

**V(A). Planned Program (Summary)**

**Program # 3**

**1. Name of the Planned Program**

Global Food Security and Hunger-Agricultural, Biological, and Natural Resources Engineering

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	20%		0%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	10%		0%	
306	Environmental Stress in Animals	5%		0%	
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals	5%		0%	
401	Structures, Facilities, and General Purpose Farm Supplies	0%		37%	
402	Engineering Systems and Equipment	50%		46%	
403	Waste Disposal, Recycling, and Reuse	10%		11%	
404	Instrumentation and Control Systems	0%		1%	
405	Drainage and Irrigation Systems and Facilities	0%		5%	
	<b>Total</b>	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	5.5	0.0	5.0	0.0
Actual Paid Professional	2.6	0.0	1.3	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
67532	0	17006	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
67532	0	83847	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	568070	0

### V(D). Planned Program (Activity)

#### 1. Brief description of the Activity

Research and outreach must not only adapt to engineering changes, but must improve efficiency under these new conditions provide by resource innovation.

#### 2. Brief description of the target audience

Stakeholders and customers of research and Extension programs represent a broad section of audiences, including agricultural producers and consumers.

#### 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. 5 MSU Extension personnel are members of the Beef Cattle COP. 4 MSU Extension personnel are members of the Freshwater Aquaculture COP. 1 MSU Extension employee is a member of the Livestock and Poultry Environmental Learning Centers COP. 2 MSU Extension personnel are members of the Marine Aquaculture COP. 1 MSU Extension employee is a member of the Wood Energy COP.

### V(E). Planned Program (Outputs)

#### 1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	9900	10008	0	0

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

Year: 2013  
Actual: 2

**Patents listed**

1. Using Biochar as a container Substrate for Plant Growth
2. Fiber separation from Grain Products including Corn Flour and DDGS Using Electrostatic Method

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2013	Extension	Research	Total
Actual	0	26	0

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number of people attending workshops, short courses, etc.

Year	Actual
2013	3318

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Number of producers adopting new practices due to research/extension recommendations.
2	Number of producers adopting new technologies, strategies, or systems.
3	Number of producers increasing production levels.
4	Number of producers decreasing production inputs/expenses.
5	Number of producers improving production efficiency.
6	Number of producers improving their environmental stewardship.

## **Outcome #1**

### **1. Outcome Measures**

Number of producers adopting new practices due to research/extension recommendations.

### **2. Associated Institution Types**

- 1862 Extension
- 1862 Research

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2013	332

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

Commercial nursery propagators use various formulations of a root-inducing compound, auxin indole-3-acetic acid (IBA), to promote rooting on stem cuttings of ornamental and fruit crops. Recently, the potassium salt of IBA (also known as K-IBA) was removed from the market. The most similar product on the market is Hortus IBA Water Soluble. Growers requested that research be conducted to determine whether results with this product would be comparable to results previously obtained using K-IBA at similar rates, or whether rates would need to be adjusted.

#### **What has been done**

A study was conducted comparing these 2 products for cutting propagation of three common, woody nursery crops. Solutions were prepared using these products at five rates of IBA: 500, 1000, 1500, 2000, and 3000 ppm. Subterminal cuttings of Texas privet and star jasmine and single-node cuttings of 'Red Cascade' rose received a 1-second basal quick-dip in one of the 10 solutions, inserted in commercial rooting medium, and placed under intermittent mist in a greenhouse. After 6-7 weeks, number of roots and root length were evaluated.

#### **Results**

Upon harvest, cuttings of all three crops showed no significant difference in number of roots or total root length between the two products, although increasing rates of IBA increased the rooting of rose and star jasmine cuttings. Results indicate that commercial propagators can switch from K-IBA to Hortus Water Soluble Salts for a basal quick-dip without an adjustment in IBA rate. Results were presented at the 2013 annual meetings of the Western Region and Southern Region of the International Plant Propagators' Society, with combined attendance of approximately 250 nursery professionals. Results were also presented at the 2013 annual meeting of the Southern Nursery Association Research Conference, with attendance of approximately 100 nursery professionals, researchers, and Extension personnel.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
402	Engineering Systems and Equipment
403	Waste Disposal, Recycling, and Reuse

#### Outcome #2

##### 1. Outcome Measures

Number of producers adopting new 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	332

##### 3c. Qualitative Outcome or Impact Statement

###### **Issue (Who cares and Why)**

Salmonella is a foodborne pathogen that causes salmonellosis in infected individuals. Poultry breeding and processing has been associated with Salmonella and consequently this pathogen has been frequently associated with various retail poultry products including ground turkey. In 2009, FoodNet-Centers for Disease Control and Prevention reported 7,039 laboratory-confirmed cases of Salmonella.

###### **What has been done**

Low concentrations of carvacrol (0.025 to 0.2%) and lauric arginate (LAE; 25 to 200 ppm) were tested at 4, 22, and 45°C in a broth model, and higher concentrations of carvacrol (0.1 to 5%) and LAE (200 to 5,000 ppm) were tested individually and in combination at 4°C in 3 different ground turkey samples (with 15, 7, and 1% fat content) for their effectiveness against a 3-strain mixture of Salmonella.

###### **Results**

A mixture of 25 ppm of LAE and 0.025% carvacrol showed a synergistic action by reducing 6 log cfu/mL Salmonella counts to an undetectable level within 30 min of exposure. For the total microbial load, about 2,000 ppm of LAE or 2% of carvacrol treatments were needed to achieve 2

to 3 log (P &#8804; 0.05) cfu/g reductions in different turkey samples. This study indicated that a combination between LAE and carvacrol would be an effective measure to control salmonella on ground turkey for the poultry industry.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
306	Environmental Stress in Animals
402	Engineering Systems and Equipment
403	Waste Disposal, Recycling, and Reuse

#### Outcome #3

##### 1. Outcome Measures

Number 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	177

##### 3c. Qualitative Outcome or Impact Statement

###### Issue (Who cares and Why)

As more growers become interested in high tunnel production, information about specific crop production techniques is vital.

###### What has been done

Vegetable production trials have been conducted annually at the Beaumont Horticultural Unit for 5 years. Variety selection, yield data, pest management, and sensory evaluation of products has been performed. Additional high tunnels have been constructed at the South Mississippi Branch Station in Poplarville and at Coastal Research and Extension Center in Biloxi. These new high tunnels will be used for specialty crop production education and evaluation.

###### Results

Information from these trials had been utilized by producers in their decision-making strategies when determining crop selection and market opportunities. Using the season-extension techniques of high tunnel production allows growers to bring product to market earlier in the

Spring and later into the Fall and Winter seasons. This presents increased marketing and revenue opportunities for farmers.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
402	Engineering Systems and Equipment

#### Outcome #4

##### 1. Outcome Measures

Number of producers decreasing production inputs/expenses.

##### 2. Associated Institution Types

- 1862 Extension
- 1862 Research

##### 3a. Outcome Type:

Change in Condition Outcome Measure

##### 3b. Quantitative Outcome

Year	Actual
2013	177

##### 3c. Qualitative Outcome or Impact Statement

###### **Issue (Who cares and Why)**

As the economy continues to recover, manufacturers utilizing wood have increased their production. There is increasing evidence that hardwood lumber manufacturing is gaining momentum, and secondary manufacturing is experiencing a resurgence. Unfortunately, much of the knowledge about wood that the companies possessed was lost to retirements and downsizing.

###### **What has been done**

Mills were visited to determine their needs and issues. From this assessment a series of publications and workshops were created and tailored to the individual needs of the mills. The materials were focused on employees that worked in the mill along with the management of the mill. Topics included wood and water relationships, wood ID, wood drying, and wood properties as they relate to the species and intended use of the materials produced.

###### **Results**

Through the examination of mill production data and return claims, mills that participated in the workshops increased production and manufacturing defects. Several mills have found alternative

wood species as a means of offsetting costs and servicing product demand, something they were unaware of being able to do until being presented with the information.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
401	Structures, Facilities, and General Purpose Farm Supplies
402	Engineering Systems and Equipment

#### Outcome #5

##### 1. Outcome Measures

Number of producers improving production efficiency.

##### 2. Associated Institution Types

- 1862 Extension
- 1862 Research

##### 3a. Outcome Type:

Change in Condition Outcome Measure

##### 3b. Quantitative Outcome

Year	Actual
2013	177

##### 3c. Qualitative Outcome or Impact Statement

###### **Issue (Who cares and Why)**

In 2009, the Yazoo Water Management District (YMD) through static water level surveys showed that the Mississippi Alluvial aquifer is being mined and projected pumping problems in a specific area in the next ten years. Most producers, consultants, and seed representatives irrigate, or encourage irrigation, to prevent any crop stress in corn in order to obtain maximum yields. So, they generally irrigate before the crop stresses at all, with no regard to soil moisture; thus, water is applied that does not result in a yield benefit.

###### **What has been done**

MAFES scientists conducted irrigation initiation field studies with corn to determine optimum irrigation timing. Initiation was tested under sprinkler and furrow irrigation methods on a silt loam and silty clay loam soil, respectively, with and without deep tillage, while in a 1:1 rotation with cotton.

###### **Results**

Deep tillage increased yield under non-irrigated and irrigated conditions most years. There is a 5- to 10-day window of opportunity that occurs between V10 and VT, depending on rainfall, in which

irrigation can be initiated in which yields will not be affected and in which apparent water-use efficiency is relatively high. Earlier initiations did not increase yield or apparent water-use efficiency. Watermark readings varied from year to year for this window of opportunity, but in the worst-case scenario, irrigation needed to be initiated by 40 and 50 kPa, for the sprinkler and furrow irrigated fields, respectively. Reducing pumping by 2-3 inches will help reduce the overdraft on the aquifer and sustain our water resources while reducing fuel costs and increasing the bottom line of the producers.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
306	Environmental Stress in Animals
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals
402	Engineering Systems and Equipment

#### Outcome #6

##### 1. Outcome Measures

Number of producers improving their environmental stewardship.

##### 2. Associated Institution Types

- 1862 Extension
- 1862 Research

##### 3a. Outcome Type:

Change in Condition Outcome Measure

##### 3b. Quantitative Outcome

Year	Actual
2013	265

##### 3c. Qualitative Outcome or Impact Statement

###### **Issue (Who cares and Why)**

Coastal communities in MS and AL provide vital economic, social, and recreational opportunities for hundreds of thousands of Americans, but decades of population migration and coastal hazards have transformed coastal landscapes and intensified demand on finite coastal resources. As a result, it has become increasingly important for communities to create and implement plans that address the dynamic nature of the coastline (watershed deterioration, changes in sea level) and assist in visualization of future scenarios (working waterfronts, greenspace).

###### **What has been done**

The MS-AL Sea Grant was responsive to planning needs by providing resources for climate adaptation planning for communities, conducting greenspace analysis, convening workshops to discuss future development options, and providing technical assistance to 15 communities in MS and AL. In addition, vulnerability assessments were conducted in 8 coastal communities, financial indicator analysis was conducted in 1 community, and 12 coastal jurisdictions received technical assistance to implement activities in the Community Rating System.

### **Results**

Communities are incorporating sea-level-rise scenarios into hazard mitigation planning. Communities are aware of their strengths and weaknesses and are using the results from the Coastal Community Resilience Index to quantify whether the steps they are taking are moving them toward a more resilient community. Stewardship program managers are using research findings to refine prescription plans for burning on state lands and to minimize risks to vulnerable high marsh areas. Local governments are using research on takings law to determine their legal ability to implement sea-level-rise adaptation policies. State legislators have been provided with recommendations that address planning/zoning, financial incentive, socioeconomic, and infrastructure issues regarding waterfront access.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
102	Soil, Plant, Water, Nutrient Relationships
402	Engineering Systems and Equipment
403	Waste Disposal, Recycling, and Reuse

### **V(H). Planned Program (External Factors)**

#### **External factors which affected outcomes**

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- 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 Environment/Nutrient Management, Sustainable Energy, Animal Production, and Aquaculture Production were combined into Global Food Security and Hunger - Agricultural, Biological, and Natural Resources Engineering. 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**