

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

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
111	Conservation and Efficient Use of Water			4%	
201	Plant Genome, Genetics, and Genetic Mechanisms			8%	
202	Plant Genetic Resources			4%	
205	Plant Management Systems			6%	
206	Basic Plant Biology			10%	
211	Insects, Mites, and Other Arthropods Affecting Plants			3%	
212	Pathogens and Nematodes Affecting Plants			8%	
216	Integrated Pest Management Systems			3%	
301	Reproductive Performance of Animals			11%	
302	Nutrient Utilization in Animals			6%	
303	Genetic Improvement of Animals			4%	
304	Animal Genome			7%	
305	Animal Physiological Processes			4%	
306	Environmental Stress in Animals			3%	
311	Animal Diseases			6%	
402	Engineering Systems and Equipment			3%	
404	Instrumentation and Control Systems			2%	
405	Drainage and Irrigation Systems and Facilities			3%	
601	Economics of Agricultural Production and Farm Management			5%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Extension	Research

Year: 2012	1862	1890	1862	1890
	0.0	0.0	47.0	0.0
Plan	0.0	0.0	44.0	0.0
Actual Paid Professional	0.0	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
0	0	4564070	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	4564070	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	107892	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Basic and translational research will be conducted and the results disseminated via scientific publications, scientific meetings, web publications, workshops, conferences, etc.

2. Brief description of the target audience

Researchers, scientists, extension specialists, field operation managers, agricultural producers

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	0	0	0	0

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

Patent Applications Submitted

Year: 2012
 Actual: 16

Patents listed

J.T. English, F.J. Schmidt, Z.D. Fang, J.E. Schoelz. 2010. Combinatorially selected peptides for protection of soybean against *Phakopsora pachyrhizi*. Patent Appl #61/330,173. United States Patent No. 7,927,828; issued on April 19, 2011; "Immunoassay for Venom Detection Including Noninvasive Sample Collection"
 Inventors: William V. Stoecker, Rolla, MO; Hernan F. Gomez, Whitmore Lake, MI; Jonathan A. Green, Columbia, MO;
 # 7 906 702 Categorically Ranking Animals for Feed Efficiency
 Welsh, M.J., C. Rogers, R.S. Prather, J. Engelhardt, Z. Yan. "Method of identifying compounds using a transgenic pig model of cystic fibrosis", Provisional patent filed March 30, 2007, U.S. #7,989,657 (issued Aug. 2, 2011).
 United States Patent No. 8,067,669, English, J, Schmidt, F.J., Stacey, G. and Fang, Z, Method for inducing resistance to fungal infection in transgenic plants using plant defense peptides. Nov. 29, 2011
 United States Patent No. 8,097,771 B2, Wan, J, Stacey, G, Stacey, M, and Zhang, X. LysM receptor-like kinases to improve plant defense response against fungal pathogens. Jan 17, 2012
 Shannon, G., H. Nguyen, A. Wrather, M. Woolard, S. Smothers. 2010. UM Disclosure No 12UMC013, "S08-8440RR soybean".
 Shannon, G., H. Nguyen, A. Wrather, M. Woolard, S. Smothers. 2010. UM Disclosure No 12UMC014, "S08-8467RR soybean".
 Shannon, G., H. Nguyen, A. Wrather, M. Woolard, S. Smothers. 2010. UM Disclosure No 12UMC015, "S08-9936RR soybean".
 Shannon, G., H. Nguyen, A. Wrather, M. Woolard, S. Smothers. 2010. UM Disclosure No 12UMC016, "S08-9942RR soybean".
 Shannon, G., H. Nguyen, A. Wrather, M. Woolard, S. Smothers. 2010. UM Disclosure No 12UMC017, "S08-9727RR soybean".
 Shannon, G., H. Nguyen, A. Wrather, M. Woolard, S. Smothers. 2010. UM Disclosure No 12UMC018, "S08-14072RR soybean".
 Shannon, G., H. Nguyen, A. Wrather, M. Woolard, S. Smothers. 2010. UM Disclosure No 12UMC019, "S08-14087RR soybean".
 Shannon, G., H. Nguyen, A. Wrather, M. Woolard, S. Smothers. 2010. UM Disclosure No 12UMC020, "S08-14117RR soybean".
 Shannon, G., H. Nguyen, A. Wrather, M. Woolard, S. Smothers. 2010. UM Disclosure No 12UMC021, "S08-17361RR soybean".
 Zhang Z and Park S. 2011. Methods for improving plant transformation. Patent disclosure
 Zhang Z, Baykal U. 2011. Novel construct designs for effective use of trans-acting small interference RNA (tasiRNA) technology. Patent disclosure

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2012	Extension	Research	Total
Actual	0	314	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of peer reviewed journal articles

Year	Actual
2012	176

Output #2

Output Measure

- Number of other peer reviewed publications (book chapters, proceedings, abstracts, etc.)

Year	Actual
2012	125

Output #3

Output Measure

- Number of invited papers and invited presentations

Year	Actual
2012	154

Output #4

Output Measure

- Number of graduate degrees awarded

Year	Actual
2012	32

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Research efforts will result in enhanced understanding of basic aspects of plant physiology and biochemistry. This knowledge will facilitate the development of better cropping management systems and improved plant varieties that have stronger disease or drought resistance, or value added traits.
2	The research efforts will result in new knowledge that will improve our understanding of animal physiology, genetics, reproduction, nutrition, growth, and animal well being. This knowledge will be translated to better animal production practices and improved animal production efficiency. In addition, students will be trained for positions in animal production, industry, government, and research/teaching.

Outcome #1

1. Outcome Measures

Research efforts will result in enhanced understanding of basic aspects of plant physiology and biochemistry. This knowledge will facilitate the development of better cropping management systems and improved plant varieties that have stronger disease or drought resistance, or value added traits.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The timing and quantity of water applied on irrigated cotton has a major impact on crop yield. Cotton yields suffer if too little, or even too much, water is applied through irrigation. Farmers can benefit from real time information on soil moisture so that the optimal amounts of irrigation can be applied at the appropriate time.

What has been done

Researchers at the University of Missouri are investigating wireless technology to develop best practices to achieve optimum regimes for irrigating cotton. Soil moisture sensors are placed at four depths in the soil profile. In addition, the soil texture and permanent wilting point (the minimal amount of soil moisture required for a plant not to wilt) are determined so that irrigation can be triggered by the percent of total available water. This smart-scheduling irrigation method is based on the actual amount of water in the soil that remains available to the plant, as opposed to estimated soil moisture based on computer programs using weather data.

Results

Using remote wireless sensors to gauge soil moisture significantly improves the information guiding irrigation parameters. Measuring actual on site soil moisture levels, rather than general estimates based on weather data, greatly enhances control of the one of the most critical management variables in growing crops. This wireless system conserves resources, can boost yields and can save farmers money.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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111	Conservation and Efficient Use of Water
205	Plant Management Systems
404	Instrumentation and Control Systems
405	Drainage and Irrigation Systems and Facilities

Outcome #2

1. Outcome Measures

The research efforts will result in new knowledge that will improve our understanding of animal physiology, genetics, reproduction, nutrition, growth, and animal well being. This knowledge will be translated to better animal production practices and improved animal production efficiency. In addition, students will be trained for positions in animal production, industry, government, and research/teaching.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

For the past 2 years, Missouri farmers have endured a significant drought that has significantly reduced forage supplies for livestock. In drought stricken regions, forage is not only in short supply, but what is available is often of poor quality. Furthermore, because pasture reserves are quickly decimated under drought conditions, producers are forced to feed stored forage or even take animals to market because of insufficient forage supplies.

What has been done

Researchers at the University of Missouri are experimenting with the optimal process for treating low quality forage with anhydrous ammonia to improve digestibility and protein content. Roughage is covered with a polyethylene sheet to create an air and ammonia tight seal. Anhydrous ammonia is injected into the stack and allowed to react with the roughage. The addition of anhydrous ammonia increases the nitrogen content of the forage thereby increasing its protein content.

Results

In persistent drought conditions, forage supplies are very limited and what is available is often of poor quality. Researchers are experimenting with treatment processes that will improve the nutritional content of hay and corn stover. Results indicate that the digestibility of low quality

forage improves by 15 percent while the protein content is doubled.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
305	Animal Physiological Processes

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Competing Public priorities

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Individual faculty were reviewed by their respective Division Directors. Faculty submitted their research goals and accomplishments. Besides evaluating individual progress, the Division Directors reviewed research progress and accomplishments in the context of the planned program. Results show continued progress in both basic and applied research.

Points of evaluation included the following:

Research focus: Was it relevant and consistent with the objectives of the planned program?

Successful scholarship: Were research results conveyed through peer reviewed publications?

Successful grantsmanship: Was the research quality high enough to successfully compete for external grant funds?

Key Items of Evaluation

- Peer reviewed publications
- Grant submission
- Presentations and communication of results
- Popular media exposure