V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Global Food Security and Hunger - Aquaculture

☑ 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
111	Conservation and Efficient Use of Water	0%		2%	
301	Reproductive Performance of Animals	0%		15%	
302	Nutrient Utilization in Animals	48%		3%	
305	Animal Physiological Processes	0%		1%	
306	Environmental Stress in Animals	13%		2%	
307	Animal Management Systems	8%		51%	
308	Improved Animal Products (Before Harvest)	23%		3%	
311	Animal Diseases	3%		3%	
312	External Parasites and Pests of Animals	1%		2%	
313	Internal Parasites in Animals	1%		0%	
315	Animal Welfare/Well-Being and Protection	3%		1%	
402	Engineering Systems and Equipment	0%		2%	
405	Drainage and Irrigation Systems and Facilities	0%		1%	
603	Market Economics	0%		8%	
903	Communication, Education, and Information Delivery	0%		6%	
	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	2.0	0.0	4.0	0.0
Actual Paid Professional	0.1	0.0	3.2	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**
2869	0	105475	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
2869	0	20715	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	2295685	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Currently, Mississippi is the number one catfish producer in the nation and catfish ranks seventh among Mississippi agricultural products in total farm gate value. In 2005, Mississippi had 400 catfish farms, with 101,000 surface acres producing a farm gate value of nearly $250 million. High production costs, foreign competition, and low wholesale prices have contributed to an industry-wide contraction. In 2012, Mississippi had 180 operations with 51,200 surface acres producing a food fish crop valued at $165 million. The goals of this program area are to increase production efficiency, reduce production costs, expand markets, and increase profitability and sustainability of this industry through the following specific objectives:

- Develop alternative feeds for optimal nutrition, increased production, and improved water quality of pond-raised catfish.
- Increase the reliability, efficiency, and cost-effectiveness of catfish fry production through the use of new and improved technologies.
- Increase reliability, efficiency, and cost-effectiveness of catfish production through the use of new and improved culture system technologies.
- Researchers will develop referred journal articles and give scientific presentations at professional societies and at producer meetings.
- Extension specialists will conduct workshops and seminar programs. Extension publications and newsletters will aid in transferring new knowledge to producers. Farm visits will help producers adapt new procedures on farms.
- Develop diagnostic tools to detect and monitor diseases in commercially raised channel catfish and determine virulence factors associated with those diseases.
- Develop fish health management procedures to control economically important diseases of channel catfish.
- Determine factors associated with emerging diseases in pond-raised channel catfish.
- Researchers will develop referred journal articles and give scientific presentations at professional societies and at producer meetings.
- Extension specialists will conduct workshops and seminar programs. Extension publications and newsletters will aid in transferring new knowledge to producers. Farm visits will help producers adapt new procedures on farms.

2. Brief description of the target audience

The target audience for this program includes producers of catfish, crayfish, and freshwater prawns, and related industry 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 Marine Aquaculture COP and the Freshwater Aquaculture COP.

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	201	31	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	2	7	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	39

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of producers adopting new technologies, strategies, or systems.
2	Number of producers improving production efficiency.
3	Number of producers improving their environmental stewardship.

Outcome #1

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
2012	8

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
High protein feeds are fed up to 50% of catfish fry standing crop. After fry are stocked, they are not at the surface eating offered feeds for the first 4-6 weeks. It is unknown if fry consume commercial feeds during that time, but it is believed fry feed may serve as a secondary food source and as a fertilizer to keep the pond fertile. Overfeeding had been preferred because of low fish biomass and the pond's ability to assimilate nutrients from excess feed. However, with current high feed prices and low fish prices, any feed wasting should be avoided.

What has been done
In 2012, MAFES scientists compared production variables between fish fed by the standard practice of feeding immediately at stocking to an alternative practice of delaying feeding for 6 weeks after stocking.

Results
After 18 weeks, there were no differences in water quality, zooplankton abundance, and fish length between the two treatments. Survival and total weight harvested were similar. Amount of feed fed was significantly lower in the delayed feeding treatment. Cost of the 35% protein fry feed used for the first 6 weeks was $0.78/kg. For farmers feeding 50% fry standing crop, initial feed savings would be $191.10/ha. Interestingly, amount of feed fed continued to be significantly ($P < 0.05$) higher with standard feeding compared to delayed feeding in the study's final 12 weeks which could produce savings of 650 kg/ha ($507/ha). If proper fertilization practices are implemented, natural productivity can sustain catfish fry stocked up to 250,000/ha. No commercial diets are required during the first 6 weeks.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
306	Environmental Stress in Animals
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)

Outcome #2

1. Outcome Measures

Number of producers improving production efficiency.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Catfish production has decreased by more than 50% over the last decade, primarily due to increased feed cost, reduced fish prices, and competition from imported catfish or other aquaculture products. To remain competitive in a global market, U. S. catfish producers must reduce production costs. Feed represents the largest expenditure, accounting for 50%-60% of total variable operation cost. Use of less expensive alternative feedstuffs without compromising fish performance and product quality would make catfish farming more sustainable.

What has been done
MAFES scientists conducted several studies in the past few years to evaluate the use of alternative feed ingredients such as cottonseed meal, corn gluten feed, corn germ meal, and distillers dried grains with solubles as partial replacement for more expensive soybean meal and corn. In 2012, a pond study was conducted to evaluate the use of a combination of cottonseed meal and corn germ meal to partially replace soybean meal and corn in catfish feeds.

Results
Results demonstrate that reducing soybean meal from 40% to 25% by the use of cottonseed meal and corn germ meal did not affect growth, net yield, and processed yield of catfish. Although feed ingredient prices fluctuate, potential savings by using these ingredients in least-

cost formulations as compared with traditional feeds are estimated to be about $10-15 per ton of feed or $4-6 million annually to the catfish industry.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
306	Environmental Stress in Animals
307	Animal Management Systems

Outcome #3

1. Outcome Measures

Number of producers improving their environmental stewardship.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Channel catfish anemia (CCA) is a disease of unknown etiology that has plagued the catfish industry since its inception. The disease results in chronic type losses that can extend over periods of 4-6 weeks with losses averaging about 5,000 lbs/10 acre pond. Larger food-sized fish are typically affected making the disease particularity costly, considering 2.0 pounds of feed are lost for every pound of fish that dies.

What has been done
Studies at the Thad Cochran National Warmwater Aquaculture Center showed oral administration of iron fortified diets, administered twice weekly to anemic fish, stimulated the production of red blood cells (RBC) resulting in normal packed cell volumes (PCV) levels after two weeks. Similar results were obtained in commercial field trials.

Results
As a result of this research, catfish operations with re-current anemia have begun using diets fortified with modest levels of ferrous sulfate to promote RBC production. To date this practice

has resulted in a dramatic decrease in the incidence of CCA which cost the industry between $5-10 million annually.

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Public Policy changes

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 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