been widely presented at farmer meetings throughout MS since late 2013.

Results

By applying a strobilurin fungicide, farmers with frogeye leaf spot susceptible varieties lose the cost of the fungicide plus application between $14 and $20 per acre. Strobilurin fungicides no longer provide a yield benefit when applied to frogeye susceptible soybean varieties as a growth stage timed application due to the development of fungicide resistance. In 2014, approximately 700,000 acres of frogeye leaf spot susceptible varieties were planted in MS. Farmers that applied a curative fungicide to manage frogeye leaf spot observed an increase between 6 and 15.5 bushels/acre or an approximate return of $52-$160/acre. If half of the frogeye leaf spot susceptible acres received a curative fungicide MS soybean farmers would have observed a return as high as $56,000,000.

4. Associated Knowledge Areas

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

{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 2014, 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 Planned Program Area. In addition, two narrative Accomplishment Reports are required from each MSU Extension employee each year. Finally, a specific request for impact statements from MSU Extension and MAFES faculty and staff is also made. The evaluation results shared through our impact statements are a combination of this quantitative and qualitative data.

Late in the 2014 program year, we introduced a Standardized Extension Evaluation Survey. The Standardized Extension Evaluation Survey was designed for use in any MSU Extension Service program, workshop, or event with adults. The survey assesses program process, participant satisfaction, knowledge and/or skill change, and behavioral intentions. It provides a ready-made evaluation for agents and specialists to use and will allow us to aggregate data across the state. A small number of agents and specialists have utilized the survey to date, but we hope use will increase over time.

Key Items of Evaluation