

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Livestock Production System - Global Food Security and Hunger

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%			
302	Nutrient Utilization in Animals	40%			
303	Genetic Improvement of Animals	10%			
307	Animal Management Systems	30%			
308	Improved Animal Products (Before Harvest)	10%			
	Total	100%			

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	15.0	0.0	0.0	0.0
Actual Paid Professional	20.0	0.0	0.0	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
806389	0	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
713908	0	0	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

(A) The learner-focused outcomes of this program will expand the scope of the Missouri Show-Me-Select Replacement Heifer Program. These outcomes include: 1) Regional Extension Livestock Specialists, veterinarians, farmers, and allied industry representatives will acquire knowledge and skills to aid in the successful adoption and implementation of existing management practices to improve beef heifer development; 2) Regional Extension Livestock Specialists, practicing veterinarians, producers, and future professionals will acquire new knowledge and skills to aid in the adoption of emerging biotechnologies in beef heifer development, including estrus synchronization and artificial insemination; 4) Regional Extension Livestock Specialists, practicing veterinarians and producers will be able to identify and discuss the economic implications of implementing production practices associated with the Show-Me-Select Replacement Heifer Program; and 5) Participating producers will develop a plan that establishes the Show-Me-Select Replacement Heifer Program as a producer owned and managed system.

(B) The MO-Pork program will include the following activities: Promotion of efficient production and management practices (Pork Industry Handbook, MU guide sheets and Midwest Plan Service Handbooks); National Swine Nutrition Guide (NSNG); Use of Manual 144/202 "The Missouri System of Swine Production"; On-farm data collection used to evaluate production and economic endpoints; Focused Management Schools for MO-Pork participants, artificial insemination course, Back to the Basics: Farrowing School, Sow Manager's Conference, Pigs to Plate: Adventures in Meat Quality Seminar, Health Summit, finishing short course, nursery management course, ventilation short course; Delivery of Pork Quality Assurance Program for MO-Pork participants; Delivery of new technologies in the swine industry to MO-Pork participants; Computer models/PDA record keeping programs; World Pork Expo and other conferences; Education about niche production markets and specialization opportunities; Media coverage of the MO-Pork program; Farm visits; On-farm research trials; Workshops; Meetings; and Consultation.

2. Brief description of the target audience

(A) The audiences targeted in this program are farmers across Missouri actively involved in cow-calf production and marketing. There are no limitations placed on the program in terms of farm or size of herd. The program to date has involved herds as small as 8 cows and as large as 6,000 cows. Numerous sectors of the Missouri livestock industry come together as a result of this program, including University Extension, the Division of Animal Sciences, the University of Missouri College of Veterinary Medicine, the Commercial Agriculture Program, the Missouri Beef Cattle Improvement Association, the Missouri Cattlemen's Association, the Missouri Department of Agriculture, and the Missouri Livestock Marketing Association.

(B) The target audience will include people who own swine operations, work on swine farms, or provide technical support to people who own or work on swine farms (e.g., veterinarians, feed dealers). In addition, MO-Pork will target beginning Missouri pork producers, expanding Missouri pork producers, and industry personnel such as Missouri grain producers (interested in adding value to their crops).

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	2340	3500	16128	85

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	12	0	1

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Provide in-service training session(s) for regional Extension specialists on an annual basis.

Year	Actual
2012	23

Output #2

Output Measure

- Regional and state specialists will conduct demonstrations on an annual basis.

Year	Actual
2012	23

Output #3

Output Measure

- Regional specialists will assist with producer sales.

Year	Actual
2012	15

Output #4

Output Measure

- Develop or revise guide sheets on an annual basis for regional Extension specialists to use in producer meetings.

Year	Actual
2012	8

Output #5

Output Measure

- Develop or revise manual(s) on an annual basis for regional Extension specialists to use in producer meetings.

Year	Actual
2012	6

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Participants will maintain or increase livestock production efficiencies and enhance marketing opportunities resulting in improved economic viability and profitability for their operation.
2	Participants will acquire knowledge and skills to aid in the successful adoption and implementation of existing management practices or emerging technology to improve livestock production efficiency and productivity.
3	Annual economic impact to the state's economy from improvements on livestock production.

Outcome #1

1. Outcome Measures

Participants will maintain or increase livestock production efficiencies and enhance marketing opportunities resulting in improved economic viability and profitability for their operation.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	540

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The audiences targeted in this program include Regional Extension Livestock Specialists, veterinarians, and farmers across Missouri that are actively involved in cow-calf production and marketing. Technology transfer with respect to management practices involved in the program is not size dependent but rather farmer dependent in terms of introducing a fundamental change in approach to management and marketing that impacts a farm's individual profitability profile.

Issues addressed related to the MO-Pork programs:

The main issue for Missouri agriculture is the freedom to farm as well as maintain a competitive infrastructure. Agriculture is Missouri's number one driver of the state's economy. As the agriculture industry embraces change and accommodates what consumer's desire then all facets of the Missouri economy will benefit.

Missouri has a long history of diverse agricultural business that drives the state's economy with more than 12,600 jobs directly associated with swine production. The swine industry represents over \$791 million dollars and 12% of all commodities produced in Missouri. This is important to the Missouri economy because as producers purchase inputs for their operation from sales the local economy of jobs and services benefit.

The audiences targeted in the MO- Pork and Show-Me-Select programs include Regional Extension Livestock Specialists, veterinarians, and farmers across Missouri that are actively involved in cow-calf production and marketing. Technology transfer with respect to the management practices involved in the program is not size dependent but rather farmer dependent in terms of introducing a fundamental change in approach to management and marketing that impacts a farm's individual profitability profile.

What has been done

The Missouri Show-Me-Select Replacement Heifer Program was designed to improve reproductive efficiency of beef herds in Missouri and increase individual farm income. The program objectives include: 1) a total quality management approach for health and management of heifers from weaning to late gestation; 2) increased marketing opportunities for, and added value to, Missouri raised heifers; and 3) the creation of reliable sources of quality commercial and purebred replacement females.

What was done by the MO-Pork programs to address the issues:

The MO-Pork program offered workshops, demonstrations, seminars, web pages, materials and short courses that were attended by more than 800 swine producers. These included the National Swine Nutrition Guide and formulator, Nutrient Management formulators, Pork Quality Assurance Plus, Growth and Quality Barrow Classic, Pork Bridge, Sow Bridge, Swine Institute, Pork Profit Seminars, Feed Efficiency Conference and many individual consultations. In addition, on-farm demonstrations and applied research efforts have allowed producers to actually visualize the importance of adapting new technology on the operation. Some additional information on the Missouri Swine Resource Guide, National Swine Nutrition Guide and By-product Feed Price Report is located on the webpage at www.agebb.missouri.edu/swine. The webpage has more than 25,000 hits annually.

Results

The Show-Me-Select Replacement Heifer Program is the first comprehensive, state-wide, on farm beef heifer development and marketing program in the U.S. Participation in the program from 1997-2012 involved 104,918 heifers on 743 farms across Missouri, 225 veterinarians, 10 regional extension livestock coordinators, and 17 regional extension livestock specialists. The marketing component of the program over this period involved 119 sales at 10 locations. During this time, 25,276 heifers sold through Show-Me-Select Replacement Heifer Program sales with gross receipts of \$30,045,050. Total net impact on Missouri's economy from the 15 years of the Show-Me-Select Replacement Heifer Program and Sales exceed \$65M. Producers from 103 of Missouri's 114 counties (91%) have enrolled heifers in the program, and 64 counties in Missouri (56% of the total) list the Show-Me-Select Replacement Heifer Program as a priority program for their county in their current Program of Work.

Outcomes resulting from the MO-Pork programmatic efforts to address the issues:

The MO-Pork program has provided technological advantages for Missouri producers through its educational materials, development of the National Swine Nutrition Guide, Least Cost diet formulator, Manure Value Optimizer, and Nutrient analyzer has provided a huge economic advantage to pork producers who will change dietary composition of feeds based on feed ingredient and acquisition prices. Computerized feeding programs enable swine producers to personally adapt diets as well as be knowledgeable about performance parameters. Feed ingredient prices can fluctuate greatly and altering commodity grain inclusion rates using the By-product Feed Price Report and the National Swine Nutrition Guide Least Cost Diet Formulator has resulted in approximately 42% reduction of feed cost inputs for Missouri Pork Producers creating an economic impact for Missouri of almost \$132 million dollars annually.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals

- 307 Animal Management Systems
- 308 Improved Animal Products (Before Harvest)

Outcome #2

1. Outcome Measures

Participants will acquire knowledge and skills to aid in the successful adoption and implementation of existing management practices or emerging technology to improve livestock production efficiency and productivity.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	720

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Continuation of low adoption rates of best management practices in the U.S. will ultimately erode the competitive position of the U.S. cattle industry. Other countries are adopting new technologies for animal production more rapidly than the U.S. Unless owners of commercial and purebred cowherds aggressively implement reproductive and genetic improvement, the U.S. will lose its competitive advantage in production of high quality beef.

Issues addressed related to the MO-Pork programs:

For MO Pork producers, feed ingredients have continued to have greater price volatility, thus refining and using technology strategies are extremely important for the sustainability of those producers. Technologies that have been adapted by Missouri pork producers are feed ingredient quality analysis, smart phone technologies and computerized feed formulations. This past year both input cost and market prices have been at a record high for the swine industry, therefore, Missouri's economy has not been hurt due to the fact agriculture is profiting and spending money to hire employees and make purchases associated with maintenance and repair.

What has been done

A number of management procedures have been cited to have a significant impact on beef herds and their resulting performance measured by reproduction and productivity. Only a limited percent of beef cattle operations use these management procedures. Best management practices for replacement beef heifers, when collectively viewed as a "program", can assist producers in more effectively managing reproduction, production, and marketing.

What was done by the MO-Pork programs to address the issues:

Missouri pork producers have gained hands-on training and resources on how to evaluate feed ingredients, formulate least cost rations, maximize manure value, and apply performance parameters to management strategies through attendance of conference, webinars and face-to-face consultations.

Results

The reproductive goals for heifers enrolled in the Show-Me-Select Replacement Heifer Program are aimed at improving breeding performance during the heifers' first breeding period, minimizing the incidence and severity of dystocia, and successful rebreeding of heifers during the subsequent breeding season. The Show-Me-Select Replacement Heifer Program is the first statewide, on-farm beef heifer development and marketing program in the U.S. Producers are utilizing available technologies for on-farm beef heifer development that are now spilling over into their cowherds. There has been a significant increase in interest and use of estrus synchronization and AI stemming perhaps from differential in sale prices, but more importantly from successful application. In general, there has been a growing awareness, understanding and appreciation for the importance of reproductive management to the whole herd.

Outcomes resulting from the MO-Pork programmatic efforts to address the issues:

On farm management strategies have been evaluated by the MO-pork program on how producers can decrease energy usage by more than 20% resulting in a fuel saving of more than \$0.60 per pig. Swine operations who have adapted this technology have saved over \$180 million for Missouri swine producers. In addition, feed management evaluations conducted on Missouri farms has allowed producers to adopt new feeder designs with alternative feed ingredients resulting in an improvement in feed efficiency saving more than \$2 million in feed inputs.

4. Associated Knowledge Areas

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

Outcome #3

1. Outcome Measures

Annual economic impact to the state's economy from improvements on livestock production.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	1760

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Veterinarians provide expertise in herd health, assessment of reproductive potential, and pregnancy diagnosis. Veterinarians serve as key information sources for U.S. beef producers and are essential in facilitating the adoption of various reproductive procedures. Nearly two-thirds (60.8%) of cow-calf producers cited their veterinarian as a "very important" source of information for their cow-calf operation including health, nutrition, or questions pertaining to production or management.

Issues addressed related to the MO-Pork:

The combined effects (direct, indirect and induced) of the swine industry in the state are estimated at \$1.1 billion. The bulk of the economic activity is associated with the direct effect of the production itself (\$800 million) which is included in the aggregated category of Agriculture. The remainder of the economic impacts attributed to the Agriculture sector is indirect and induced effects that include input purchases by swine farmers but also spending of wages and profits on agriculturally related goods. As expected, most of the economic activity is concentrated in the Agriculture sector. Similarly, the associated jobs (> 30,000) are concentrated in the agriculture sector. Approximately 65% of these jobs are estimated to be directly related to swine production with the remainder associated with other facets of agriculture. Again, in terms of jobs, the wholesale/retail trade, finance/insurance/real estate and service sectors benefit most from the presence of the swine industry.

What has been done

Implementation of the Show-Me-Select Replacement Heifer Program in Missouri involved University specialists working closely with producers, regional extension specialists, and veterinarians. On-farm development programs that involve local veterinarians, state, regional extension livestock specialists, and individual farm operators provide the structure through which change can occur.

What was done by the MO-Pork to address the issues:

Swine producer contacts, mailings, surveys and follow up evaluations from demonstrations, conferences, webinars, emails, phone calls and farm visits have allowed direct feedback related to economic impacts of changes made at the farm level.

Results

Veterinarians provide expertise in the areas of health, assessment of reproductive potential, pregnancy diagnosis, and fetal aging. Veterinarians serve as key information sources for U.S. beef producers and are essential in facilitating the adoption of various reproductive procedures. Nearly two-thirds (60.8%) of cow-calf producers cited their veterinarian as a "very important" source of information for their cow-calf operation including health, nutrition, or questions

pertaining to production or management. The success of this program over the past years was largely a function of being able to reach the target audience and the associated impact of that connection. Implementation involved University specialists working closely with producers, regional extension specialists, and veterinarians. On-farm development programs that involve local veterinarians, state and regional extension specialists, and individual farm operators provide the structure through which change can occur.

Outcomes resulting from the MO-Pork Programmatic efforts to address the issues:
The Missouri swine industry has been able to stay profitable when many other industries have not. This has occurred because producers have been willing to make changes, be aggressive in continuing education and willingness to observe/try new technology. With more than 3.1 million hogs in Missouri, any ability for producers to improve profitability will increase the GDP of the state economy which already contributes more than \$314 million to the state of Missouri.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
303	Genetic Improvement of Animals
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Programmatic Challenges
- Other (Marketing Fluctuations)

Brief Explanation

The audiences targeted in this program include Regional Extension Livestock Specialists, veterinarians, and farmers across Missouri that are actively involved in cow-calf production and marketing. There are no limitations placed on the program in terms of farm or size of cowherd. The pilot programs involved herds as small as 8 cows and as large as 8,000 cows. Technology transfer with respect to the management practices involved is not size dependent but rather producer dependent in terms of introducing a fundamental change in approach to management and marketing that impacts the profitability profile of a particular farm or ranch. The success of this program over the past 15 years relied largely in reaching this target audience and the associated impact of that connection. Numerous sectors of the Missouri livestock industry came together as a result of this program, including University of Missouri Extension, the College of Agriculture Food and Natural Resources, the College of Veterinary Medicine, the Division of Animal Sciences, the Commercial Agriculture Program, the Missouri Beef Cattle Improvement Association, the Missouri Cattlemen's Association, the Missouri Department of Agriculture, and the Missouri

Livestock Marketing Association. Since 1997, when the program was initiated, 743 farms in Missouri have enrolled 104,918 heifers in the Show-Me-Select Replacement Heifer Program. The program has been led by 10 Regional Extension Livestock Specialists that serve as Coordinators of the Program in their respective regions, and 17 additional Specialists across the state that support efforts in these regions. In addition, 225 veterinarians in Missouri have participated in the Program since its inception. The Show-Me-Select Replacement Heifer Program draws on the fundamental basis upon which Extension and the Land Grant System was founded: The use and application of what we know to create knowledge. Hence, evaluation has an impact in the program itself. Meaningful assessment of this program began with building in evaluation as part of the design. Data collection was part of the delivery process and reinforced the development of sound management practices through on-farm, individualized result demonstrations conducted on farms that participated in the Program. Farmers used data generated on their own farms with the focus of the program centered on action alternatives based on data generated, methods flowed from issues. The end result was that a negotiated participatory process evolved among the Regional Extension Livestock Specialist, the veterinarian, and the farmer with support from State specialists. The existing database from the Show-Me-Select Replacement Heifer Program serves as a conduit in the development of new educational programming areas.

Pork is the most widely consumed meat in the world and the U.S. is the third largest producer after China and the European Union. Historically, Missouri has produced about five to seven percent of hogs and pigs in the U.S. In recent decades this percentage has been declining as production in Missouri declined and production expanded dramatically in certain regions of the country, but Missouri's share of hog production seems to have stabilized to around five percent. As production systems evolved, many producers have exited the industry while others have expanded. In the process, the areas of the state with the highest levels of production have changed, but the overall importance of the industry has been maintained.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The Missouri Show-Me-Select Replacement Heifer Program was designed to improve reproductive efficiency of beef herds in Missouri and increase individual farm income. The program objectives include: 1) a total quality management approach for health and management of heifers from weaning to late gestation; 2) increased marketing opportunities for and added value from Missouri raised heifers; and 3) the creation of reliable sources of quality commercial and purebred replacement females. The program was initiated as a pilot project in two regions of Missouri in 1997 with 33 farms and 1,873 heifers. During the past 15 years, 743 farms enrolled 104,918 heifers in the program. Regional extension livestock specialists serve as coordinators of the program locally and work closely with the 225 veterinarians involved with the program state wide. State specialists provide program support to regional extension field staff and participating veterinarians. The reproductive goals for heifers enrolled in the program are aimed at improving breeding performance during the heifers' first breeding period, minimizing the incidence and severity of dystocia, with the resulting delivery of healthy vigorous calves, and successful rebreeding of heifers during the subsequent breeding season. The marketing component of the program facilitated the sale of 25,276 heifers in 119 sales across Missouri from 1997 through the fall sales in 2012. These sales generated interest from 8,590 prospective buyers that formally registered to buy heifers, and 2,911

individuals that purchased heifers from the various sales. Heifers from the program have now sold to farms in AR, AZ, FL, GA, IA, IL, IN, KY, KS, LA, MO, NE, OK, SC, SD, TN and TX. Collectively, 119 sales have generated \$30,045,050 in gross sales. Economic impact in Missouri over the past 15 years resulting from the Show-Me-Select Replacement Heifer Program exceeds \$65M. The Missouri Show-Me-Select Replacement Heifer Program is the first statewide on-farm development and marketing program of its kind in the U.S.

Key Items of Evaluation

The Missouri Show-Me-Select Replacement Heifer Program was designed to improve reproductive efficiency of beef herds in Missouri and increase individual farm income. During the past 15 years, 743 farms enrolled 104,918 heifers in the program. Regional extension livestock specialists serve as coordinators of the program locally and work closely with the 225 veterinarians involved with the program state wide. State specialists provide program support to regional extension field staff and participating veterinarians. The reproductive goals for heifers enrolled in the program are aimed at improving breeding performance during the heifers' first breeding period, minimizing the incidence and severity of dystocia, with the resulting delivery of healthy vigorous calves, and successful rebreeding of heifers during the subsequent breeding season. The marketing component of the program facilitated the sale of 25,276 heifers in 119 sales across MO from 1997 through the fall sales in 2012. These sales generated interest from 8,590 prospective buyers that formally registered to buy heifers, and over 2,911 individuals that purchased heifers from the various sales. Heifers from the program have now sold to farms in 18 states. Collectively, 119 sales have generated \$30,045,050 in gross sales. Producers from 91% of Missouri's 114 counties have participated in the Show-Me-Select Replacement Heifer Program, and buyers from 98% of Missouri's counties have registered to purchase heifers from the program. The program fosters the adoption of reproductive technologies focused on expanded use of artificial insemination (AI), use of high accuracy AI sires, and provides the infrastructure for effective implementation of new reproductive technologies and economic feedback regarding their use. By-products of adoption of reproductive technologies in beef cattle include enhanced genetic merit of heifers and steers, and improvements in whole herd reproductive management. The Missouri Show-Me-Select Replacement Heifer Program recently created a Tier Two classification that distinguishes heifers from high accuracy sires. Using data from the past five sales seasons (Fall 2010 through Fall 2012), in which Tier Two heifers sold, we may begin to consider opportunities for producers to add value to their heifers as a result of improvements in genetic merit. For purposes of example, if we use the average sales price of Show-Me-Select qualified heifers carrying a natural-service sired pregnancy as a baseline sale average for heifers we can then make the following comparisons to determine the relative added value that resulted from improvements in genetics of the heifer and/or the pregnancy she was carrying: 1) Show-Me-Select heifers carrying natural-service sired pregnancies sold for an average sale price per heifer of \$1,549; 2) Show-Me-Select heifers carrying AI-sired pregnancies sold for an average sale price per heifer of \$1695, adding \$146 per heifer; 3) Tier Two Show-Me-Select heifers carrying natural-service sired pregnancies sold for an average sale price per heifer of \$1786, adding \$237 per heifer; and 4) Tier Two Show-Me-Select heifers carrying AI-sired pregnancies sold for an average sale price per heifer of \$1906, adding \$357 per heifer. The Missouri Show-Me-Select Replacement Heifer Program is the first statewide on-farm development and marketing program of its kind in the U.S. Economic impact stemming from the program on an annual basis is estimated at \$3.5M to \$5M. Impact on Missouri's economy from the first 15 years of the Show-Me-Select program exceeds \$65M.