

# 2007 University of Missouri Research Plan of Work

## Brief Summary about Plan of Work

Agricultural research assumed new dimensions in the 21st century as a result of advances in science and technology, changes in the global economy and emergence of competing priorities that include heightened concern for the natural and social environments in which agricultural activity takes place.

Advancements in science and technology offer new opportunities to improve all aspects of food and fiber production. For instance, enhanced understanding of plant function at the cellular and molecular levels have allowed researchers to engineer desirable traits in plants such as drought tolerance, novel amino acid profiles and disease resistance. With marker assisted selection, plant breeders have significantly reduced the time it takes to identify and isolate novel traits. Advances in understanding have been made possible by significant innovation in the technologies needed to measure and analyze natural processes that regulate plant and animal functions.

Changes in the character of agricultural research have also been influenced by significant changes in the global economy. In prior decades, the U.S. went unchallenged as the world low cost producer of agricultural products. In today's globally competitive environment, major competitors such as Brazil have emerged as new, low cost, production centers. Our comparative advantage in the future economy relies on investments in basic and translational research that will result in new niches for a vibrant U.S. agricultural sector.

Agricultural research investments in plant and animal agriculture had been dominated by relatively narrow efforts to increase output and enhance efficiency. Today, societal needs are more complex and reflect competing priorities. Agricultural production is now evaluated in the context of environmental stewardship and the public's desire for sustainability. Research into social, economic and environmental implications of agricultural activity, from production through consumption, will continue to expand in the foreseeable future.

These changes in agricultural research are addressed in the portfolio of planned programs for the Missouri Agricultural Experiment Station. Programs in the areas of plant biology and biochemistry, animal biology and production, food systems and biological engineering, natural resources and agricultural policy and rural development represent a wider, integrated spectrum of research efforts than the more narrowly focused quest for increased output in previous times. The Missouri AES research plan of work addresses research efforts from plant and animal biology, through production systems and regional/national policy development. The plan of work integrates efforts from basic to translational research. The companion Missouri Extension plan of work identifies stakeholders and needs which are then communicated through program integration, thereby translating back to research priorities. Integration between the proposed research and extension efforts are shown below.

Research planned program  
Goal  
Extension planned program

### Plant Biology and Biochemistry

Improve understanding of basic plant function and translate into improved plant technologies.

- Mo Crop Management Systems
- Plant Protection for the 21st Century
- Forage Production and Management
- Home Horticulture & Environment

### Animal Biology and Production

Improve whole animal function & develop innovative animal husbandry practices.

- MO-PORK: Increasing Pork Production in Missouri
- Grass Based Dairy Systems
- Show-Me-Select

**Natural Resources**

Ensure that natural resources are conserved and managed for sustainable use.

- Missouri Master Wildlifer
- Missouri Woodland Steward
- Missouri Master Naturalist

**Food Systems and Bioengineering**

Improve the utilization & delivery of agricultural outputs as high-quality food and nonfood products

- Individual Wastewater Systems
- Watershed Management & Planning

**Ag Policy and Rural Development**

Provide meaningful public and private decision support

- Profit Focused Agriculture
- Facilitating Community Decision Making
- Creating Community Economic Viability
- Community Leadership Development
- Building Inclusive Communities

**Estimated number of professional FTEs/SYs to be budgeted for this plan.**

Year	Extension		Research	
	1862	1890	1862	1890
2007	0.0	0.0	42.0	0.0
2008	0.0	0.0	42.0	0.0
2009	0.0	0.0	42.0	0.0
2010	0.0	0.0	42.0	0.0
2011	0.0	0.0	42.0	0.0

**Merit Review Process**

The merit review process that will be employed during the 5-Year Plan of Work cycle

- see below

### **Brief explanation**

We will use annual faculty reporting instruments, including individual report of accomplishments and the CSREES progress reports to evaluate the program progress.

### **Evaluation of Multis & Joint Activities**

#### **1. How will the planned programs address the critical issues of strategic importance, including those identified by the stakeholders?**

The MO AES research planned program will provide the background research and discovery needed to• supply extension programs with sound science for applied programs• add to the body of scientific knowledge through peer reviewed dissemination of results• prepare graduate students to work in areas of strategic importance• develop applied solutions for state and regional issues.

#### **2. How will the planned programs address the needs of under-served and under-represented populations of the State(s)?**

Extension programs (identified elsewhere) that seek to address the needs of under-served and under-represented populations will influence research priorities.

#### **3. How will the planned programs describe the expected outcomes and impacts?**

By the nature of research results, outcomes and impacts for the research planned programs will be described in qualitative causal affects, rather than quantitative measurements. Quantitative measures standard to research progress, such as peer reviewed publications, will be used to measure program outputs.

#### **4. How will the planned programs result in improved program effectiveness and/or efficiency?**

Improved efficiency will be gained by more explicitly integrating research and extension functions and facilitating program evaluation by arranging knowledge areas into functional groups.

### **Stakeholder Input**

#### **1. Actions taken to seek stakeholder input that encourages their participation (Check all that apply)**

- Other

#### **Brief explanation.**

Stakeholder input is addressed in the MU Extension Plan of Work.

#### **2(A). A brief statement of the process that will be used by the recipient institution to identify individuals and groups stakeholders and to collect input from them**

##### **1. Method to identify individuals and groups**

- Use Advisory Committees

#### **Brief explanation.**

The following committees meet regularly to get stakeholder input:

- Farms and Centers Advisory Committee
- Research Center Advisory Committee
- Ag commodity group advisory boards
- Vice Chancellor's Leadership Council, College of Agriculture, Food and Natural Resources

#### **2(B). A brief statement of the process that will be used by the recipient institution to identify individuals and groups stakeholders and to collect input from them**

##### **1. Methods for collecting Stakeholder Input**

- Other

**Brief explanation**

Stakeholder input is addressed in the MU Extension Plan of Work.

**3. A statement of how the input will be considered**

- Other

**Brief explanation.**

Stakeholder input is addressed in the MU Extension Plan of Work.

## 1. Name of the Planned Program

Plant Biology and Biochemistry

## 2. Program knowledge areas

- 211 Insects, Mites, and Other Arthropods Affecting Plants 4 %
- 204 Plant Product Quality and Utility (Preharvest) 5 %
- 201 Plant Genome, Genetics, and Genetic Mechanisms 14 %
- 102 Soil, Plant, Water, Nutrient Relationships 6 %
- 216 Integrated Pest Management Systems 4 %
- 213 Weeds Affecting Plants 3 %
- 205 Plant Management Systems 10 %
- 212 Pathogens and Nematodes Affecting Plants 17 %
- 206 Basic Plant Biology 26 %
- 203 Plant Biological Efficiency and Abiotic Stresses Affecting Plants 11 %

## 3. Program existence

- Mature (More than five years)

## 4. Program duration

- Long-Term (More than five years)

## 5. Brief summary about Planned Program

The Missouri AES research portfolio combines basic and applied research to further the discipline of plant biology and to provide information for delivery by extension programs. Understanding the basic functions of plant biology and biochemistry is critical to advancing agricultural science as it relates to plant production and protection. Traditional areas of crop management and breeding are now augmented by basic research that enhances our understanding of plant function at the environmental, whole plant, cellular and gene levels. Research in these areas provides new information about physiological relationships within the plant that ultimately are translated into crop management technologies. Research areas under this planned program include basic plant biology and genomics, pests and diseases affecting plants, abiotic stresses, plant production management and integrated pest management.

## 6. Situation and priorities

Plants form the basis for Missouri's agricultural and green industries, from the direct production of food for human or animal consumption to their use as factories for novel chemical compounds. Weather, pests, plant genetic background and environmental impacts are four primary aspects of production that influence agricultural production and profitability. AES scientists at MU conduct basic and applied research in these areas to improve plant production systems. Basic research leads to crop improvement by enhancing the understanding of plant genetics and function. With model system research, investigators use well understood plants, such as Arabidopsis, to increase knowledge of plant function in important processes including resistance to diseases and interactions with the environment. For instance, research in plant response to abiotic stress, such as water deficit, can help lead to crops with improved drought tolerance. Research in cellular signaling pathways is leading to an understanding of plant interactions with both beneficial and harmful microorganisms and insects. Genetic modification of plants with genes to synthesize natural products (biopesticides) or to exhibit resistance to pesticides can lead to decreased dependence on pesticides and thereby reduce negative environmental impacts (eg on water quality). Ultimately, knowledge gained through basic research gives rise to applied or translational research that improves performance in plant production systems. Missouri investigators conduct applied research to improve the economic performance of plant production systems and mitigate adverse environmental consequences associated with system inputs. Research in areas such as integrated crop management and plant breeding is transferred by means of extension programs such as the Missouri Crop Management Systems program that uses multiple delivery methods to reach a broad range of learners. The Forage Production and Management extension program is used to educate forage producers on best practices in systems such as management-intensive grazing and pasture-based dairying. While a variety of crops are grown in Missouri, the major economic drivers in Missouri crop production are soybean and forages. This economic importance is reflected in research priorities at MU. In addition, Missouri ranks 6th in rice production in the US and research efforts to improve plant production management are increasing in importance. Basic research underlying applied plant research continues to be a priority as significant

advances in the understanding of plant structure and function leads to improvements in crop production and disease resistance. Soybean production in Missouri is reduced by biotic and abiotic stresses. Soybean cyst nematode accounts for approximately 50 dollars in yield losses annually. Researchers work in the areas of plant breeding, genomics and plant-microbe interactions to improve disease and nematode resistance, nitrogen fixation and the development of value added soybeans through manipulation of protein and oil content and the amino acid profile.

**7. Assumptions made for the Program**

Interdisciplinary work -

People will continue to work together –

- 1) across disciplines, divisions and colleges
- 2) with extension personnel so that research results can translated into practical applications.

MU has a rich history and culture of collaborative work. In the plant sciences, researchers from the Division of Plant Sciences, Division of Natural Resources, Division of Biochemistry and the Division of Biological Sciences work together to advance questions related to plant biology. Researchers in crop production and protection have worked closely with the extension faculty in crop and forage programs.

**8. Ultimate goal(s) of this Program**

Basic research- improve understanding of basic plant function- improve understanding of plant interaction with the biotic and abiotic environment- manipulate plant genomics to create added value for producers  
 Translational research- improve drought tolerance in crops- increase disease and nematode resistance- develop improved pest management

**9. Scope of Program**

- In-State Research
- Integrated Research and Extension
- Multistate Integrated Research and Extension
- Multistate Research

**Inputs for the Program**

**10. Expending formula funds or state-matching funds**

- Yes

**11. Expending other then formula funds or state-matching funds**

- Yes

**12. Expending amount of professional FTE/SYs to be budgeted for this Program**

Year	Extension		Research	
	1862	1890	1862	1890
2007	0.0	0.0	15.0	0.0
2008	0.0	0.0	15.0	0.0
2009	0.0	0.0	15.0	0.0
2010	0.0	0.0	15.0	0.0
2011	0.0	0.0	15.0	0.0

**Outputs for the Program**

**13. Activity (What will be done?)**

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

**14. Type(s) of methods will be used to reach direct and indirect contacts**

Extension	
Direct Method	Indirect Methods
● {NO DATA ENTERED}	● {NO DATA ENTERED}

**15. Description of targeted audience**

{NO DATA ENTERED}

**16. Standard output measures**

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2007	0	0	0	0
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0

**17. (Standard Research Target) Number of Patents**

Expected Patents	
Year	Target
2007	0
2008	0
2009	0
2010	0
2011	0

**18. Output measures**

**Output Text**

Number of peer reviewed journal articles

2007 Target: 70  
 2008 Target: 70  
 2009 Target: 70  
 2010 Target: 70  
 2011 Target: 70

**Output Text**

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

2007 Target: 9  
2008 Target: 9  
2009 Target: 9  
2010 Target: 9  
2011 Target: 9

**Output Text**

Number of invited papers and invited presentations

2007 Target: 2  
2008 Target: 2  
2009 Target: 2  
2010 Target: 2  
2011 Target: 2

**Output Text**

Number of graduate degrees awarded

2007 Target: 7  
2008 Target: 7  
2009 Target: 7  
2010 Target: 7  
2011 Target: 7

**Outcomes for the Program**

**19. Outcome measures**

**Outcome Text: Awareness created**

**Outcome Text**

Enhanced understanding of basic aspects of plant physiology and biochemistry.

**Outcome Type:** Long

2007 Target: 0  
2008 Target: 0  
2009 Target: 0  
2010 Target: 0  
2011 Target: 0

**Outcome Text**

Development of plant varieties with improved yield, disease and insect resistance and drought tolerance.

**Outcome Type:** Long

2007 Target: 0  
2008 Target: 0  
2009 Target: 0  
2010 Target: 0  
2011 Target: 0

**Outcome Text**

Development of new plant varieties with value added traits, such as oil and protein content.

**Outcome Type:** Long

2007 Target: 0  
2008 Target: 0  
2009 Target: 0  
2010 Target: 0  
2011 Target: 0

**Outcome Text**

Translation of basic knowledge gained in model systems for the improvement of cropping systems management.

**Outcome Type:** Long

2007 Target: 0  
2008 Target: 0  
2009 Target: 0  
2010 Target: 0  
2011 Target: 0

**20. External factors which may affect outcomes**

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

**Description**

{NO DATA ENTERED}

**21. Evaluation studies planned**

- During (during program)

**Description**

We will use annual faculty reporting instruments, including individual report of accomplishments and the CSREES progress reports to evaluate the program progress.

**22. Data Collection Methods**

- {NO DATA ENTERED}

**Description**

{NO DATA ENTERED}

## 1. Name of the Planned Program

Animal Biology and Production

## 2. Program knowledge areas

- 303 Genetic Improvement of Animals 6 %
- 305 Animal Physiological Processes 9 %
- 311 Animal Diseases 12 %
- 301 Reproductive Performance of Animals 33 %
- 314 Toxic Chemicals, Poisonous Plants, Naturally Occuring Toxins, and Other Hazards Affecting Animals 2 %
- 307 Animal Management Systems 2 %
- 304 Animal Genome 12 %
- 306 Environmental Stress in Animals 8 %
- 302 Nutrient Utilization in Animals 10 %
- 308 Improved Animal Products (Before Harvest) 6 %

## 3. Program existence

- Mature (More than five years)

## 4. Program duration

- Long-Term (More than five years)

## 5. Brief summary about Planned Program

The Animal Biology and Production Research Program will encompass both basic and translational research, extending beyond the traditional areas of agriculture to include such disciplines as molecular and cellular biology, immunology, and molecular genetics. The research effort will be diverse and focus on the following objectives: 1) Elucidation of molecular, cellular, and metabolic mechanisms that impact growth, lactation, muscle biology, reproductive efficiency, and well being of livestock species; 2) Production of genetically modified rodent and livestock animals that will benefit human medicine, veterinary medicine, and animal agriculture; 3) Utilization of basic research discoveries to improve whole animal function and to develop innovative animal husbandry practices that will promote food and fiber production.; and 4) Examination of the economic impact of new production practices in commercial livestock and poultry enterprises. Each of the preceding objectives is central to the life sciences research effort in Missouri and has the potential to directly impact the economy of Missouri.

## 6. Situation and priorities

Animal agriculture is a very important resource to Missouri. The state has a high inventory (top 10 ranking among states) in the major livestock species. Sales of livestock, poultry and their products contribute \$2 billion annually to the State's income, accounting for over 50% of the total agricultural cash income. One in six jobs in Missouri involves livestock production, processing, transportation or sales. Animal products serve human needs by supplying approximately 3/4 of the protein, 1/3 of the energy and a substantial amount of essential vitamins and minerals in the American diet as well as fiber to be used in the production of clothing. The challenge of providing food and fiber for the ever expanding human population is before us. A thriving and efficient animal agriculture is essential to aid in meeting these challenges of the 21st century. The research effort will focus on both basic and translational approaches. Research in animal reproduction, forage utilization, ruminant nutrition and swine nutrition/production will be transferred to end users through the following extension programs: Show-Me Select Heifer Program, Forage Production Management, Pasture Based Dairy, and Mo-Pork (Increasing pork production in Missouri).

## 7. Assumptions made for the Program

Animal agriculture will continue to be a major industry in Missouri. The need for continued development of efficient, sustainable, and economical animal production practices will continue to be a high priority. Research opportunities for new uses of livestock species, e.g., xenotransplantation of pig organs to humans, will continue. The Animal Biology and Production Research Program will continue to be a scientifically diverse program with the ability to address research problems from the molecular to whole animal level.

## 8. Ultimate goal(s) of this Program

To continue utilizing basic research discoveries to improve whole animal function and to develop innovative animal husbandry

practices that will promote food and fiber production.

**9. Scope of Program**

- In-State Research
- Integrated Research and Extension
- Multistate Integrated Research and Extension
- Multistate Research

**Inputs for the Program**

**10. Expending formula funds or state-matching funds**

- Yes

**11. Expending other than formula funds or state-matching funds**

- Yes

**12. Expending amount of professional FTE/SYs to be budgeted for this Program**

Year	Extension		Research	
	1862	1890	1862	1890
2007	0.0	0.0	10.0	0.0
2008	0.0	0.0	10.0	0.0
2009	0.0	0.0	10.0	0.0
2010	0.0	0.0	10.0	0.0
2011	0.0	0.0	10.0	0.0

**Outputs for the Program**

**13. Activity (What will be done?)**

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

**14. Type(s) of methods will be used to reach direct and indirect contacts**

Extension	
Direct Method	Indirect Methods
● {NO DATA ENTERED}	● {NO DATA ENTERED}

**15. Description of targeted audience**

{NO DATA ENTERED}

**16. Standard output measures**

**Target for the number of persons(contacts) to be reached through direct and indirect contact methods**

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2007	0	0	0	0
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0

**17. (Standard Research Target) Number of Patents**

Expected Patents	
Year	Target
2007	1
2008	1
2009	1
2010	1
2011	1

**18. Output measures**

**Output Text**

Number of peer reviewed journal articles

2007 Target: 80  
 2008 Target: 80  
 2009 Target: 80  
 2010 Target: 80  
 2011 Target: 80

**Output Text**

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

2007 Target: 70  
 2008 Target: 70  
 2009 Target: 70  
 2010 Target: 70  
 2011 Target: 70

**Output Text**

Number of invited papers and invited presentations

2007 Target: 12  
 2008 Target: 12  
 2009 Target: 12  
 2010 Target: 12  
 2011 Target: 12

**Output Text**

Number of graduate degrees awarded

2007 Target: 15  
2008 Target: 15  
2009 Target: 15  
2010 Target: 15  
2011 Target: 15

**Outcomes for the Program**

**19. Outcome measures**

**Outcome Text: Awareness created**

**Outcome Text**

1) Pigs will be genetically modified to provide new biomedical models of human and animal diseases.

**Outcome Type:** Medium

2007 Target: 0  
2008 Target: 0  
2009 Target: 0  
2010 Target: 0  
2011 Target: 0

**Outcome Text**

2) Improved and more economical protocols for fixed-time artificial insemination of cattle will be developed.

**Outcome Type:** Medium

2007 Target: 0  
2008 Target: 0  
2009 Target: 0  
2010 Target: 0  
2011 Target: 0

**Outcome Text**

3) New information on measuring feed efficiency in cattle will be developed and recommendations on the incorporation of byproducts feeds into swine, poultry, and cattle rations will be determined.

**Outcome Type:** Medium

2007 Target: 0  
2008 Target: 0  
2009 Target: 0  
2010 Target: 0  
2011 Target: 0

**Outcome Text**

4) Management procedures will be developed for reducing negative environmental impacts in swine, poultry, and beef confinement.

**Outcome Type:** Medium

2007 Target: 0  
2008 Target: 0  
2009 Target: 0  
2010 Target: 0  
2011 Target: 0

**Outcome Text**

5) New selection tools for the genetic improvement of livestock species will be developed.

**Outcome Type:** Medium

2007 Target: 0  
2008 Target: 0  
2009 Target: 0  
2010 Target: 0  
2011 Target: 0

**20. External factors which may affect outcomes**

- Public Policy changes
- Government Regulations
- Competing Public priorities

**Description**

{NO DATA ENTERED}

**21. Evaluation studies planned**

- During (during program)

**Description**

We will use annual faculty reporting instruments, including individual report of accomplishments and the CSREES progress reports to evaluate the program progress.

**22. Data Collection Methods**

- {NO DATA ENTERED}

**Description**

{NO DATA ENTERED}

## 1. Name of the Planned Program

Natural Resources

## 2. Program knowledge areas

- 111 Conservation and Efficient Use of Water 2 %
- 605 Natural Resource and Environmental Economics 8 %
- 112 Watershed Protection and Management 14 %
- 125 Agroforestry 10 %
- 123 Management and Sustainability of Forest Resources 14 %
- 135 Aquatic and Terrestrial Wildlife 30 %
- 104 Protect Soil from Harmful Effects of Natural Elements 1 %
- 101 Appraisal of Soil Resources 7 %
- 131 Alternative Uses of Land 2 %
- 133 Pollution Prevention and Mitigation 12 %

## 3. Program existence

- Mature (More than five years)

## 4. Program duration

- Long-Term (More than five years)

## 5. Brief summary about Planned Program

The Natural Resources research program plans basic and applied research efforts within and across disciplines to understand the underlying principles related natural resources and the sustainable management of those resources. This research will address vitally important issues related to the conservation and sustainable use of natural resources. Those resources are essential to the economic, psycho-social, health needs of people. Increasing human populations put greater demands and stress on natural resources. There are widespread needs to restore, conserve, and effectively manage natural resources. To do so requires basic understanding of those natural resources.

## 6. Situation and priorities

Human populations continue to grow and place increasing demands on natural resources for economic and social betterment. To maintain a sustainable supply of natural resources for economic and social purposes, there is a need to understand the basic functioning of ecosystems and their constituent communities and species. There also is need to develop effective, efficient management strategies to ensure the health and sustainable use of those natural ecosystems and constituent parts.

## 7. Assumptions made for the Program

The conservation and sustainable use of natural resources will be a high priority for the State of Missouri and the nation. The human population will continue to increase, putting increased pressure on natural resources. Problems related to natural resource use can be positively addressed by the scientific method.

## 8. Ultimate goal(s) of this Program

To protect the integrity of natural systems so as to ensure that natural resources are conserved and managed for sustainable use for the economic and social benefits of people.

## 9. Scope of Program

- In-State Research
- Integrated Research and Extension
- Multistate Integrated Research and Extension
- Multistate Research

**Inputs for the Program**

**10. Expending formula funds or state-matching funds**

- Yes

**11. Expending other than formula funds or state-matching funds**

- Yes

**12. Expending amount of professional FTE/SYs to be budgeted for this Program**

Year	Extension		Research	
	1862	1890	1862	1890
2007	0.0	0.0	12.0	0.0
2008	0.0	0.0	12.0	0.0
2009	0.0	0.0	12.0	0.0
2010	0.0	0.0	12.0	0.0
2011	0.0	0.0	12.0	0.0

**Outputs for the Program**

**13. Activity (What will be done?)**

Basic and applied research will be conducted to address elucidate underlying principles related to natural resources and to assist in the implementation of efficient, effective management actions to conserve natural resources and ensure the sustainable use of those resources. Research finds will be disseminated via appropriate scientific publications, conferences, workshops, trainings, etc.

**14. Type(s) of methods will be used to reach direct and indirect contacts**

Extension	
Direct Method	Indirect Methods
● {NO DATA ENTERED}	● {NO DATA ENTERED}

**15. Description of targeted audience**

{NO DATA ENTERED}

**16. Standard output measures**

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2007	0	0	0	0
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0

**17. (Standard Research Target) Number of Patents**

Expected Patents	
Year	Target
2007	0
2008	0
2009	0
2010	0
2011	0

**18. Output measures**

**Output Text**

Number of peer reviewed journal articles

2007 Target: 50  
 2008 Target: 50  
 2009 Target: 50  
 2010 Target: 50  
 2011 Target: 50

**Output Text**

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

2007 Target: 30  
 2008 Target: 30  
 2009 Target: 30  
 2010 Target: 30  
 2011 Target: 30

**Output Text**

Number of invited papers and invited presentations

2007 Target: 3  
 2008 Target: 3  
 2009 Target: 3  
 2010 Target: 3  
 2011 Target: 3

**Output Text**

Number of graduate degrees awarded

2007 Target: 15  
2008 Target: 15  
2009 Target: 15  
2010 Target: 15  
2011 Target: 15

**Outcomes for the Program**

**19. Outcome measures**

**Outcome Text: Awareness created**

**Outcome Text**

Enhanced understanding of the basic functioning of ecosystems and their constituent communities and species.

**Outcome Type:** Long

2007 Target: 0  
2008 Target: 0  
2009 Target: 0  
2010 Target: 0  
2011 Target: 0

**Outcome Text**

Development of new, more efficient strategies to manage renewable natural resources.

**Outcome Type:** Long

2007 Target: 0  
2008 Target: 0  
2009 Target: 0  
2010 Target: 0  
2011 Target: 0

**Outcome Text**

Develop new economic opportunities related to the sustainable use of natural resources.

**Outcome Type:** Long

2007 Target: 0  
2008 Target: 0  
2009 Target: 0  
2010 Target: 0  
2011 Target: 0

**Outcome Text**

Develop new techniques for study of ecosystems and constituent communities and species.

**Outcome Type:** Long

2007 Target: 0  
2008 Target: 0  
2009 Target: 0  
2010 Target: 0  
2011 Target: 0

**Outcome Text**

Enhanced understanding of people's attitudes toward, perceptions of, and use of natural resources.

**Outcome Type:** Long

2007 Target: 0  
2008 Target: 0  
2009 Target: 0  
2010 Target: 0  
2011 Target: 0

**Outcome Text**

Develop direct solutions to problems related to the human-natural resource interactions.

**Outcome Type:** Long

2007 Target: 0  
2008 Target: 0  
2009 Target: 0  
2010 Target: 0  
2011 Target: 0

**20. External factors which may affect outcomes**

- Public Policy changes
- Competing Public priorities

**Description**

{NO DATA ENTERED}

**21. Evaluation studies planned**

- During (during program)

**Description**

We will use annual faculty reporting instruments, including individual report of accomplishments and the CSREES progress reports to evaluate the program progress.

**22. Data Collection Methods**

- {NO DATA ENTERED}

**Description**

{NO DATA ENTERED}

## 1. Name of the Planned Program

Food Systems and Biological Engineering

## 2. Program knowledge areas

- 712 Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occuring Toxi 13 %
- 711 Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sourc 2 %
- 502 New and Improved Food Products 11 %
- 501 New and Improved Food Processing Technologies 34 %
- 511 New and Improved Non-Food Products and Processes 6 %
- 702 Requirements and Function of Nutrients and Other Food Components 14 %
- 402 Engineering Systems and Equipment 5 %
- 404 Instrumentation and Control Systems 12 %
- 405 Drainage and Irrigation Systems and Facilities 3 %

## 3. Program existence

- Mature (More than five years)

## 4. Program duration

- Long-Term (More than five years)

## 5. Brief summary about Planned Program

The Food Systems and Bioengineering program includes multiple research areas that are a part of a broad range of activities needed to convert agricultural biomass (plants and animals) into useful products. Researchers in this program work to develop methods and processes to create food products and nonfood products (such as biomass based plastics, foams and fuels). They also develop sensing and processing technologies to ensure the quality, safety and healthfulness of the products.

## 6. Situation and priorities

Priorities fall under two main categories: helping consumers by 1) developing better, safer food and 2) increasing opportunities for Missouri agricultural producers by developing new and more efficient uses for their output. Food safety and nutrient value are a major public interest as reflected in the national goal of securing a safe and secure food and fiber system. The desire to decrease dependency on fossil fuels is a national priority and represents new opportunities to develop renewable biomass based sources of energy.

## 7. Assumptions made for the Program

Research will lead to the development of new products, more efficient processes and food products with improved safety and nutrition. Interest in developing renewable biomass based sources of energy will continue or increase.

## 8. Ultimate goal(s) of this Program

Improve the utilization and delivery of agricultural outputs as high-quality food and nonfood products to consumers in a safe, efficient and environmentally friendly manner.

## 9. Scope of Program

- In-State Research
- Integrated Research and Extension
- Multistate Integrated Research and Extension
- Multistate Research

**Inputs for the Program**

**10. Expending formula funds or state-matching funds**

- Yes

**11. Expending other than formula funds or state-matching funds**

- Yes

**12. Expending amount of professional FTE/SYs to be budgeted for this Program**

Year	Extension		Research	
	1862	1890	1862	1890
2007	0.0	0.0	2.0	0.0
2008	0.0	0.0	2.0	0.0
2009	0.0	0.0	2.0	0.0
2010	0.0	0.0	2.0	0.0
2011	0.0	0.0	2.0	0.0

**Outputs for the Program**

**13. Activity (What will be done?)**

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

**14. Type(s) of methods will be used to reach direct and indirect contacts**

Extension	
Direct Method	Indirect Methods
<ul style="list-style-type: none"> <li>● {NO DATA ENTERED}</li> </ul>	<ul style="list-style-type: none"> <li>● {NO DATA ENTERED}</li> </ul>

**15. Description of targeted audience**

{NO DATA ENTERED}

**16. Standard output measures**

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2007	0	0	0	0
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0

**17. (Standard Research Target) Number of Patents**

Expected Patents	
Year	Target
2007	0
2008	0
2009	0
2010	0
2011	0

**18. Output measures**

**Output Text**

Number of peer reviewed journal articles

2007 Target: 10  
 2008 Target: 10  
 2009 Target: 10  
 2010 Target: 10  
 2011 Target: 10

**Output Text**

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

2007 Target: 12  
 2008 Target: 12  
 2009 Target: 12  
 2010 Target: 12  
 2011 Target: 12

**Output Text**

Number of invited papers and invited presentations

2007 Target: 3  
 2008 Target: 3  
 2009 Target: 3  
 2010 Target: 3  
 2011 Target: 3

**Output Text**

Number of graduate degrees awarded

2007 Target: 4  
2008 Target: 4  
2009 Target: 4  
2010 Target: 4  
2011 Target: 4

**Outcomes for the Program**

**19. Outcome measures**

**Outcome Text: Awareness created**

**Outcome Text**

Develop new uses and products from biomass - food and nonfood (fuels, plastics, acids, etc).

**Outcome Type:** Long

2007 Target: 0  
2008 Target: 0  
2009 Target: 0  
2010 Target: 0  
2011 Target: 0

**Outcome Text**

Improve efficiency in conversion processes.

**Outcome Type:** Long

2007 Target: 0  
2008 Target: 0  
2009 Target: 0  
2010 Target: 0  
2011 Target: 0

**Outcome Text**

Food and water quality – develop sensing tools and assurance systems.

**Outcome Type:** Medium

2007 Target: 0  
2008 Target: 0  
2009 Target: 0  
2010 Target: 0  
2011 Target: 0

**Outcome Text**

Food safety and health – develop biosensing and microbiological technologies.

**Outcome Type:** Medium

2007 Target: 0

2008 Target: 0

2009 Target: 0

2010 Target: 0

2011 Target: 0

**20. External factors which may affect outcomes**

- Public Policy changes
- Government Regulations
- Competing Public priorities

**Description**

{NO DATA ENTERED}

**21. Evaluation studies planned**

- During (during program)

**Description**

We will use annual faculty reporting instruments, including individual report of accomplishments and the CSREES progress reports to evaluate the program progress.

**22. Data Collection Methods**

- {NO DATA ENTERED}

**Description**

{NO DATA ENTERED}

## 1. Name of the Planned Program

Agricultural Policy and Rural Development

## 2. Program knowledge areas

- 601 Economics of Agricultural Production and Farm Management 35 %
- 803 Sociological and Technological Change Affecting Individuals, Families and Communities 25 %
- 610 Domestic Policy Analysis 40 %

## 3. Program existence

- Mature (More than five years)

## 4. Program duration

- Long-Term (More than five years)

## 5. Brief summary about Planned Program

AES research in applied social sciences is built around the broad theme of public and private decision support. On the public side, faculty conduct research that helps public decision makers improve the process of making policy choices. Stakeholders include the US Congress, Missouri government agencies and several levels of local /regional governments. For example, investigators work directly with the US Congress to provide analysis of different public policy choices in the area of agricultural and rural policy. Their approach is not to develop policy options themselves but rather to provide the best possible analysis of the consequences of different options being proposed which should ultimately result in improved decision making. On the private side, research focuses on studying how firms/organizations operate and how decision support tools can be harnessed to provide for improved efficiency and better economic returns. In this area "firms" can range from a single farm to much larger organizations such as cooperatives and other agribusiness enterprises. One example of work being done in this area is analysis of the governance and structure of agricultural cooperatives. Cooperatives, as a business unit, have some unique organizational and governance challenges which are largely ignored in business schools.

## 6. Situation and priorities

The global economy has made competition in the food and agricultural sector a fact of life. Organizations (whether firms or farms) must be efficient and look for ways to add value to what they produce. Due to the high cost of labor and land in the United States, it will be increasingly difficult to be a "low cost" producer in the global context. Therefore, firms operating in the food sector are going to need new strategies for generating profit. In the public sector increased pressure for reduced government spending, the specter of massive budget deficits and the general push towards making more efficient use of government tax revenue all point to the need for the development of decision support systems that improve policy decision making.

## 7. Assumptions made for the Program

Public policy will continue to be a major component in the agricultural sector and the need for information will persist. Better public policy decisions can be made with better information.

## 8. Ultimate goal(s) of this Program

To provide public and private decision makers with information which will allow them to make improved decisions for the long term betterment of public policy or firm efficiency.

## 9. Scope of Program

- In-State Research
- Integrated Research and Extension
- Multistate Integrated Research and Extension
- Multistate Research

**Inputs for the Program**

**10. Expending formula funds or state-matching funds**

- Yes

**11. Expending other than formula funds or state-matching funds**

- Yes

**12. Expending amount of professional FTE/SYs to be budgeted for this Program**

Year	Extension		Research	
	1862	1890	1862	1890
2007	0.0	0.0	3.0	0.0
2008	0.0	0.0	3.0	0.0
2009	0.0	0.0	3.0	0.0
2010	0.0	0.0	3.0	0.0
2011	0.0	0.0	3.0	0.0

**Outputs for the Program**

**13. Activity (What will be done?)**

Public policy analysis will be conducted and provided to public agencies at the regional, state and national levels. Research will be conducted and the results disseminated via scientific publications, scientific meetings, workshops, conferences, etc.

**14. Type(s) of methods will be used to reach direct and indirect contacts**

Extension	
Direct Method	Indirect Methods
<ul style="list-style-type: none"> <li>● {NO DATA ENTERED}</li> </ul>	<ul style="list-style-type: none"> <li>● {NO DATA ENTERED}</li> </ul>

**15. Description of targeted audience**

{NO DATA ENTERED}

**16. Standard output measures**

**Target for the number of persons(contacts) to be reached through direct and indirect contact methods**

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2007	0	0	0	0
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0

**17. (Standard Research Target) Number of Patents**

Expected Patents	
Year	Target
2007	0
2008	0
2009	0
2010	0
2011	0

**18. Output measures**

**Output Text**

Number of peer reviewed journal articles

2007 Target: 5  
 2008 Target: 5  
 2009 Target: 5  
 2010 Target: 5  
 2011 Target: 5

**Output Text**

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

2007 Target: 4  
 2008 Target: 4  
 2009 Target: 4  
 2010 Target: 4  
 2011 Target: 4

**Output Text**

Number of invited papers and invited presentations

2007 Target: 1  
 2008 Target: 1  
 2009 Target: 1  
 2010 Target: 1  
 2011 Target: 1

**Output Text**

Number of graduate degrees awarded

2007 Target: 2  
2008 Target: 2  
2009 Target: 2  
2010 Target: 2  
2011 Target: 2

**Outcomes for the Program**

**19. Outcome measures**

**Outcome Text: Awareness created**

**Outcome Text**

Improve the understanding of potential consequences of alternative policies under consideration.

**Outcome Type:** Medium

2007 Target: 0  
2008 Target: 0  
2009 Target: 0  
2010 Target: 0  
2011 Target: 0

**Outcome Text**

Policy impacts that are more consistent with intended objectives.

**Outcome Type:** Long

2007 Target: 0  
2008 Target: 0  
2009 Target: 0  
2010 Target: 0  
2011 Target: 0

**Outcome Text**

Improved business structures or organizations.

**Outcome Type:** Short

2007 Target: 0  
2008 Target: 0  
2009 Target: 0  
2010 Target: 0  
2011 Target: 0

**20. External factors which may affect outcomes**

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

**Description**

{NO DATA ENTERED}

**21. Evaluation studies planned**

- Other

**Description**

We will use annual faculty reporting instruments, including individual report of accomplishments and the CSREES progress reports to evaluate the program progress.

**22. Data Collection Methods**

- {NO DATA ENTERED}

**Description**

{NO DATA ENTERED}