

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Global Food Security and Hunger - Animal 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
301	Reproductive Performance of Animals	10%		18%	
302	Nutrient Utilization in Animals	10%		17%	
303	Genetic Improvement of Animals	5%		3%	
304	Animal Genome	5%		15%	
305	Animal Physiological Processes	5%		17%	
306	Environmental Stress in Animals	5%		7%	
307	Animal Management Systems	15%		13%	
308	Improved Animal Products (Before Harvest)	5%		1%	
311	Animal Diseases	10%		7%	
312	External Parasites and Pests of Animals	5%		0%	
313	Internal Parasites in Animals	5%		0%	
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals	5%		1%	
315	Animal Welfare/Well-Being and Protection	10%		1%	
402	Engineering Systems and Equipment	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	14.2	0.0	10.0	0.0
Actual Paid Professional	14.6	0.0	16.4	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
373925	0	794651	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
373925	0	1665164	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	6262225	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Extension personnel will communicate with animal producers and the general public through seminars, workshops, and Extension bulletins and newsletters distributed in paper copy and electronically via the internet. Field demonstrations may also be required to encourage acceptance of new practices and methodologies. Results of research projects may also be published in peer-reviewed scientific journals.

2. Brief description of the target audience

The target audience for this program includes animal producers and related industry personnel. Specifically, the target audience includes producers of beef, dairy, swine, equine, forage, catfish, crayfish, freshwater prawns, and commercial poultry.

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.

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	54847	86953	0	0

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

Patent Applications Submitted

Year: 2013
Actual: 2

Patents listed

1. Oral Delivery of Attenuated Edwardsiella ictaluri Vaccines.
2. In Vivo Vaginal Biomechanics Device.

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	1	87	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

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

Year	Actual
2013	23633

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 increasing production levels.
3	Number of producers optimizing production inputs/expenses.
4	Number of producers improving their environmental stewardship.
5	Number of producers improving production efficiency.
6	Number of producers improving overall animal health and/or protection.

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
2013	4727

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Mississippi lands are well-suited to raising stocker cattle due to a favorable forage grazing season. Calves transitioning from a pasture-based ranch system into a beef stocker system can experience multiple stressors that increase the likelihood of bovine respiratory disease (BRD). BRD is the most common and economically detrimental disease of beef cattle during the post-weaning phase. BRD causes an estimated \$800 million to \$900 million annually in economic losses to the U.S. beef industry from death, reduced feed efficiency, and treatment costs.

What has been done

A strong emphasis of this research program is the improvement of the health and performance of Mississippi stocker cattle. This includes an emphasis on receiving programs that reduce the incidence of BRD while improving calf gains and profitability. The research program seeks to improve animal health and performance through applying management practices such as vaccinations programs, nutritional programs, and management systems.

Results

Impacts of improved nutrient utilization and management systems can reduce the incidence of BRD in Mississippi stocker producers and add more value to these calves for producers. If the incidence of BRD could be reduced by half in the 400,000+ head of stocker cattle in the state, this could result in increased returns over \$5 million.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals

302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
304	Animal Genome
305	Animal Physiological Processes
306	Environmental Stress in Animals
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)

Outcome #2

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	1260

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Many new producers enter beef cattle production needing general knowledge of major beef production and marketing topics tailored specifically for Mississippi production environments. Many experienced producers also need continuing education with updated information to be competitive and profitable. Complicating matters for information seekers is that much of the information available online is not relevant to Mississippi operations. There is a need for a comprehensive, publicly available, localized curriculum addressing these concerns.

What has been done

The Mississippi (MS) Master Cattle Producer Program, updated in 2013, focuses on improving overall management and decision-making skills and developing a broad beef cattle production knowledge base. This comprehensive training in major beef cattle production topic areas consists of current recommendations tailored to MS-based operations. An Internet-based self-study version of the MS Master Cattle Producer Program is available for online completion by producers interested in learning more about improving production on beef cattle operations.

Results

For every 500 participants trained through the MS Master Cattle Producer Program, there is potential to increase total beef cattle production annual net returns by over \$4.1 million. For every \$1 million increase in value of cattle production, the expected impact on the MS economy exceeds \$1.9 million including support for employment and the tax base. This equates to an annual economic impact to date of greater than \$8.6 million as a result of this program. In addition to MS beef cattle producers, Mississippians from other segments of the beef cattle industry, such as feed retailers, as well as out-of-state beef cattle producers participate in the program. Program participation continues to grow.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
305	Animal Physiological Processes
306	Environmental Stress in Animals
307	Animal Management Systems

Outcome #3

1. Outcome Measures

Number of producers optimizing 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	1260

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Cattfish culture is an important agricultural commodity and an essential component of the AL, AR, and MS economies. The regional economic impact exceeds \$4 billion, and the industry employs more than 10,000 citizens in the deep-south. With increasing feed costs the profitability of catfish farming has shrunk, leading to the closure of half the total U.S. farm acreage. Since feed is the largest variable cost to production, developing low cost feeds with alternative feed ingredients has

tremendous potential to increase profitability of fish farming.

What has been done

Research was conducted to develop catfish feeds with less expensive alternative feed ingredients. Primary feed constituents evaluated were the use of alternative protein sources, lower protein levels, and defining optimal levels of vitamin and mineral premixes in feed formulations. Research showed diets could be formulated with partial replacement of traditional feed ingredients, such as fish meal, soybean meal, and corn and reduced vitamin and mineral premixes and protein levels without significant reductions in growth and processing yield.

Results

Collectively, work from this project has resulted in tremendous savings to the catfish producer and ultimately the U.S. consumer. Based on current commodity prices and an estimated 400,000 tons of feed sold in 2013, potential savings by using cost-effective feeds with traditional and alternative feed ingredients are estimated to be about \$50 per ton of feed, or \$20 million annually, to the catfish producer. This information is currently utilized by feed mills to formulate low-cost, quality diets and is a tremendous economic benefit to the catfish producer.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
305	Animal Physiological Processes
306	Environmental Stress in Animals
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)

Outcome #4

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
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2013

946

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Forage utilization has remained unchanged for long period of times in Mississippi leading to losses in forage quality and declining stocking rates. Over 90% of the livestock producers use rotational grazing due to economic constrains and how their farm is set up for grazing management.

What has been done

This program serves as a pilot program to look at ways to extend the grazing season and reduce supplementation; it identifies 2-3 farms in each of the districts in collaboration with Extension area agents that participate in the program for a minimum of 2 years. Part of the farm follows grazing and nutrient management guidelines established by the MSU Forage program to compare current management practices to improved alternatives. Our goal is to add more producers each year and use the farms as on-farm research and classroom instruction for other producers.

Results

Producers that participated in the first year of the program have become more aware of the advantages of rotational grazing. They have developed skills to determine grazing capacity, rotation patterns, and use of soil survey to determine species suitability and how to manage nutrient applications. Producers participating in the program have been able to increase stocking rates from 0.5 to 0.8 animal units per acre and extend the grazing season by an average of 47 days. Nutrient applications have decreased by 60% when using recommendations, forage utilization has increased from 35% to 57%, and forage quality has increased by 4%. The application of this program has reduced forage production cost by 20% saving producers an average of \$250.00 per acre. A full implementation in the state will save approximately \$250 million annually.

4. Associated Knowledge Areas

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

Outcome #5

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
2013	1261

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Due to continual increases in world-wide demands for foods and biofuels, high animal feed cost has become a major problem that dramatically restrains the profit of swine production in Mississippi, the nation, and the world. As animal scientists conducting research at MSU, we have a responsibility to help swine producers maintain and enhance the sustainability of swine production. From a nutritional standpoint, one approach to maintain or enhance sustainable swine production is to improve the feed economic efficiency for swine industry.

What has been done

A long-term research goal of our research team is to develop novel nutritional strategies to raise pigs and to improve feed efficiency and muscle growth rate of pigs via molecular understanding and intervention. Therefore, we have been studying how dietary lysine, the first limiting essential amino acid in common, typical swine diets, on the expression of genes that are related to muscle protein biosynthesis and degradation in growing pigs, with an aim to elucidate the underlying molecular mechanisms in terms of gene regulatory network affected by lysine.

Results

The knowledge gained from this research program will shed light onto the current "black/gray box," - how amino acid lysine regulate swine muscle protein biosynthesis and the body mass increase at cellular and molecular levels. This increased understanding can further provide a foundation for exploring the molecular mechanisms by which other amino acids, individually or in concert, regulate muscle protein biosynthesis. Holistic understanding of the molecular mechanisms by which amino acids regulate muscle protein accretion and tissue growth will eventually lead to the development of innovative nutritional strategies to improve the economic efficiency of swine production. This understanding can also give insight to human nutritionists and physicians to develop innovated therapy.

4. Associated Knowledge Areas

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

402 Engineering Systems and Equipment

Outcome #6

1. Outcome Measures

Number of producers improving overall animal health and/or protection.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	945

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In 2003 over 300 million kg of farm raised catfish, valued at approximately \$400 million, were produced in the SE U.S. Despite successful growth and prosperity over the past few decades, the U.S. catfish industry is threatened by increasing disease losses, considered the largest impediment to increasing production efficiencies. The most prevalent disease affecting catfish is enteric septicemia of catfish (ESC), caused by a gram negative bacterium. This disease is estimated to reduce production by 25-30% at cost of \$30-40 million annually.

What has been done

In efforts to develop more effective management strategies for controlling ESC, we developed and tested a live attenuated vaccine and a mechanism for oral delivery. The vaccine is mixed with feed at the point of delivery to ensure optimal viability of vaccine cells. The new oral delivery method has been shown safe and effective in laboratory tests and commercial-scale field trials. Protocols for vaccine production and processing have been developed and validated in field trials. Commercial field trials will be conducted during the USDA/APHIS licensing process.

Results

This oral vaccination platform will virtually eliminate ESC-related losses in the catfish industry and dramatically reduce the use of medicated feeds in catfish culture. In repeated pond trials, vaccination resulted in two-fold improvements in survival and feed conversion ratios and three-fold increases in projected net sales. The implementation of this technology will greatly reduce disease-related costs and substantially increase the net profitability of catfish farming to help insure the economic viability of the U.S. catfish industry.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
306	Environmental Stress in Animals
307	Animal Management Systems
311	Animal Diseases
312	External Parasites and Pests of Animals
313	Internal Parasites in Animals
315	Animal Welfare/Well-Being and Protection

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

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 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 Animal Science Production, Animal Science Protection, Aquaculture Health, Aquaculture Production, and Poultry were combined into Global Food Security and Hunger - Animal 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