

2011 Tennessee State University Research Plan of Work

Status: Accepted

Date Accepted: 06/14/2010

I. Plan Overview

1. Brief Summary about Plan Of Work

The School of Agriculture and Consumer Sciences at Tennessee State University is grateful for the opportunity to collaborate with the United States Department of Agriculture, the National Institute of Food and Agriculture (NIFA), the State of Tennessee, various agricultural industries, and other public sector entities to improve the quality of life for citizens of our state and country by performing research in the priority areas outlined by NIFA.

This Plan of Work represents our commitment to address the needs of our society, with particular emphasis on underserved populations. It is also a manifestation of our efforts to build strong, realistic, and mutually beneficial partnerships, to remain relevant to our stakeholders, and to pursue new frontiers in agricultural research. The research objectives outlined in the plan were created in cooperation with external (private citizens and industry representatives) and internal (faculty, researchers, students, staff, Cooperative Extension personnel, and administrators at Tennessee State University) stakeholders to address the research goals emphasized by NIFA. In addition, the programs outlined in this Plan of Work reflect the coordinated efforts of our faculty to address the issues identified in our strategic planning processes while linking them to issues of importance to Tennessee small farmers, underrepresented groups, and urban and rural families.

Completion of the research outlined in this Plan of Work will make our food and environment safer, our families healthier, our energy more sustainable, provide economic opportunities for our citizens, and provide experiential training opportunities in high-demand areas for students at Tennessee State University.

As per suggestions by NIFA, the Planned Programs in this current submission stress the priority NIFA research goals and better address research themes than the programs in previous Plans of Work.

Estimated Number of Professional FTEs/SYs total in the State.

Year	Extension		Research	
	1862	1890	1862	1890
2011	0.0	0.0	0.0	61.4
2012	0.0	0.0	0.0	61.4
2013	0.0	0.0	0.0	61.4
2014	0.0	0.0	0.0	61.4
2015	0.0	0.0	0.0	61.4

II. Merit Review Process

1. The Merit Review Process that will be Employed during the 5-Year POW Cycle

- Internal University Panel
- Expert Peer Review

2. Brief Explanation

Each component of the planned programs in this Plan of Work was reviewed by internal research/extension scientist teams as well as research and extension administrators. Potential research projects were evaluated for relevance to NIFA goals, applicability to stakeholder needs, scientific soundness, and appropriateness of planned outcomes. In addition, select research plans were also reviewed by outside experts. Only those proposed projects that were approved by all parties were developed further for inclusion into planned programs. A number of strategies were developed as a result of previous strategic planning processes to guarantee that approved programs are periodically reviewed to ensure they are meeting goals and remaining relevant. Prior to the initiation of research, researchers initiate contact with appropriate stakeholders, i.e., government agencies, community groups/representatives, professional organizations, extension personnel, or industry groups, to identify and prioritize critical needs. Periodically during the program, researchers communicate with appropriate stakeholders to evaluate the degree of program/project success. An administrator within the School of Agriculture and Consumer Sciences has been appointed to meet with every researcher at scheduled intervals to monitor the progress of the planned programs. If the program is not progressing as planned, appropriate remedial steps will be initiated. We feel that these procedures will contribute significantly to ensuring the planned programs will be executed completely and with maximum benefit to stakeholders.

III. 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 research programs in the TSU School of Agriculture and Consumer Sciences have an established record of soliciting, establishing, and maintaining direct input from stakeholders concerning research content and direction.

The direct relationship we enjoy with our stakeholders and the feedback and oversight they provide to us ensures the research we perform addresses issues of strategic importance.

For example, our research programs relating to food safety and nutrition work closely with various individual stakeholders and stakeholder groups. Because of these interactions we now produce educational materials in different languages, adjust delivery method to suit the audience (e.g. less web-based delivery to seniors), perform more in-person interviews (as opposed to telephone, mail or web), and plan for repetition of demonstrations to certain audiences to ensure adoption of new behaviors.

Another example of stakeholder input affecting research is in our ornamental pest management program. A portion of our research efforts emphasize finding the most effective and most economical treatments that will allow our stakeholders to comply with the mandates of federal fire ant quarantine policies. Based on feedback received during demonstration and information sessions with our stakeholders, it became apparent that the current prescribed method to apply certain ant baits was technically sound, but ineffective in real-world situations. This feedback led to the development of alternative methods of bait distribution, methods that utilized equipment most producers already had on hand, and was more efficacious than the former method.

Clearly, not every example of our stakeholder input process can be detailed here; however, the relationship we maintain with our stakeholders has proven to be extremely valuable and will be continued.

Examples of other means our scientific programs use to identify critical issues include obtaining input through professional meetings, field days, research demonstrations, industry trade shows, consultations, and informal contacts. The involvement of extension colleagues (formally and informally) has further extended our outreach efforts to stakeholders. Input from all sources is discussed within the research groups and used to identify and assess research targets. Agricultural statistics published by the Tennessee Department of Agriculture, the National Agricultural Statistics Service, and the Tennessee Agricultural Statistics Service are also consulted to determine the economic importance of crops, pests, diseases, and other research issues.

2. How will the planned programs address the needs of under-served and under-represented populations of the

As previously described, the research goals in this Plan of Work are the culmination of a process that was used to define the scope and direction of the agriculture research programs at Tennessee State University. By virtue of our history and research/extension culture, all of our programs, regardless of area, focus on finding solutions to challenges faced by socially and economically disadvantaged groups, and contribute to the prosperity of the citizens of Tennessee and the nation.

Thus, each research goal, and subsequently each planned program, is based on a mandate to serve those members of our population that are traditionally classified as being underserved. In addition to focusing on socially

and economically disadvantaged groups, our planned research programs also target groups not usually served by mainstream agriculture, i.e., owners of small farms, producers of niche products, etc. Even though some of our programs may develop solutions to challenges faced by mainstream segments of our population, the core emphasis of the research is centered upon finding solutions that are acutely applicable to small producers, niche product producers, or persons who are economically or socially disadvantaged.

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

Outcomes and impacts for the Planned Programs are described within the program logic models for those Planned Programs. Each Planned Program includes defined outcome goals that will generate quantifiable impacts.

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

The objectives of the planned programs have been developed after a thorough planning and review process in which the assets and liabilities of the agricultural research enterprise at TSU were examined. This examination included tangible items such as equipment, staffing, laboratory space, field space and greenhouse space, as well as intangible items such as the scientific and technical expertise of the university staff, and relationships with, and priorities of, stakeholders. Each scientist formulated research goals that best fit the strengths of the individual, the priorities of stakeholders, and the goals of NIFA. This procedure produced the best possible scenario for ensuring program effectiveness, i.e. building on known strengths in a synergistic research atmosphere, while addressing issues of concern to stakeholders and funding agencies. Because the planned programs were specifically developed with the end-user (stakeholder) in mind, the overall effectiveness of the planned programs should be very high.

This process has also led to planned programs that are utilizing space, equipment and expertise already in place in at Tennessee State University; only relatively small expenditures will be needed for new equipment. No unplanned additions of personnel are needed to complete the planned programs. Each individual researcher has defined output and outcome goals, providing a benchmark on which to measure progress. This scenario assures programmatic efficiency.

IV. Stakeholder Input

1. Actions taken to seek stakeholder input that encourages their participation

- Targeted invitation to traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals

Brief explanation.

A number of different avenues are utilized by researchers in the School of Agriculture and Consumer Sciences to seek stakeholder input. Most of the faculty in the School are active participants in the trade associations related to their research (i.e. Tennessee Goat Producers Association, Tennessee Nursery and Landscapers Association, etc.), and regularly serve on association committees, attend association meetings, have research exhibits at association trade shows, and act as speakers at educational functions sponsored by the associations. This relationship permits a marked level of both formal and informal interaction with stakeholders. Another method of garnering stakeholder input is through formal meetings with distinct groups of stakeholders established specifically to provide input for a given area of research. An example of this sort of group is our Nursery Advisory Group, a group of established nursery producers from throughout the state that meets to review the nursery related research activities of the School, and whose members are regularly utilized for industry information. Our scientists also serve on public advisory boards related to their areas of research; this service enables them to develop relationships with, and receive information from, a wide range of stakeholders.

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
- Use Internal Focus Groups
- Needs Assessments
- Use Surveys
- Other (See explanation below.)

Brief explanation.

For the 'Other' category, a number of different methods were used: 1) meetings with regulatory officials; 2) discussions with other researchers performing research in the area; 3) meetings with trade group representatives; and 4) discussions with related stakeholder groups.

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

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- Survey of traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals

Brief explanation.

Most stakeholder input is collected in either face-to-face discussions or via survey instruments. Each of these methods are effective. The face-to-face discussions are often held in a group setting, this permits questions and answers to direct and stimulate discussion of areas of importance to stakeholders. However, individual discussions are also an important source of input. We have found that some persons are not comfortable speaking out in a group, but are very willing to email opinions and ideas, or to speak one-on-one with scientists. Survey instruments are a useful tool to assess information from broader groups of stakeholders. While some stakeholders prefer the anonymity and brevity of a survey instrument (resulting in increased participation), the survey instrument does not allow for discussion of previously unrecognized areas of concern.

3. A statement of how the input will be considered

- To Identify Emerging Issues
- Redirect Research Programs
- To Set Priorities

Brief explanation.

The close involvement of Tennessee State University scientists with stakeholder groups and individuals provides an almost constant feedback about the utility and practicality of the research we conduct and the solutions we pursue. We engage our stakeholders in discussion of all aspects of our research, from planning, to execution, to dissemination of results. Examples of our use of feedback are presented in Section III 1 of this report.

For example, our research programs relating to food safety and nutrition work closely with various individual stakeholders and stakeholder groups. Because of these interactions we now produce educational materials in different languages, adjust delivery method to suit the audience (e.g. less web-based delivery to seniors), perform more in-person interviews (as opposed to telephone, mail or web), and plan for repetition of demonstrations to certain audiences to ensure adoption of new behaviors.

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feedback led to the development of alternative methods of bait distribution, methods that utilized equipment most producers already had on hand, and was more efficacious than the former method.

V. Planned Program Table of Content

S. No.	PROGRAM NAME
1	Global Food Security and Hunger - improving animal production for small producers
2	Global Food Security and Hunger - enhancing sustainability of agricultural plant production
3	Sustainable Energy - new feedstocks and improved feedstock production
4	Climate Change- low-impact alternatives for ornamental crop production
5	Climate Change- improving the quality of water runoff from agricultural production
6	Food Safety- Keeping food contaminant-free

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Global Food Security and Hunger - improving animal production for small producers

2. Brief summary about Planned Program

The objective of this planned program is to improve efficiency of animal production by small and/or limited resource producers. Avenues to be explored are improvements in meat goat production systems, production systems for alternative poultry species, and improvements in forages for ruminants.

Meat goat production in the Southeast will be improved by understanding how animal genetics can be managed to enhance lifetime doe reproductive output. Genetic influences will be assessed within an environment of low to moderate management inputs under southeastern pasture conditions. In addition, updated information will be delivered to goat producers and individuals contemplating goat production about the economic viability of production and/or methods to enhance producer income. Hands-on clinics and workshops for value-added products to diversify income streams and increase production management returns will be held.

Research will be conducted to enhance the production efficiency of Guinea fowl, and to enhance the adoption and profitability of the guinea fowl as alternative poultry for small scale and limited resource farmers.

To increase ruminant livestock productivity, research will be conducted to produce better quality and more productive forages by determining the adaptability, productivity and nutritive values of alternative forages (i.e pigeon pea).

3. Program existence : Intermediate (One to five years)

4. Program duration : Medium Term (One to five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : No

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
204	Plant Product Quality and Utility (Preharvest)				10%
301	Reproductive Performance of Animals				20%
302	Nutrient Utilization in Animals				15%
303	Genetic Improvement of Animals				20%
307	Animal Management Systems				15%
601	Economics of Agricultural Production and Farm Management				10%
604	Marketing and Distribution Practices				10%
	Total				100%

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Alternative livestock and forage options will enhance the sustainability of small and limited resource producers in the southeast.

From 1987 to 2007, global meat goat production increased 92% and the US meat goat inventory increased 627%. Demand for goat products is increasing in the US due to increasing ethnic diversity. Goat meat imports increased from 142 metric tons (\$0.256 mil.) to 10,166 metric tons (\$37.047 mil.) in the last 20 years.

The US goat production and marketing systems are rather haphazard. Lack of standardized processing techniques and unavailability of goat meat in local stores causes consumer difficulty in obtaining goat meat. Without relevant information, producers are disadvantaged in making informed decisions about production opportunities and marketing options. A need exists to educate the public about the health benefits and qualities associated with goat meat.

Stakeholders have recommended improved outreach activities to communicate marketing, materials/practices, and hands-on demonstrations for value added products.

Goat industry producers have problems maintaining healthy and productive does due to poor genetic-environment combinations, leading to increased production inputs, resulting in low profitability and compromised long-term sustainability. It will benefit producers to maintain herds of mature does that do not require intensive, resource-intensive management. Stayability differences between breeds for mature does and indicators of reproductive potential in young doelings within genotypes requires further investigation.

Demand for guinea fowl as alternative poultry continues to increase driven by consumers' pursuit for leaner animal protein sources. This animal is an alternative poultry crop for small scale producers who cannot compete in the traditional poultry industry. Lack of nutrient requirements to guide formulation of least-cost rations hampers this industry. Genetic resource information to aid marker-assisted selection for important traits is also lacking. Poor feed efficiency and a lack of optimum nutrient requirements results in poor performance, increased production costs, poor quality poultry and poultry products, and environmental pollution from excess nutrients in poultry manure. These constraints can be overcome by determining nutrient requirements of the guinea fowl and generating genetic resource information to aid guinea fowl breeding programs.

Warm season forages in the southern US decline in nutrient quality and quantity as the summer season progresses. Few forage legumes are adapted to the southeast US. Knowledge of the most suitable legumes for forage and use as ruminant livestock production will enhance animal performance. A number of pigeon pea cultivars exist with the potential for use in the southeast. Pigeon pea can extend the grazing season by making high quality forage available for longer periods of time; it is a grain and forage legume that is well adapted to drought periods, will grow on marginal land, a wide range of soil textures, and requires generally few inputs. In areas where fodder scarcity is prevalent, pigeon pea can contribute to improved feed resources.

2. Scope of the Program

- In-State Extension
- In-State Research

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

There is no detailed, concentrated statewide program for assisting goat producers in the state of Tennessee, yet there are hundreds of small producers in the state. Stakeholders agree that additional information concerning goat production and marketing in Tennessee is needed.

Longevity in meat goat does has not been addressed in the literature. In traditional ruminant livestock sectors, female longevity and lifetime productivity are growing in importance and have been the focus of numerous studies. There are economic costs associated with purchasing or raising replacement females as well as biological costs associated with lower productivity in young females. Management costs are not expected to decrease. Increased demand for chevron is expected to continue. Genetic fitness and longevity are of increased importance because FDA-approved pharmaceuticals for goats are few and not likely to increase, whereas environmental conditions in the Southeast create obstacles to maintaining adequate goat health without elevated management inputs. There are dramatic differences among young straightbred does for reproductive and fitness traits, including retention rates in the herd. Early work has been well received by producer stakeholders and their application of TSU-derived research findings and concepts are expected to continue. Stability of human and facility resources is anticipated throughout this project.

Optimum nutrient levels in rations of guinea fowl will improve bird performance. Environmental factors such

as temperature and humidity will be controlled successfully and not confound the studies. Experimental birds are readily available to initiate studies. Improved feeding programs for guinea fowl will minimize feeding cost and enhance success of the guinea fowl production enterprise. There will be adequate personnel to assist in collecting data. Guinea fowl producers will utilize the nutrient recommendations in formulating rations.

The School of Agriculture and Consumer Sciences has all the necessary facilities required to conduct this program to a successful completion. The School's Research and Education Center located in Nashville, TN has over 80 acres of permanent pasture including fenced plots for grazing study complete with housing, feeding/watering and handling facilities capable of accommodating over 300 animals for experimental purpose. Part of this land will be devoted to the proposed pigeon pea forage research. In addition, there is a metabolism building with metabolic crates, an animal care unit, a storage room and a cooler and a freezer. A state of the art poultry research facility is also maintained by the School, it contains all the necessary resources to successfully complete this program. The School's research analytical laboratories are fully equipped with state of the art equipment needed for nutritional analysis of feedstuffs. In addition, full-time farm crews and graduate and undergraduate student workers are available under the supervision of the principal investigators. The project will be conducted in collaboration with the School's extension faculty for effective dissemination of the results to producers.

2. Ultimate goal(s) of this Program

The overall goal of this program is to improve the sustainability and profitability of animal production for small and limited resource producers.

This goal will be accomplished by:

Promotion of meat goat consumption among traditional and non traditional consumers

Timely delivery of updated information to goat producers and individuals contemplating the economic viability of goat production. Provision of hands-on clinics and workshops for value-added products to diversify income streams and increase production management returns.

Improved marketing of goats.

Improved efficiency of commercial meat goat production by understanding how animal genetics can be managed to enhance lifetime doe reproductive output. Genetic influences will be assessed within an environment of low to moderate management inputs under Southeastern pasture conditions.

Enhancement of production efficiency, adoption, and profitability of the guinea fowl as alternative poultry for small scale and limited resource farmers.

Determine the adaptability, productivity and nutritive values of alternative forages (i.e. pigeon pea) for forage in Tennessee with the goal of increasing ruminant livestock productivity by making better quality and productive forage available.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2011	0.0	0.0	0.0	11.3
2012	0.0	0.0	0.0	11.3
2013	0.0	0.0	0.0	11.3
2014	0.0	0.0	0.0	11.3
2015	0.0	0.0	0.0	11.3

V(F). Planned Program (Activity)

1. Activity for the Program

Conduct seminars, conferences, hands-on clinics, provide proceedings and training to producers, participation in industry events and the development of industry-targeted publications based on research findings.

Conduct research on alternative forages: forage production and quality; animal performance / growth response

Conduct research on the longitudinal survival and reproductive output of meat goat does.

Conduct research on nutritional requirements for Guinea fowl.

Perform genome mapping of important production qualities in Guinea fowl.

Conduct literature review of available secondary information

Conduct focus group meetings to collect information from producers and consumers

Develop and administer surveys to selected producers and consumers

Collect and analyze several available marketing data

Identify selected meat goat consumers/ethnic groups/communities

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● Education Class ● Workshop ● Demonstrations 	<ul style="list-style-type: none"> ● Web sites

3. Description of targeted audience

- Dairy and meat goat producers
- National meat goat industry
- Institutions of meat goat research
- Ruminant livestock producers
- Students
- Public officials
- Guinea fowl and poultry industries
- Small farmers
- Scientific community
- Extension specialists

V(G). Planned Program (Outputs)

1. Standard output measures

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

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	125	11500	20	100
2012	800	12000	25	100
2013	900	12500	30	100
2014	0	0	0	0
2015	0	0	0	0

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

2011:0**2012:0****2013:0****2014:0****2015:0****3. Expected Peer Review Publications**

Year	Research Target	Extension Target	Total
2011	2	3	5
2012	5	5	10
2013	5	5	10
2014	0	0	0
2015	0	0	0

V(H). State Defined Outputs**1. Output Target**

- Producer workshops to improve animal production in small farm and limited resource populations.

2011:2**2012:5****2013:5****2014:0****2015:0**

- Dietary recommendations for improved Guinea fowl production.

2011:0**2012:1****2013:2****2014:0****2015:0**

- Techniques to improve dairy goat production.

2011:0**2012:0****2013:2****2014:0****2015:0**

V(I). State Defined Outcome

O. No.	Outcome Name
1	Percentage of direct contact meat goat producers with knowledge of altered doe selection techniques
2	Percentage of direct contact meat goat producers practicing altered doe selection techniques
3	Percentage of goat producer doe non-recorders with knowledge of the advantages of doe record keeping
4	Percentage of goat producer doe non-recorders participating in doe record keeping
5	Percentage of ruminant livestock producers with knowledge of pigeon pea as an alternative forage
6	Percentage of ruminant livestock producers adopting pigeon pea as an alternative forage
7	Percentage of guinea fowl producers with knowledge of calcium and phosphorus recommendations for optimal nutrition
8	Percentage of guinea fowl producers adopting calcium and phosphorus recommendations for optimal nutrition
9	Percentage of guinea fowl producers adopting lysine recommendations for optimal nutrition
10	Percentage of guinea fowl producers with knowledge of lysine recommendations for optimal nutrition
11	Percentage of guinea fowl producers with increased profitability of production
12	Number of producers with increased knowledge of meat goat marketing channels
13	Number of researchers with increased understanding of the constraints and prospects of the meat goat industry
14	Number of producers expanding their marketing to identified channels and markets
15	Increase in number of consumers aware of the healthy benefits of meat goat consumption
16	Number of producers aware of consumer preferences for meat goat products
17	Number of producers and researchers with a better understanding of how maternal genetics can affect meat goat carcass yield
18	Number of producers with increased income by marketing through new channels

Outcome # 1**1. Outcome Target**

Percentage of direct contact meat goat producers with knowledge of altered doe selection techniques

2. Outcome Type : Change in Knowledge Outcome Measure

2011:50	2012:50	2013:0	2014:0	2015:0
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3. Associated Knowledge Area(s)

- 301 - Reproductive Performance of Animals
- 303 - Genetic Improvement of Animals
- 307 - Animal Management Systems

4. Associated Institute Type(s)

- 1890 Research

Outcome # 2**1. Outcome Target**

Percentage of direct contact meat goat producers practicing altered doe selection techniques

2. Outcome Type : Change in Action Outcome Measure

2011:0	2012:0	2013:20	2014:0	2015:0
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3. Associated Knowledge Area(s)

- 301 - Reproductive Performance of Animals
- 303 - Genetic Improvement of Animals
- 307 - Animal Management Systems

4. Associated Institute Type(s)

- 1890 Research

Outcome # 3**1. Outcome Target**

Percentage of goat producer doe non-recorders with knowledge of the advantages of doe record keeping

2. Outcome Type : Change in Knowledge Outcome Measure

2011:50	2012:0	2013:0	2014:0	2015:0
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3. Associated Knowledge Area(s)

- 301 - Reproductive Performance of Animals
- 303 - Genetic Improvement of Animals
- 307 - Animal Management Systems

4. Associated Institute Type(s)

- 1890 Research

Outcome # 4

1. Outcome Target

Percentage of goat producer doe non-recorders participating in doe record keeping

2. Outcome Type : Change in Action Outcome Measure

2011:0 2012:20 2013:20 2014:0 2015:0

3. Associated Knowledge Area(s)

- 301 - Reproductive Performance of Animals
- 303 - Genetic Improvement of Animals
- 307 - Animal Management Systems

4. Associated Institute Type(s)

- 1890 Research

Outcome # 5

1. Outcome Target

Percentage of ruminant livestock producers with knowledge of pigeon pea as an alternative forage

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0 2012:70 2013:70 2014:0 2015:0

3. Associated Knowledge Area(s)

- 204 - Plant Product Quality and Utility (Preharvest)

4. Associated Institute Type(s)

- 1890 Research

Outcome # 6

1. Outcome Target

Percentage of ruminant livestock producers adopting pigeon pea as an alternative forage

2. Outcome Type : Change in Action Outcome Measure

2011:0 2012:0 2013:90 2014:0 2015:0

3. Associated Knowledge Area(s)

- 204 - Plant Product Quality and Utility (Preharvest)

4. Associated Institute Type(s)

- 1890 Research

Outcome # 7

1. Outcome Target

Percentage of guinea fowl producers with knowledge of calcium and phosphorus recommendations for optimal nutrition

2. Outcome Type : Change in Knowledge Outcome Measure

2011:60 2012:80 2013:80 2014:0 2015:0

3. Associated Knowledge Area(s)

- 302 - Nutrient Utilization in Animals

4. Associated Institute Type(s)

- 1890 Research

Outcome # 8

1. Outcome Target

Percentage of guinea fowl producers adopting calcium and phosphorus recommendations for optimal nutrition

2. Outcome Type : Change in Action Outcome Measure

2011:30 2012:30 2013:30 2014:0 2015:0

3. Associated Knowledge Area(s)

- 302 - Nutrient Utilization in Animals

4. Associated Institute Type(s)

- 1890 Research

Outcome # 9

1. Outcome Target

Percentage of guinea fowl producers adopting lysine recommendations for optimal nutrition

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0 2012:0 2013:40 2014:0 2015:0

3. Associated Knowledge Area(s)

- 302 - Nutrient Utilization in Animals

4. Associated Institute Type(s)

- 1890 Research

Outcome # 10

1. Outcome Target

Percentage of guinea fowl producers with knowledge of lysine recommendations for optimal nutrition

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0 2012:60 2013:80 2014:0 2015:0

3. Associated Knowledge Area(s)

- 302 - Nutrient Utilization in Animals

4. Associated Institute Type(s)

- 1890 Research

Outcome # 11

1. Outcome Target

Percentage of guinea fowl producers with increased profitability of production

2. Outcome Type : Change in Condition Outcome Measure

2011:0 2012:0 2013:10 2014:0 2015:0

3. Associated Knowledge Area(s)

- 302 - Nutrient Utilization in Animals

4. Associated Institute Type(s)

- 1890 Research

Outcome # 12

1. Outcome Target

Number of producers with increased knowledge of meat goat marketing channels

2. Outcome Type : Change in Knowledge Outcome Measure

2011:100 2012:200 2013:0 2014:0 2015:0

3. Associated Knowledge Area(s)

- 307 - Animal Management Systems
- 604 - Marketing and Distribution Practices

4. Associated Institute Type(s)

- 1890 Research

Outcome # 13

1. Outcome Target

Number of researchers with increased understanding of the constraints and prospects of the meat goat industry

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	2012:75	2013:0	2014:0	2015:0
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3. Associated Knowledge Area(s)

- 307 - Animal Management Systems
- 604 - Marketing and Distribution Practices

4. Associated Institute Type(s)

- 1890 Research

Outcome # 14

1. Outcome Target

Number of producers expanding their marketing to identified channels and markets

2. Outcome Type : Change in Action Outcome Measure

2011:0	2012:30	2013:30	2014:0	2015:0
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3. Associated Knowledge Area(s)

- 604 - Marketing and Distribution Practices

4. Associated Institute Type(s)

- 1890 Research

Outcome # 15

1. Outcome Target

Increase in number of consumers aware of the healthy benefits of meat goat consumption

2. Outcome Type : Change in Action Outcome Measure

2011:0	2012:25	2013:25	2014:0	2015:0
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3. Associated Knowledge Area(s)

- 604 - Marketing and Distribution Practices

4. Associated Institute Type(s)

- 1890 Research

Outcome # 16

1. Outcome Target

Number of producers aware of consumer preferences for meat goat products

2. Outcome Type : Change in Action Outcome Measure

2011:0 2012:400 2013:0 2014:0 2015:0

3. Associated Knowledge Area(s)

- 601 - Economics of Agricultural Production and Farm Management
- 604 - Marketing and Distribution Practices

4. Associated Institute Type(s)

- 1890 Research

Outcome # 17

1. Outcome Target

Number of producers and researchers with a better understanding of how maternal genetics can affect meat goat carcass yield

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0 2012:0 2013:500 2014:0 2015:0

3. Associated Knowledge Area(s)

- 303 - Genetic Improvement of Animals
- 307 - Animal Management Systems

4. Associated Institute Type(s)

- 1890 Research

Outcome # 18

1. Outcome Target

Number of producers with increased income by marketing through new channels

2. Outcome Type : Change in Condition Outcome Measure

2011:0 2012:0 2013:30 2014:0 2015:0

3. Associated Knowledge Area(s)

- 601 - Economics of Agricultural Production and Farm Management
- 604 - Marketing and Distribution Practices

4. Associated Institute Type(s)

- 1890 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Appropriations changes
- Government Regulations
- Competing Programmatic Challenges

Description

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

Description

2. Data Collection Methods

Description

V(A). Planned Program (Summary)**Program # 2****1. Name of the Planned Program**

Global Food Security and Hunger - enhancing sustainability of agricultural plant production

2. Brief summary about Planned Program

As input resources become more limiting, it is important to develop knowledge and techniques that will enable agricultural producers to maximize their production in a sustainable, minimal-input manner. This program addresses this issue from a variety of directions: sustainability through understanding basic fundamentals of disease infection in plants, and hence ways to prevent it; sustainability through reduced inputs in the manner of organic production, sustainability via the reduction of biotic and abiotic stresses, sustainability by developing plants genetically pre-determined to perform better, sustainability via multifunction land management; and identification and solution to problems of sustainable agricultural practices in near-urban and urban contexts.

3. Program existence : Intermediate (One to five years)

4. Program duration : Medium Term (One to five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : No

V(B). Program Knowledge Area(s)**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships				10%
111	Conservation and Efficient Use of Water				10%
125	Agroforestry				10%
131	Alternative Uses of Land				10%
134	Outdoor Recreation				10%
201	Plant Genome, Genetics, and Genetic Mechanisms				10%
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants				15%
204	Plant Product Quality and Utility (Preharvest)				5%
212	Pathogens and Nematodes Affecting Plants				10%
216	Integrated Pest Management Systems				10%
	Total				100%

V(C). Planned Program (Situation and Scope)**1. Situation and priorities**

Decreasing the inputs of traditional, organic, and urban agriculture and enhancing the productivity of land will lead to improved sustainability of agricultural production.

The increased use of chemicals in agriculture challenges the sustainability of many agricultural enterprises by increasing production costs, polluting the environment and, in many instances, lowering plant quality. One program goal is to develop systems to reduce chemical inputs, minimize pollutants, and improve nutritive value of food crops by extending shelf life of fruits, enhancing nutritive content of foods, lowering harmful minerals in foods, reducing the inputs needed to control disease, and developing crops with a greater threshold for stress.

Biotic and abiotic host stresses have important repercussions pathogen-induced infections. The pathogen-host interaction of soft rot diseases will be examined to understand enzymatic pathways of host cell degradation. An understanding of the relationship between pathogens and hosts is required for the design of effective control strategies utilizing fewer inputs.

New, low input techniques for yield improvement need to be explored to increase sustainability. Novel approaches in genetic characterization of gametes will be explored to increase desirable characteristics in model plants. Advances in genetic techniques will produce improved yields with reduced inputs.

Most urban lands today are designed in much the same manner as they were in 1910, i.e. for functional and aesthetic purposes with little regard to environmental quality and resource consumption. These landscapes consume extensive resources in construction and maintenance. Urban landscapes can be designed that function in healthy, environmentally responsive ways, while greatly reducing long-term maintenance costs. There are no widely accepted rigorous, testable, and scientifically-based criteria to evaluate relative sustainability of land design. Such a process would result in multi-functional, cost effective, environmentally responsive urban landscapes that create opportunities for sustainable urban agriculture, production of renewable biofuels, reduction of urban air and water pollution, and provision of recreational opportunities.

Small landowners face many challenges as they attempt to increase farm productivity and profits or keep forestland as forest. Minorities and limited resource farm/forest landowner communities are the hardest hit by these economic difficulties. Agroforestry, a set of land use practices that integrate production of crops, trees, animals on the same parcel of land offers opportunities to increase productivity, income and initiate best management practices on small farms and forest lands. A multifunction land management system that permits small landowners to integrate production of carbon credits and timber with biofuel crops and ecosystem services will be developed.

2. Scope of the Program

- In-State Extension
- In-State Research

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

The current trend in government and industry is towards greening of products and processes. A clear example is the current administration's efforts to create green industries and jobs. This trend has wide ripple effects. The assumption is that this movement towards increased sustainability will become increasingly prevalent in all social, economic, and environmental aspects of our day-to-day life. This project assumes:

- Reduced inputs in traditional and urban agriculture will continue to be important in agricultural production
- Reduced inputs will lead to increased sustainability
- Inputs can be reduced via research on novel methods of improving the genetic composition of crops
- Inputs can be reduced via increased understanding of pathogen-host interactions
- Sustainability will be enhanced if the crops produced have increased nutritive value and decreased possible toxicity
- There will be willing limited-resource farm/forest landowners seeking information to improve/make productive use of their land
- Alley cropping agroforestry systems for carbon storage, biofuel crops, and timber and ecosystems services will be profitable to small land owners

2. Ultimate goal(s) of this Program

Improve sustainability of agricultural production:

- Improved crop production and biofortification of plants through precision use of macro and micro nutrients through organic and conventional fertility management program by the under represented population
- Reduction of crop losses due to soft rot disease through an understanding of the host-pathogen interaction processes
- Increased crop adaptability and productivity through advances in breeding via novel genetic gamete analysis
- Develop a and test predictive model for designing more sustainable, multi-purpose urban agriculture to improve social, economic, and environmental conditions in urban communities
- Expand opportunities for productive and sustainable use of landscapes owned by limited resource landowners

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2011	0.0	0.0	0.0	8.4
2012	0.0	0.0	0.0	8.4
2013	0.0	0.0	0.0	8.4
2014	0.0	0.0	0.0	8.4
2015	0.0	0.0	0.0	8.4

V(F). Planned Program (Activity)

1. Activity for the Program

- Conduct experimental work on molecular analyses of plants and bacterial cultures
- Conduct research on current best practices in sustainable site design and sustainable construction
- Conduct experimental work on molecular analyses of cotton chromosomal substitution lines
- Conduct expert interviews with professional practitioners, academics and researchers with expertise in sustainable urban lands design using internet-based, phone and in-person interview methods as appropriate
- Conduct research experiments on nutrient uptake, translocation, accumulation and partitioning in plants using various elements using organic and mineral fertilizers
- Explore the potentials of plug transplanting and grafting technology for organic transplants
- Conduct hands-on training and workshops on visual nutrient deficiency symptoms of food crops and ornamentals
- Train and educate students and extension agents in plant mineral nutrition management
- Develop alley cropping agroforestry systems for carbon storage, biofuel crops, and timber and ecosystems services will be profitable to small land owners

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
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- Workshop
- Demonstrations

- Web sites

3. Description of targeted audience

Scientific community, extension agents,
 Plant pest management researchers and agricultural producers
 Organic and conventional growers of food crops and ornamentals
 Professional design practitioners
 Community stakeholders
 Farmers, forest landowners, environmental and conservation conscious individuals
 Undergraduate and graduate students

V(G). Planned Program (Outputs)

1. Standard output measures

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

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	65	250	0	0
2012	90	350	0	0
2013	120	500	0	0
2014	0	0	0	0
2015	0	0	0	0

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

2011:0 2012:0 2013:1 2014:0 2015:0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	5	6	11
2012	6	6	12
2013	7	6	13
2014	0	0	0
2015	0	0	0

V(H). State Defined Outputs**1. Output Target**

- Number of exotic species/cultivars introduced as alternative crops

2011:0	2012:2	2013:2	2014:0	2015:0
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- Number of workshops held addressing agricultural sustainability

2011:5	2012:7	2013:5	2014:0	2015:0
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- Number of workshops held addressing the adoption of agroforestry techniques for small and limited-resource landowners

2011:0	2012:1	2013:1	2014:0	2015:0
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- Number of demonstration sites developed for sustainable urban agriculture

2011:0	2012:0	2013:2	2014:0	2015:0
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- Number of workshops held to education stakeholders on sustainable urban agriculture design principles

2011:4	2012:8	2013:2	2014:0	2015:0
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- Number of curricula developed in sustainable urban design

2011:1	2012:1	2013:1	2014:0	2015:0
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- Lists of inducer-regulated pathogenesis genes developed

2011:1	2012:0	2013:0	2014:0	2015:0
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V(I). State Defined Outcome

O. No.	Outcome Name
1	Number of producers adopting the use of specialized fertilizer formulations to reduce environmental nutrient contamination
2	Number of producers realizing reduction in crop loss through the use of specialized fertilizer formulations to reduce environmental nutrient contamination
3	Number of producers realizing increases in crop yield and income as a result of the use of specialized fertilizer formulations
4	Number of students trained in plant biotechnology techniques related to biotic and abiotic stress
5	Number of biotic/abiotic stress management strategies developed
6	Number of farm/forest landowners with increased knowledge of multi-function land management techniques
7	Number of farm/forest landowners adopting multi-function land management techniques
8	Number of farm/forest landowners realizing increased income as a result of multi-function land management techniques
9	Number of educators (i.e. Extension agents, state forestry officials) with increased knowledge of multi-function land management techniques
10	Number of urban design professionals with increased knowledge of sustainable design principles
11	Number of protocols developed for genetic analysis of pollen
12	Number of gamete-based integrated linkage maps to facilitate market assisted selection
13	Number of students trained in genetic analysis of gametes for crop improvement
14	Number of breeders incorporating low-level pathogen inducer genes in to germplasm

Outcome # 1

1. Outcome Target

Number of producers adopting the use of specialized fertilizer formulations to reduce environmental nutrient contamination

2. Outcome Type : Change in Action Outcome Measure

2011:5 2012:20 2013:20 2014:0 2015:0

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 111 - Conservation and Efficient Use of Water

4. Associated Institute Type(s)

- 1890 Research

Outcome # 2

1. Outcome Target

Number of producers realizing reduction in crop loss through the use of specialized fertilizer formulations to reduce environmental nutrient contamination

2. Outcome Type : Change in Condition Outcome Measure

2011:5 2012:20 2013:20 2014:0 2015:0

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 111 - Conservation and Efficient Use of Water

4. Associated Institute Type(s)

- 1890 Research

Outcome # 3

1. Outcome Target

Number of producers realizing increases in crop yield and income as a result of the use of specialized fertilizer formulations

2. Outcome Type : Change in Condition Outcome Measure

2011:0 2012:20 2013:20 2014:0 2015:0

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 111 - Conservation and Efficient Use of Water

4. Associated Institute Type(s)

- 1890 Research

Outcome # 4

1. Outcome Target

Number of students trained in plant biotechnology techniques related to biotic and abiotic stress

2. Outcome Type : Change in Knowledge Outcome Measure

2011:1	2012:2	2013:2	2014:0	2015:0
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3. Associated Knowledge Area(s)

- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants
- 212 - Pathogens and Nematodes Affecting Plants

4. Associated Institute Type(s)

- 1890 Research

Outcome # 5

1. Outcome Target

Number of biotic/abiotic stress management strategies developed

2. Outcome Type : Change in Condition Outcome Measure

2011:0	2012:1	2013:1	2014:0	2015:0
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3. Associated Knowledge Area(s)

- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants
- 212 - Pathogens and Nematodes Affecting Plants

4. Associated Institute Type(s)

- 1890 Research

Outcome # 6

1. Outcome Target

Number of farm/forest landowners with increased knowledge of multi-function land management techniques

2. Outcome Type : Change in Knowledge Outcome Measure

2011:30	2012:50	2013:75	2014:0	2015:0
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3. Associated Knowledge Area(s)

- 125 - Agroforestry
- 131 - Alternative Uses of Land

4. Associated Institute Type(s)

- 1890 Research

Outcome # 7

1. Outcome Target

Number of farm/forest landowners adopting multi-function land management techniques

2. Outcome Type : Change in Action Outcome Measure

2011:0 2012:10 2013:25 2014:0 2015:0

3. Associated Knowledge Area(s)

- 125 - Agroforestry
- 131 - Alternative Uses of Land

4. Associated Institute Type(s)

- 1890 Research

Outcome # 8

1. Outcome Target

Number of farm/forest landowners realizing increased income as a result of multi-function land management techniques

2. Outcome Type : Change in Condition Outcome Measure

2011:0 2012:0 2013:5 2014:0 2015:0

3. Associated Knowledge Area(s)

- 125 - Agroforestry
- 131 - Alternative Uses of Land

4. Associated Institute Type(s)

- 1890 Research

Outcome # 9

1. Outcome Target

Number of educators (i.e. Extension agents, state forestry officials) with increased knowledge of multi-function land management techniques

2. Outcome Type : Change in Knowledge Outcome Measure

2011:10 2012:15 2013:15 2014:0 2015:0

3. Associated Knowledge Area(s)

- 125 - Agroforestry
- 131 - Alternative Uses of Land

4. Associated Institute Type(s)

- 1890 Research

Outcome # 10

1. Outcome Target

Number of urban design professionals with increased knowledge of sustainable design principles

2. Outcome Type : Change in Knowledge Outcome Measure

2011:50 2012:100 2013:100 2014:0 2015:0

3. Associated Knowledge Area(s)

- 134 - Outdoor Recreation
- 216 - Integrated Pest Management Systems

4. Associated Institute Type(s)

- 1890 Research

Outcome # 11

1. Outcome Target

Number of protocols developed for genetic analysis of pollen

2. Outcome Type : Change in Knowledge Outcome Measure

2011:1 2012:0 2013:0 2014:0 2015:0

3. Associated Knowledge Area(s)

- 201 - Plant Genome, Genetics, and Genetic Mechanisms

4. Associated Institute Type(s)

- 1890 Research

Outcome # 12

1. Outcome Target

Number of gamete-based integrated linkage maps to facilitate market assisted selection

2. Outcome Type : Change in Action Outcome Measure

2011:0 2012:1 2013:0 2014:0 2015:0

3. Associated Knowledge Area(s)

- 201 - Plant Genome, Genetics, and Genetic Mechanisms

4. Associated Institute Type(s)

- 1890 Research

Outcome # 13

1. Outcome Target

Number of students trained in genetic analysis of gametes for crop improvement

2. Outcome Type : Change in Knowledge Outcome Measure

2011:2	2012:2	2013:2	2014:0	2015:0
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3. Associated Knowledge Area(s)

- 201 - Plant Genome, Genetics, and Genetic Mechanisms

4. Associated Institute Type(s)

- 1890 Research

Outcome # 14

1. Outcome Target

Number of breeders incorporating low-level pathogen inducer genes in to germplasm

2. Outcome Type : Change in Action Outcome Measure

2011:0	2012:1	2013:1	2014:0	2015:0
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3. Associated Knowledge Area(s)

- 201 - Plant Genome, Genetics, and Genetic Mechanisms
- 212 - Pathogens and Nematodes Affecting Plants

4. Associated Institute Type(s)

- 1890 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

{NO DATA ENTERED}

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

Description

{NO DATA ENTERED}

2. Data Collection Methods

Description

{NO DATA ENTERED}

V(A). Planned Program (Summary)**Program # 3****1. Name of the Planned Program**

Sustainable Energy - new feedstocks and improved feedstock production

2. Brief summary about Planned Program

Dependence on crude oil has become risky due to volatility in price and potential for disruption in its supply. The use of agricultural crops such as corn and soybeans for bio-fuel production can result in animal feeds and human food product shortages. The biofuel boom is causing a spike in food prices worldwide. It is contributing to the current food crisis because agricultural land on which food crops used to be grown is increasingly being converted to bio-fuel crop production. This program will focus on the development and improvement of alternative, non-food crop feedstocks for biofuel production and the improvement of the efficiency of alternative energy feedstock production.

3. Program existence : Intermediate (One to five years)**4. Program duration** : Medium Term (One to five years)**5. Expending formula funds or state-matching funds** : Yes**6. Expending other than formula funds or state-matching funds** : No**V(B). Program Knowledge Area(s)****1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants				10%
213	Weeds Affecting Plants				20%
511	New and Improved Non-Food Products and Processes				60%
603	Market Economics				10%
	Total				100%

V(C). Planned Program (Situation and Scope)**1. Situation and priorities**

Bioenergy crop production is one solution to the global problems of energy security, economic uncertainty and environmental degradation. However, it can be limited by availability of suitable land that does not compete with growing food, feed and fiber. At present, corn accounts for 95% of the bioenergy produced in the US; however, it is recognized that inputs required for large scale bioenergy production from corn are not economically or environmentally sustainable. The Energy Independence and Security Act mandates the production of 21 billion gallons of renewable fuels from non-corn sources by 2022. Alternative bioenergy feedstocks and feedstock conversion systems are needed. One such alternative feedstock may be pigeonpea; this crop used for animal feed is noted for great soil adaptability. The stalk, which is commonly discarded, can be used as feedstock for biofuel. Other alternatives include cellulosic herbaceous perennials (CHPs) such as switchgrass for bioenergy production. A major appeal of CHPs as bioenergy feedstock stems from their ability to be produced on marginal and degraded land, thus moderating the food-energy debate. One form of land degradation is soil acidity which renders up to 30-40% of the world's arable land unproductive. A way by which CHPs are able to tolerate soil acidity is through their associations with fungi collectively known as mycorrhizae. This program includes priorities to enhance CHP-mycorrhizae associations to improve biomass production. Although switchgrass is the most recognized CHP, it is necessary to identify and evaluate the potential of other CHPs to add to the inventory of feedstocks that can be used for bioenergy production. Accordingly, another priority is selection of gamagrass and miscanthus to complement switchgrass for bioenergy production

in Southeastern US.

A third area of improved bioenergy availability is in feedstock production. The ability to produce feedstock on marginal lands will improve feedstock availability. Selection for variants/mutants capable of prospering on marginal lands and/or tolerant to herbicides will increase biofuel availability.

2. Scope of the Program

- In-State Research

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Fuel consumption will continue to increase and supplies of foreign oil will continue to be a constraint until the US can become self-sufficient in fuel production. Biofuels will remain a viable and important component in the suite of alternative energy options available to fuel producers. Agricultural producers will continue to have a financial incentive to pursue feedstock production; alternatives to current standard feedstocks will increase available acreage for feedstock production and decrease competition for food production acreage. Improved feedstock production efficiency will enhance sustainability of biofuel production.

2. Ultimate goal(s) of this Program

Enhancing bioenergy production and sustainability through improvement of biomass feedstocks, development of alternative feedstocks and enhanced feedstock production on marginal lands.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2011	0.0	0.0	0.0	10.0
2012	0.0	0.0	0.0	10.0
2013	0.0	0.0	0.0	10.0
2014	0.0	0.0	0.0	10.0
2015	0.0	0.0	0.0	10.0

V(F). Planned Program (Activity)

1. Activity for the Program

Design and implement field and laboratory research.
 Disseminate research findings to the scientific community, stakeholders, agricultural, environmental, life science industries.
 Conduct agronomic and economic analysis.
 Recruit and train students, incorporating research training into teaching and extension curricula.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
• Education Class	• Web sites

3. Description of targeted audience

State, local and federal agencies, small and limited-resource farmers, researchers, educators, policy makers, consumers and bioenergy companies.

V(G). Planned Program (Outputs)**1. Standard output measures**

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

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	300	0	0	0
2012	450	1200	0	0
2013	500	2500	0	0
2014	0	0	0	0
2015	0	0	0	0

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

2011:0

2012:0

2013:0

2014:0

2015:0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	2	1	3
2012	4	3	7
2013	5	3	8
2014	0	0	0
2015	0	0	0

V(H). State Defined Outputs**1. Output Target**

- Number of workshops and presentations concerning new or alternative biofuel feedstocks

2011:1

2012:2

2013:2

2014:0

2015:0

V(I). State Defined Outcome

O. No.	Outcome Name
1	Increase in number of producers with knowledge of production options available for growing bioenergy feedstocks
2	Increase in number of producers adopting production of bioenergy feedstocks
3	Number of students receiving training in bioenergy production
4	Number of protocols developed for mutagenesis and selection of herbicide resistant biofuel feedstock varieties
5	Number of desirable biofuel feedstock varietal mutants recovered
6	Number of new varieties of biofuel feedstocks developed
7	Increase in number of producers aware of current government policies regarding cellulosic feedstock
8	Number of producers obtaining information on production of pigeonpea under different climatic and soil conditions
9	Number of producers with increased knowledge of the benefits of producing pigeonpea stalk for bioenergy
10	Number of producers adopting pigeonpea as feedstock for bioenergy
11	Number of producers with increased income due to pigeonpea production for bioenergy

Outcome # 1

1. Outcome Target

Increase in number of producers with knowledge of production options available for growing bioenergy feedstocks

2. Outcome Type : Change in Knowledge Outcome Measure

2011:3 2012:5 2013:0 2014:0 2015:0

3. Associated Knowledge Area(s)

- 511 - New and Improved Non-Food Products and Processes

4. Associated Institute Type(s)

- 1890 Research

Outcome # 2

1. Outcome Target

Increase in number of producers adopting production of bioenergy feedstocks

2. Outcome Type : Change in Condition Outcome Measure

2011:0 2012:0 2013:5 2014:0 2015:0

3. Associated Knowledge Area(s)

- 511 - New and Improved Non-Food Products and Processes

4. Associated Institute Type(s)

- 1890 Research

Outcome # 3

1. Outcome Target

Number of students receiving training in bioenergy production

2. Outcome Type : Change in Condition Outcome Measure

2011:2 2012:3 2013:0 2014:0 2015:0

3. Associated Knowledge Area(s)

- 511 - New and Improved Non-Food Products and Processes

4. Associated Institute Type(s)

- 1890 Research

Outcome # 4

1. Outcome Target

Number of protocols developed for mutagenesis and selection of herbicide resistant biofuel feedstock varieties

2. Outcome Type : Change in Knowledge Outcome Measure

2011:2 2012:0 2013:0 2014:0 2015:0

3. Associated Knowledge Area(s)

- 213 - Weeds Affecting Plants
- 511 - New and Improved Non-Food Products and Processes

4. Associated Institute Type(s)

- 1890 Research

Outcome # 5

1. Outcome Target

Number of desirable biofuel feedstock varietal mutants recovered

2. Outcome Type : Change in Action Outcome Measure

2011:0 2012:2 2013:0 2014:0 2015:0

3. Associated Knowledge Area(s)

- 213 - Weeds Affecting Plants
- 511 - New and Improved Non-Food Products and Processes

4. Associated Institute Type(s)

- 1890 Research

Outcome # 6

1. Outcome Target

Number of new varieties of biofuel feedstocks developed

2. Outcome Type : Change in Condition Outcome Measure

2011:0 2012:0 2013:2 2014:0 2015:0

3. Associated Knowledge Area(s)

- 213 - Weeds Affecting Plants
- 511 - New and Improved Non-Food Products and Processes

4. Associated Institute Type(s)

- 1890 Research

Outcome # 7

1. Outcome Target

Increase in number of producers aware of current government policies regarding cellulosic feedstock

2. Outcome Type : Change in Knowledge Outcome Measure

2011:300 2012:300 2013:0 2014:0 2015:0

3. Associated Knowledge Area(s)

- 511 - New and Improved Non-Food Products and Processes

4. Associated Institute Type(s)

- 1890 Research

Outcome # 8

1. Outcome Target

Number of producers obtaining information on production of pigeonpea under different climatic and soil conditions

2. Outcome Type : Change in Knowledge Outcome Measure

2011:300 2012:300 2013:0 2014:0 2015:0

3. Associated Knowledge Area(s)

- 511 - New and Improved Non-Food Products and Processes

4. Associated Institute Type(s)

- 1890 Research

Outcome # 9

1. Outcome Target

Number of producers with increased knowledge of the benefits of producing pigeonpea stalk for bioenergy

2. Outcome Type : Change in Knowledge Outcome Measure

2011:500 2012:0 2013:0 2014:0 2015:0

3. Associated Knowledge Area(s)

- 511 - New and Improved Non-Food Products and Processes
- 603 - Market Economics

4. Associated Institute Type(s)

- 1890 Research

Outcome # 10

1. Outcome Target

Number of producers adopting pigeonpea as feedstock for bioenergy

2. Outcome Type : Change in Action Outcome Measure

2011:0 2012:0 2013:60 2014:0 2015:0

3. Associated Knowledge Area(s)

- 511 - New and Improved Non-Food Products and Processes
- 603 - Market Economics

4. Associated Institute Type(s)

- 1890 Research

Outcome # 11

1. Outcome Target

Number of producers with increased income due to pigeonpea production for bioenergy

2. Outcome Type : Change in Condition Outcome Measure

2011:0 2012:0 2013:60 2014:0 2015:0

3. Associated Knowledge Area(s)

- 511 - New and Improved Non-Food Products and Processes
- 603 - Market Economics

4. Associated Institute Type(s)

- 1890 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

{NO DATA ENTERED}

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

Description

{NO DATA ENTERED}

2. Data Collection Methods

Description

{NO DATA ENTERED}

V(A). Planned Program (Summary)**Program # 4****1. Name of the Planned Program**

Climate Change- low-impact alternatives for ornamental crop production

2. Brief summary about Planned Program

Ornamental plant production is the fastest growing segment of US agriculture. To remain viable, strong and productive, research that address issues that will enable US producers to be more environmentally friendly while remaining competitive and profitable are necessary.

This program will conduct research that addresses insect and disease related production issues facing the ornamental nursery industry, and provide guidance to nursery growers on economic disease and insect management strategies.

In the area of plant diseases, this program will address disease problems in Tennessee nursery production systems for woody plants. This requires applied research on the etiology of new disease threats to nursery production and development of disease management strategies. Studies on disease resistance, fungicide efficacies and identification of biopesticides including biological agents will be performed using conventional methods and molecular techniques.

In the area of insect control, an area to be addressed will be the development of nursery plant treatments that will meet certification requirements for Japanese beetle and imported fire ants. These treatments will be cost effective, integrate into current nursery production systems, are environmentally safe, less hazardous to workers, and reduce the utilization of synthetic petroleum-based insecticides.

3. Program existence : Intermediate (One to five years)

4. Program duration : Medium Term (One to five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : No

V(B). Program Knowledge Area(s)**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
133	Pollution Prevention and Mitigation				20%
211	Insects, Mites, and Other Arthropods Affecting Plants				40%
212	Pathogens and Nematodes Affecting Plants				40%
	Total				100%

V(C). Planned Program (Situation and Scope)**1. Situation and priorities**

Chemical protective fungicides are routinely used to control diseases in nursery production systems. Newer systemic and protective fungicides are available in the market, but growers often use pesticides that are familiar to them and forget that pesticide chemistries are designed for specific pathogens. Consequently, disease management of new emerging problems may fail because of lack of guidance to growers. Good management of new emerging disease problems requires research on disease etiology and control strategies. Effective pesticides may provide immediate remedy to disease problems, but this practice increases production costs and the potential for environmental contamination. However, routine pesticide applications continue to be the main method for controlling diseases in commercial nurseries. Extensive fungicide

applications tend to increase development of fungicide resistance, destroy or disrupt non-target beneficial microflora in the phylloplane, and potentially lead to the development of new disease problems. There is need to find alternatives to conventional fungicides. Alternatives to chemical pesticides include host resistance and biopesticides derived from less toxic compounds, including plant extracts and biological agents. Host resistance is the best method for disease control, but it takes time to develop and its durability often requires the integration with other methods of disease management.

Invasive insects requiring impractical and costly treatments to certify plants impact profit and sustainability of nurseries. Imported fire ants (IFA) and Japanese beetle (JB) are problematic due to easy transport in soil and limited control options. IFA has greater impact than JB because market destinations require more plants to be treated. In Tennessee, ~80% of the nursery industry was added to the Federal IFA quarantine in Sept. 2009. Field-grown nurseries have 3 IFA options, but they are impractical, costly, environmentally damaging, hazardous, and have unfeasible certifications (i.e., 30-84 days), including: a) 6 repeated post-harvest chlorpyrifos drenches, b) post-harvest chlorpyrifos dips, or c) pre-harvest IFA bait followed 3-5 days with granular chlorpyrifos. All IFA treatments are limited to only chlorpyrifos. Higher costs especially impact nurseries when sales are slow, which in turn impacts the rural community that depends on nursery-related jobs. Producers need low cost / effective pre-harvest treatments with long, 6 month certifications. The existing research focus has been low cost and rapidly applied band treatments to eliminate IFA or JB from the harvest zone. Although bands are ~95% effective for IFA, eliminating large IFA colonies has been difficult. Recently, large colonies were directly targeted with drenches, providing near 100% control, but more testing is needed for approval in quarantine programs. Numerous treatments have been identified for JB, so current work will focus on reduced-risk biopesticides and treatments requiring more support data.

2. Scope of the Program

- In-State Extension
- In-State Research

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Efficient disease management requires information on the etiology and biology of the pathogen, its winter survival and primary source of infection. This information is needed for resistance screening to avoid disease escapes, and also for development of efficient spray programs that are well targeted before infection spreads causing severe damage to affected plants. Development of efficient disease management strategies requires the understanding of options available according to the etiology and biology of the pathogen. In addition to chemical spray programs, there is accumulating evidence that antagonist microorganisms can be as effective as chemicals in repressing fungal pathogens. Components of integrated disease management may include host resistance, biological agents and chemical fungicides. Our previous studies have identified fungi, bacteria and yeasts that are effective against powdery mildew, but more research is needed before these antagonists can be used in disease management.

Imported fire ants (IFA) and Japanese beetle (JB) are serious nursery issues. Resources and staff at Tennessee State University have the knowledge and ability to address IFA and JB issues. A network of USDA collaborators ensures further ability to address issues. This project will reduce JB and IFA impacts. Research will support external changes in regulations and insecticide labels. The idea that IFA and JB critically impact nurseries is supported by: 1) interactions with TSU Nursery Advisory Stakeholder Group (NASG) and growers at workshops, field days, and one-on-one, 2) market destinations of Tennessee plants, which indicate ~85% of plants sold need treatment, 3) cost assessment of current JB and IFA treatments, and 4) lack of suitable alternatives. The NASG identified IFA as the primary pest issue in the Tennessee nursery industry. The notion that TSU and USDA colleagues can address JB and IFA issues comes from over 10 years of JB and IFA experience. In that time, research supported Marathon 60WP, Discus, and Flagship pre-harvest treatments in the JB Harmonization Plan (JBHP), an Onyx Pro dip label for JB and IFA, a JBHP Onyx Pro insecticide dip, and an 8X reduction in chlorpyrifos rate in JBHP. IFA data collected in the past 5-years will eliminate ineffective research directions and allow focus on methods likely to succeed. The idea that IFA and JB regulations will be improved is supported by past treatment approvals, our close interaction with regulatory agencies, and PI service as a science advisor to the JBHP Treatments Review Committee.

2. Ultimate goal(s) of this Program

Develop environmentally friendly and cost effective treatments nursery plant for the nursery industry that will control disease and meet certification requirements for Japanese beetle and imported fire ants. These new procedures will be cost effective, integrate into current nursery production systems, are environmentally safe, less hazardous to workers, and reduce

the utilization of synthetic petroleum-based insecticides.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2011	0.0	0.0	0.0	19.0
2012	0.0	0.0	0.0	19.0
2013	0.0	0.0	0.0	19.0
2014	0.0	0.0	0.0	19.0
2015	0.0	0.0	0.0	19.0

V(F). Planned Program (Activity)

1. Activity for the Program

Identify new pesticide, biopesticide, and treatment methodologies for container and field-grown nursery stock to manage disease and insect problems.

Determine the lowest effective rates for synthetic petroleum-based pesticides and develop new reduced rate insecticide / biopesticide combinations.

Identify new biopesticides that can substitute for synthetic petroleum-based pesticides and reduce worker exposure risk and environmental impact.

Release phorid-decapitating flies in Tennessee to provide imported fire ant biological control.

Provide extension training and literature to producers on imported fire ant and Japanese beetle management and train students in pest management and research techniques.

Provide data to support new treatments in the Domestic Japanese Beetle Harmonization Plan and the Federal Imported Fire Ant Quarantine, as well as data to support new insecticide label amendments.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> • Workshop • Demonstrations 	<ul style="list-style-type: none"> • Web sites

3. Description of targeted audience

Nursery growers and extension specialists

Regulatory agencies (e.g., U.S. Environmental Protection Agency, USDA-APHIS, Tennessee Department of Agriculture)

Agrochemical manufacturers

V(G). Planned Program (Outputs)

1. Standard output measures

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

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	100	0	0	0
2012	100	0	0	0
2013	100	0	0	0
2014	0	0	0	0
2015	0	0	0	0

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

2011:0 2012:1 2013:0 2014:0 2015:0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	3	1	4
2012	4	2	6
2013	6	1	7
2014	0	0	0
2015	0	0	0

V(H). State Defined Outputs**1. Output Target**

- Workshops to inform producers about alternative insect control methodologies

2011:1 2012:2 2013:2 2014:0 2015:0

- Disease resistant cultivars developed

2011:0 2012:0 2013:1 2014:0 2015:0

- Extension factsheets about alternative methods to control disease and insects in nursery production

2011:1 2012:2 2013:1 2014:0 2015:0

V(I). State Defined Outcome

O. No.	Outcome Name
1	Number of producers educated on proper management of invasive pests through presentations and workshops
2	Number of producers educated on proper management of invasive pests through publications and factsheets
3	Number of new treatments for invasive pests
4	Number of new reduced-risk treatments developed for invasive pests
5	Number of new treatments for invasive pests approved by quarantine regulatory agencies
6	Number of confirmed establishments of new invasive pest parasites
7	Number of producers informed about new or emerging diseases
8	Number of producers informed about new biological control treatments
9	Number of producers informed about new sources of host resistance
10	New cultivars exhibiting disease resistance available to growers
11	Organisms identified as potential biocontrol candidates
12	Number of biological control product efficacy tests conducted for invasive insect control
13	Number of new product registrations for biological control of invasive insects

Outcome # 1

1. Outcome Target

Number of producers educated on proper management of invasive pests through presentations and workshops

2. Outcome Type : Change in Knowledge Outcome Measure

2011:100 2012:100 2013:100 2014:0 2015:0

3. Associated Knowledge Area(s)

- 133 - Pollution Prevention and Mitigation
- 211 - Insects, Mites, and Other Arthropods Affecting Plants

4. Associated Institute Type(s)

- 1890 Research

Outcome # 2

1. Outcome Target

Number of producers educated on proper management of invasive pests through publications and factsheets

2. Outcome Type : Change in Knowledge Outcome Measure

2011:100 2012:100 2013:100 2014:0 2015:0

3. Associated Knowledge Area(s)

- 133 - Pollution Prevention and Mitigation
- 211 - Insects, Mites, and Other Arthropods Affecting Plants

4. Associated Institute Type(s)

- 1890 Research

Outcome # 3

1. Outcome Target

Number of new treatments for invasive pests

2. Outcome Type : Change in Knowledge Outcome Measure

2011:1 2012:0 2013:0 2014:0 2015:0

3. Associated Knowledge Area(s)

- 133 - Pollution Prevention and Mitigation
- 211 - Insects, Mites, and Other Arthropods Affecting Plants

4. Associated Institute Type(s)

- 1890 Research

Outcome # 4

1. Outcome Target

Number of new reduced-risk treatments developed for invasive pests

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	2012:1	2013:0	2014:0	2015:0
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3. Associated Knowledge Area(s)

- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Pathogens and Nematodes Affecting Plants

4. Associated Institute Type(s)

- 1890 Research

Outcome # 5

1. Outcome Target

Number of new treatments for invasive pests approved by quarantine regulatory agencies

2. Outcome Type : Change in Action Outcome Measure

2011:0	2012:0	2013:1	2014:0	2015:0
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3. Associated Knowledge Area(s)

- 133 - Pollution Prevention and Mitigation
- 211 - Insects, Mites, and Other Arthropods Affecting Plants

4. Associated Institute Type(s)

- 1890 Research

Outcome # 6

1. Outcome Target

Number of confirmed establishments of new invasive pest parasites

2. Outcome Type : Change in Condition Outcome Measure

2011:0	2012:0	2013:1	2014:0	2015:0
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3. Associated Knowledge Area(s)

- 133 - Pollution Prevention and Mitigation
- 211 - Insects, Mites, and Other Arthropods Affecting Plants

4. Associated Institute Type(s)

- 1890 Research

Outcome # 7

1. Outcome Target

Number of producers informed about new or emerging diseases

2. Outcome Type : Change in Knowledge Outcome Measure

2011:100 2012:100 2013:100 2014:0 2015:0

3. Associated Knowledge Area(s)

- 133 - Pollution Prevention and Mitigation

4. Associated Institute Type(s)

- 1890 Research

Outcome # 8

1. Outcome Target

Number of producers informed about new biological control treatments

2. Outcome Type : Change in Knowledge Outcome Measure

2011:100 2012:100 2013:100 2014:0 2015:0

3. Associated Knowledge Area(s)

- 133 - Pollution Prevention and Mitigation
- 212 - Pathogens and Nematodes Affecting Plants

4. Associated Institute Type(s)

- 1890 Research

Outcome # 9

1. Outcome Target

Number of producers informed about new sources of host resistance

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0 2012:0 2013:100 2014:0 2015:0

3. Associated Knowledge Area(s)

- 133 - Pollution Prevention and Mitigation
- 212 - Pathogens and Nematodes Affecting Plants

4. Associated Institute Type(s)

- 1890 Research

Outcome # 10

1. Outcome Target

New cultivars exhibiting disease resistance available to growers

2. Outcome Type : Change in Action Outcome Measure

2011:0 2012:0 2013:1 2014:0 2015:0

3. Associated Knowledge Area(s)

- 133 - Pollution Prevention and Mitigation
- 212 - Pathogens and Nematodes Affecting Plants

4. Associated Institute Type(s)

- 1890 Research

Outcome # 11

1. Outcome Target

Organisms identified as potential biocontrol candidates

2. Outcome Type : Change in Condition Outcome Measure

2011:0 2012:0 2013:2 2014:0 2015:0

3. Associated Knowledge Area(s)

- 133 - Pollution Prevention and Mitigation
- 212 - Pathogens and Nematodes Affecting Plants

4. Associated Institute Type(s)

- 1890 Research

Outcome # 12

1. Outcome Target

Number of biological control product efficacy tests conducted for invasive insect control

2. Outcome Type : Change in Action Outcome Measure

2011:4 2012:6 2013:8 2014:0 2015:0

3. Associated Knowledge Area(s)

- 133 - Pollution Prevention and Mitigation
- 211 - Insects, Mites, and Other Arthropods Affecting Plants

4. Associated Institute Type(s)

- 1890 Research

Outcome # 13

1. Outcome Target

Number of new product registrations for biological control of invasive insects

2. Outcome Type : Change in Action Outcome Measure

2011:0 2012:2 2013:4 2014:0 2015:0

3. Associated Knowledge Area(s)

- 133 - Pollution Prevention and Mitigation
- 211 - Insects, Mites, and Other Arthropods Affecting Plants

4. Associated Institute Type(s)

- 1890 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Government Regulations

Description

As this is agricultural research, adverse climate condition can influence the outcome of research studies. Changing economic conditions can change the priorities of producers. Changes in government regulations, particularly quarantine regulations, can significantly change the scope of this research.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

Description

{NO DATA ENTERED}

2. Data Collection Methods

Description

{NO DATA ENTERED}

V(A). Planned Program (Summary)**Program # 5****1. Name of the Planned Program**

Climate Change- improving the quality of water runoff from agricultural production

2. Brief summary about Planned Program

Clean water is of fundamental importance for all facets of life. Unfortunately, many agricultural enterprises produce situations that may lead to contamination of surface and ground water with excess nutrients, agricultural chemicals, and sediments. This program will address the issue of runoff from agricultural production. Research will be conducted to improve quality of agricultural run-off and agricultural sites by identification and modification of contaminant-producing nursery crop production procedures.

3. Program existence : Intermediate (One to five years)

4. Program duration : Medium Term (One to five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : No

V(B). Program Knowledge Area(s)**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
112	Watershed Protection and Management				50%
133	Pollution Prevention and Mitigation				50%
	Total				100%

V(C). Planned Program (Situation and Scope)**1. Situation and priorities**

Many State regulatory agencies are promulgating laws to ensure that non-point source pollutants are assessed and regulated. Agricultural production contributes to non-point source pollution. Therefore, the assessment of creeks, streams, lakes and rivers requires sound monitoring strategies at the watershed scale. In Middle Tennessee, especially in Warren, Dekalb and Grundy counties, large concentrations of nursery crop production operations exist and the Collins River sub-watershed spans these counties. Therefore, the potential for sediments and nutrient loading by overland and subsurface flow to the Collins River exists. During storm events, large volumes of sediments can be added to streams from surface runoff, especially in areas where the landscape has been disturbed. Plowing, liming and fertilization of nursery fields can result in the runoff of tons of soil and essential crop nutrients. There is a dearth of research on the impact of nursery crop production systems on surface water quality. It is expected that the data collected will be used to define special emphasis watershed for specialty crops with specific conservation and management techniques for field nursery production systems. Traditionally, the environmental impact of high-input row crop (eg. corn and soybean) production systems on water quality have received major attention. Conversely, nursery crops, especially field grown ornamental crops have received minimal focus.

2. Scope of the Program

- In-State Extension
- In-State Research

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Recent global climate changes have farmers and others interested in safe, reliable water sources and has increased their attention to surface water vulnerability to contamination. Degraded waters pose threats to human health through impaired drinking water supplies, and water availability for production of food and fiber. On a watershed scale, land-use is cited as one of the leading causes of sediment loading. Sediment problems are exacerbated during storm events; because large volumes of sediments can be added to streams from surface runoff, especially in areas where the landscape has been disturbed. It is expected that growers will adopt specific conservation and management techniques for field nursery crop production systems that minimize sediments load to water bodies.

2. Ultimate goal(s) of this Program

Improve water quality from agricultural production or contaminated sites.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2011	0.0	0.0	0.0	4.7
2012	0.0	0.0	0.0	4.7
2013	0.0	0.0	0.0	4.7
2014	0.0	0.0	0.0	4.7
2015	0.0	0.0	0.0	4.7

V(F). Planned Program (Activity)

1. Activity for the Program

Conduct research in water quality monitoring.
 Develop outreach materials.
 Communicate findings to producers/end users.
 Train students.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
• Workshop	• Web sites

3. Description of targeted audience

Agricultural producers, environmental scientists, environmental regulatory agencies.

V(G). Planned Program (Outputs)

1. Standard output measures

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

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	0	0	0	0
2012	0	0	0	0
2013	0	0	0	0
2014	0	0	0	0
2015	0	0	0	0

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

2011:0 2012:0 2013:0 2014:0 2015:0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	0	0	0
2012	1	1	2
2013	1	1	2
2014	0	0	0
2015	0	0	0

V(H). State Defined Outputs

1. Output Target

- Workshops to communicate research findings to stakeholders

2011:0 2012:1 2013:1 2014:0 2015:0

- Workshops to educate producers in the target population on how to reduce sediment load to surface water

2011:0 2012:2 2013:5 2014:0 2015:0

V(I). State Defined Outcome

O. No.	Outcome Name
1	Increase in number of nursery producers in the target population aware of nonpoint source pollution from field production of specialty crops
2	Students trained in water quality monitoring
3	Number of producers in the target population with increased knowledge of the relationship between land cultivation practices and sediment load to surface water

Outcome # 1

1. Outcome Target

Increase in number of nursery producers in the target population aware of nonpoint source pollution from field production of specialty crops

2. Outcome Type : Change in Knowledge Outcome Measure

2011:5 2012:10 2013:10 2014:0 2015:0

3. Associated Knowledge Area(s)

- 112 - Watershed Protection and Management
- 133 - Pollution Prevention and Mitigation

4. Associated Institute Type(s)

- 1890 Research

Outcome # 2

1. Outcome Target

Students trained in water quality monitoring

2. Outcome Type : Change in Knowledge Outcome Measure

2011:2 2012:2 2013:2 2014:0 2015:0

3. Associated Knowledge Area(s)

- 112 - Watershed Protection and Management
- 133 - Pollution Prevention and Mitigation

4. Associated Institute Type(s)

- 1890 Research

Outcome # 3

1. Outcome Target

Number of producers in the target population with increased knowledge of the relationship between land cultivation practices and sediment load to surface water

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0 2012:10 2013:10 2014:0 2015:0

3. Associated Knowledge Area(s)

- 112 - Watershed Protection and Management
- 133 - Pollution Prevention and Mitigation

4. Associated Institute Type(s)

- 1890 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Economy
- Appropriations changes
- Government Regulations
- Competing Public priorities

Description

{NO DATA ENTERED}

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

Description

{NO DATA ENTERED}

2. Data Collection Methods

Description

{NO DATA ENTERED}

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Food Safety- Keeping food contaminant-free

2. Brief summary about Planned Program

Home refrigerators can harbor pathogenic bacteria that pose a potential to contaminate stored foods. Consumers should be informed about safe handling of refrigerated foods and proper cleaning of home refrigerators to reduce the risk of food contaminations. However, despite numerous studies on consumer refrigeration practices, the role of storage conditions of refrigerated foods in the home on consumer health remains to be fully assessed. Using a combination of microbiological studies, and in-home observations and surveys, this program will quantify the risk of mishandling and cross contamination of foods, the dynamics of microbial survival and growth, as well as factors that affect bacterial transfer efficiency during refrigerator storage. In response to the findings, risk communication messages appropriate for consumers will be developed and disseminated to the public in order to minimize the risk of food-borne illnesses associated with improper handling and storage of refrigerated foods in the home.

Global use of antibiotics and antimicrobial agents in agriculture has contributed to antibiotic resistant bacteria in the food chain. Increased antimicrobial resistance of foodborne pathogens and changes in food production practices pose a major threat to consumers and the food industry. In the last three decades, the number of disease outbreaks caused by foodborne pathogens that are associated with fresh produce has become a major health concern in the United States. A possible threat could be the consumption of fresh produce contaminated with antibiotic-resistant bacteria. An additional goal of this project is to determine the prevalence of antibiotic resistant foodborne pathogens in the farm environment and retail fresh produce, and to deliver educational programs on safe fresh produce handling practices and judicious use of antibiotics in agriculture.

3. Program existence : Intermediate (One to five years)

4. Program duration : Medium Term (One to five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : No

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources				50%
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins				50%
	Total				100%

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

The US food supply is among the safest in the world, yet each year millions of Americans become sick and thousands die from eating food contaminated with foodborne pathogens. The nation therefore faces a continuing challenge to further reduce foodborne risks to human health. It has been suggested that foodborne illness is initiated in private homes more frequently than in commercial operations. Many of these cases, perhaps up to 50%, are attributable to inappropriate food storage including ineffective chill storage and refrigerator management. Refrigerators form an important link in the wider chain of cross-contamination, and are a significant factor in 28% of outbreaks of domestic foodborne disease. Bacteria contaminating

unwashed raw foods and leaking packages introduced to domestic refrigerators may directly contaminate other stored foods, or attach to and persist on the internal surface of the refrigerator, posing risks of indirect longer term contamination during subsequent food preparation activities. In previous projects we have measured consumer knowledge and have obtained some consumer practice data. However, the potential for these practices to cause food borne illness has not been fully assessed. Additionally, targeted demographic groups were included in the previous study. Findings from that study indicate potential differences between subpopulation groups. In a study conducted at our institution, the prevalence of pathogens was higher in the refrigerators of low income households. Additionally conditions such as open meat packages and other foods stored in the meat compartment with raw meats were found in many of the homes, both of which could cause cross-contamination.

Recently, there has been alarming increase of foodborne illnesses associated with fresh produce. This becomes a significant issue when coupled with the trend of people consuming more vegetables and fruits for health and nutritional benefit.

Consequently, foodborne pathogens in fresh produce has been cited as emerging issue in food safety and one of the most pressing public health needs. Foodborne pathogens in fresh produce indicate a weakness in the nation's fresh produce production system; as was demonstrated by recent multi-state outbreaks in produce, including the E. coli OH7:H7 outbreak from spinach that lead to 183 cases of illness, 29 cases of Hemolytic Uremic Syndrome, 95 hospitalizations, and one death. Increasing applications of antimicrobial agents in production systems has resulted in multiple antibiotic-resistant pathogenic and commensal bacteria in human and animal habitats.

Research data is needed to determine all major sources of foodborne pathogens, especially those associated with antibiotic resistance. The research findings on the occurrence, profiles, and patterns of antibiotic-resistant foodborne pathogens in fresh produce and educational programs in this program will provide useful information needed in mitigation efforts.

2. Scope of the Program

- In-State Extension
- In-State Research

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

The problem of cross-contamination is generally recognized to be complex, involving consumer behaviors, the dynamics of microbial survival and growth, as well as factors that affect bacterial transfer efficiency. Existing research has looked at each of these factors independently, but generally fails to examine the problem holistically. It is essential to understand the interaction of specific observed consumer food preparation behaviors with subsequent frequency and levels of contamination. Intervention strategies targeting potentially unsafe consumer practices will reduce foodborne illnesses associated with home-prepared foods. Investigating storage practices of refrigerated foods and the likelihood and mechanisms of cross contamination will provide essential information to develop effective intervention strategies. By improving food handling and storage practices at home, this project should reduce the risk of foodborne illness.

In another avenue for food contamination, the application of raw animal manure for fertilizer can increase the threat of contamination on fruits and vegetables and possibly pass antibiotic-resistant bacteria to humans by the consumption of contaminated fresh produce. Consumer handling practices and storage of food determines the degree of microbial contamination and the possibility of causing food contamination.

This program will characterize, analyze, and identify pathogenic profiles and patterns of pathogenic microorganisms in fresh produce and farm environments and deliver educational programs to producers and consumers on hygienic agricultural and food handling practices that are needed to improve fresh produce safety. In addition, it will reduce antibiotic-resistant bacteria in fresh produce and the farm environment; change the behaviors of consumers and farmers to produce safer fresh produce handling practices and judicious use of antibiotics; and train competitive students with relevant skills for employment opportunities in food safety.

2. Ultimate goal(s) of this Program

To improve consumer and producer food safety knowledge and practices to minimize the risk of food borne illnesses associated with improper handling and storage of refrigerated foods, and to reduce the prevalence of antibiotic resistant foodborne pathogens.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2011	0.0	0.0	0.0	7.5
2012	0.0	0.0	0.0	7.5
2013	0.0	0.0	0.0	7.5
2014	0.0	0.0	0.0	7.5
2015	0.0	0.0	0.0	7.5

V(F). Planned Program (Activity)

1. Activity for the Program

Experiments will be conducted to:

- Identify risk factors for cross contamination by investigating storage practices of refrigerated foods
- Determine the likelihood and mechanisms of cross contamination by mapping the fingerprints for strains of bacteria from the same refrigerator
- Change potentially unsafe consumer practices through effective intervention strategies,
- Characterize, analyze, and identify antibiotic-resistant bacteria in the farm environment (animal manure, soil) and irrigation water

Train students on isolation and characterization of foodborne pathogens in fresh produce and the farm environment.

Develop and deliver educational materials on hygienic agricultural practices needed to reduce the use of antibiotics and safe fresh produce handling practices.

The development, maintenance, and revision of an educational website and brochure on safe fresh produce handling practices and judicious use of antibiotic in agriculture.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
• Workshop	• Web sites

3. Description of targeted audience

Fresh produce farmers and consumers, households in the metropolitan Nashville area.

V(G). Planned Program (Outputs)

1. Standard output measures

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

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	75	0	0	0
2012	125	0	0	0
2013	250	0	0	0

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2014	0	0	0	0
2015	0	0	0	0

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

2011:0 2012:0 2013:0 2014:0 2015:0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	0	0	0
2012	1	0	1
2013	2	0	2
2014	0	0	0
2015	0	0	0

V(H). State Defined Outputs

1. Output Target

- Website developed to educate consumers on antibiotic resistant pathogens on fresh produce.

2011:0 2012:0 2013:1 2014:0 2015:0

- Database of characterized antibiotic resistant microorganisms isolated from animal manure.

2011:1 2012:0 2013:0 2014:0 2015:0

- Database of characterized antibiotic resistant microorganisms isolated from irrigation water and watersheds.

2011:0 2012:1 2013:0 2014:0 2015:0

V(I). State Defined Outcome

O. No.	Outcome Name
1	Consumers educated via booklets on the occurrence and prevention of antibiotic resistant pathogens on fresh produce
2	Number of producers practicing judicious use of antibiotics on farms through improved agricultural practices
3	Increase in number of consumers practicing safe fresh produce handling practices via food safety education
4	Number of target consumers with increased knowledge of improved kitchen cleanliness
5	Number of target consumers with increased knowledge of means to reduce the chance of cross contamination
6	Number of target consumers adopting safer food storage practices
7	Number of target consumers adopting improved cleaning skills

Outcome # 1

1. Outcome Target

Consumers educated via booklets on the occurrence and prevention of antibiotic resistant pathogens on fresh produce

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0 2012:600 2013:600 2014:0 2015:0

3. Associated Knowledge Area(s)

- 711 - Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

4. Associated Institute Type(s)

- 1890 Research

Outcome # 2

1. Outcome Target

Number of producers practicing judicious use of antibiotics on farms through improved agricultural practices

2. Outcome Type : Change in Action Outcome Measure

2011:0 2012:50 2013:0 2014:0 2015:0

3. Associated Knowledge Area(s)

- 711 - Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

4. Associated Institute Type(s)

- 1890 Research

Outcome # 3

1. Outcome Target

Increase in number of consumers practicing safe fresh produce handling practices via food safety education

2. Outcome Type : Change in Action Outcome Measure

2011:0 2012:100 2013:0 2014:0 2015:0

3. Associated Knowledge Area(s)

- 711 - Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

4. Associated Institute Type(s)

- 1890 Research

Outcome # 4

1. Outcome Target

Number of target consumers with increased knowledge of improved kitchen cleanliness

2. Outcome Type : Change in Knowledge Outcome Measure

2011:20 2012:40 2013:40 2014:0 2015:0

3. Associated Knowledge Area(s)

- 711 - Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

4. Associated Institute Type(s)

- 1890 Research

Outcome # 5

1. Outcome Target

Number of target consumers with increased knowledge of means to reduce the chance of cross contamination

2. Outcome Type : Change in Knowledge Outcome Measure

2011:15 2012:30 2013:30 2014:0 2015:0

3. Associated Knowledge Area(s)

- 711 - Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

4. Associated Institute Type(s)

- 1890 Research

Outcome # 6

1. Outcome Target

Number of target consumers adopting safer food storage practices

2. Outcome Type : Change in Action Outcome Measure

2011:0 2012:0 2013:20 2014:0 2015:0

3. Associated Knowledge Area(s)

- 711 - Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

4. Associated Institute Type(s)

- 1890 Research

Outcome # 7

1. Outcome Target

Number of target consumers adopting improved cleaning skills

2. Outcome Type : Change in Action Outcome Measure

2011:0 2012:0 2013:20 2014:0 2015:0

3. Associated Knowledge Area(s)

- 711 - Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

4. Associated Institute Type(s)

- 1890 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

{NO DATA ENTERED}

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

Description

{NO DATA ENTERED}

2. Data Collection Methods

Description

{NO DATA ENTERED}