

# 2008 Tennessee State University Research Plan of Work

## I. Plan Overview

### 1. Brief Summary about Plan Of Work

The Institute of Agricultural and Environmental Research (IAgER) at Tennessee State University is grateful for the opportunity to partner with the United States Department of Agriculture, the State of Tennessee, various agricultural industries, the academic community, and other public sector entities to improve the quality of life for citizens of our state and for people in other regions of the US. This Plan of Work represents our commitment to address specific needs of our state and of society in general. 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.

In preparation for the development of this Plan of Work, the Institute of Agricultural and Environmental Research conducted a strategic planning process in 2005. This 8-month effort involved every member of the Institute and produced succinct research goals for the Institute as well as a concise mission statement that reflects the mission of the Institute within the contexts of Tennessee State University, the State of Tennessee, and the United States of America.

The Planned Programs in this Plan of Work were created in cooperation with external stakeholders (private citizens and industry representatives) and internal stakeholders (faculty, researchers, students, staff, Cooperative Extension personnel, and administrators at Tennessee State University) using the research goals developed in the strategic planning process. This Plan of Work is a description of the research activities we intend to undertake during the period of October 1, 2007 through September 30, 2012.

The Institute of Agricultural and Environmental Research is the principal agricultural research entity at Tennessee State University. Research in the Institute is conducted by scientists organized into five multidisciplinary research teams: Animal and Alternative Livestock; Agricultural Economics and Policy; Nursery, Medicinal and Alternative Food Crops; Environmental Protection and Enhancement; and Food Safety, Nutrition and Family Well-Being. The Planned Programs outlined in this Plan of Work reflect the coordinated efforts of each of these teams to address the issues identified in the strategic planning process. The programs will address 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, provide economic opportunities for our citizens, and provide experiential training opportunities for students at Tennessee State University.

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

Year	Extension		Research	
	1862	1890	1862	1890
2008	0.0	0.0	0.0	60.4
2009	0.0	0.0	0.0	60.6
2010	0.0	0.0	0.0	60.6
2011	0.0	0.0	0.0	60.6
2012	0.0	0.0	0.0	60.6

## II. Merit Review Process

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

- Internal University Panel
- External University Panel

## 2. Brief Explanation

Each Planned Program in this Plan of Work was approved by separate external and internal review panels. These panels were composed of agricultural research administrators in the 1890 University system. Potential Planned Programs were evaluated for relevance, scientific soundness, and appropriateness of planned outcomes. Only those proposed programs that were approved by both panels were developed into Planned Programs.

A number of strategies were developed as a result of the strategic planning process outlined earlier to guarantee that approved programs are periodically reviewed to ensure they are meeting goals and remaining relevant:

Prior to the initiation of IAgER projects/programs, researchers/research teams initiate and document 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 and upon completion of IAgER projects/programs, researchers/research teams initiate and document contact with appropriate stakeholders to evaluate the degree of program/project success. These results will be provided to the IAgER advisory group.

An administrator within the Institute of Agricultural and Environmental Research has been appointed to meet with every project leader semiannually 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 Institute of Agricultural and Environmental Research has an established record of soliciting, establishing, and maintaining direct input from stakeholders concerning its research direction and research programs. The direct relationship we enjoy with our stakeholders and the feedback and oversight they provide to the Institute ensures the research we perform addresses issues of strategic importance.

An example of stakeholder involvement in our research can be found in our research programs in nursery production. IAgER has maintained a standing Nursery Advisory Group to provide nursery research advice and direction for over a decade. This group, currently at 14 members from throughout the state, was initiated by IAgER, but maintains autonomy over the composition of its members. It meets annually to review nursery-related research being conducted in IAgER, and to make recommendations on current research and suggestions for future research.

Another example is in the area of nutrition and family well being; an advisory council was formed that includes persons who work with disadvantaged populations, including representatives from the Nashville Davidson County Health Department, Second Harvest Food Bank, Metropolitan Davidson County Health Department, Cooperative Extension Program Agents, Davidson County Sheriff's Department, and the Hispanic Coalition. This advisory council conducts reviews of research in this area and provides input for improving the research and the process of targeting research areas.

Not every example of the Institute's stakeholder input process is detailed here; however, the relationship IAgER maintains with its stakeholders has proven to be extremely valuable and will be continued.

Examples of other means IAgER uses to identify critical issues include obtaining input through professional meetings, field days, 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 teams 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 State(s)?

As previously described, the planned programs in this Plan of Work are the culmination of a recently completed, thorough strategic planning process that was used to define the scope and direction of the research programs in the Institute of Agricultural and Environmental Research. A component of the strategic planning process was the development of a mission statement for the

IAGeR. A tenet of the mission statement is:

“Research at IAGeR generates scientific knowledge in the following areas: animal and alternative livestock; economics and policy; food safety, nutrition and family well-being; environmental protection and enhancement; and nursery, medicinal and alternative crops. Through this innovative research, IAGeR identifies and addresses the needs of stakeholders, focuses on finding solutions to challenges faced by socially and economically disadvantaged groups, and contributes 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 planned programs may develop solutions to challenges faced by mainstream segments of our population, the core emphasis of the research will be on 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 strategic planning process in which the assets and liabilities of the Institute of Agricultural and Environmental Research 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 Institute staff, and relationships with, and priorities of, stakeholders. Using the results of the strategic planning analysis, each IAGeR research team formulated research goals that best fit the strengths of the team and the priorities of stakeholders. This procedure produced the best possible scenario for ensuring program effectiveness – building on known strengths in a synergistic research atmosphere, while addressing issues of concern to stakeholders. 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 IAGeR; 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 and research team now 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 individuals
- Survey of traditional stakeholder individuals
- Survey of traditional stakeholder groups
- Targeted invitation to selected individuals from general public
- Targeted invitation to traditional stakeholder groups

#### **Brief explanation.**

A number of different avenues are utilized by researchers in the Institute of Agricultural and Environmental Research to seek stakeholder input. Most of the faculty in the Institute are active participants in the trade associations related to their research (i.e. Tennessee Goat Producers Association, Tennessee Nursery and Landscapers Association), and regularly serve on association committees, attend association trade shows, have research exhibits at association trade shows, and act as speakers at educational functions sponsored by the associations. This relationship allows 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 Institute, 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 Surveys
- Other (See explanation below.)
- Use Internal Focus Groups
- Needs Assessments

**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 individuals
- Survey of traditional Stakeholder groups
- Survey specifically with non-traditional individuals
- Meeting specifically with non-traditional individuals
- Meeting with traditional Stakeholder individuals

**Brief explanation**

{NO DATA ENTERED}

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

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

**Brief explanation.**

The close involvement of Institute of Agricultural and Environmental Research scientists with stakeholder groups and individuals provides an almost constant feedback on 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.

## V. Planned Program Table of Content

S. NO.	PROGRAM NAME
1	Analyzing the green industry and related sub-sectors in Tennessee: challenges and prospects
2	Assessment of nutrients in the Collins River basin
3	Biopesticides to control diseases and insects and improve water quality from container nursery stock
4	Controlling imported fire ants in the nursery industry using behavior modifying chemicals
5	Developing a recombinant antibody-based biosensor for rapid detection of salmonella in foods
6	Development of treatments to manage quarantine insects in field nursery production
7	Evaluating strategies to promote the goat meat industry in Tennessee
8	Evaluation and characterization of heirloom varieties of tomato, pepper and eggplant
9	Evaluation of doe reproductive output, fitness and longevity among three meat goat breeds
10	Evaluation of pathogen infectivity in stressed plants.
11	Evaluation of poinsettias and seasonal alternative crops for production in Tennessee
12	Functional studies on cold and heat-regulated genes using tomato as a model plant
13	Germplasm collection and evaluation of Goldenseal clones with superior properties
14	Impact of the tobacco buyout program and strategies to promote economic viability of small farmers
15	Improving families through improved nutrition and well-being of limited resource households
16	Management strategies to improve meat goat and guinea fowl production
17	Molecular approaches for the study of leaf surface microorganisms in ornamental crops
18	Nutritional and management strategies to improve growth and production performance of guinea fowl
19	Pathology research to benefit the Tennessee nursery industry
20	Reducing risk of food borne illness by characterizing food pathogens and risky consumer practices
21	Reducing the costs of food borne illnesses to small producers, selected food handlers and consumers

**V(A). Planned Program (Summary)**

**1. Name of the Planned Program**

Analyzing the green industry and related sub-sectors in Tennessee: challenges and prospects

**2. Brief summary about Planned Program**

This planned program will (1) use secondary data to develop profiles of the green industry and related sub-sectors, (2) provide information for participation in the industry using printed materials and websites, (3) collect primary data using mail surveys and focus groups to identify opportunities and challenges in the industry, (4) develop strategies to assist existing producers and assist the entry of new small producers into the industry and related sub sectors, and (5) analyze consumer behavior towards products and service provided by the green industry and related sub-sectors.

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

**4. Program duration :** Long-Term (More than 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**

● 601	50%	Economics of Agricultural Production and Farm Management
● 604	50%	Marketing and Distribution Practices

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

**1. Situation and priorities**

The green industry is experiencing rapid growth but is dominated by large producers. There are entry barriers (both perceived and real) for small producers. This planned program will address the problem of structure and other issues in the industry.

**2. Scope of the Program**

- In-State Research

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

**1. Assumptions made for the Program**

The industry will continue to grow at the current pace. A reasonable degree of cooperation is expected from producers and consumers. It is assumed that the results of the study will benefit both producers and consumers. The personnel on the project have the necessary skills to conduct the proposed work.

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

To generate research-based results that will enhance the economic well-being of producers and consumers of green industry products.

**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
2008	0.0	0.0	0.0	2.2
2009	0.0	0.0	0.0	2.2
2010	0.0	0.0	0.0	2.2
2011	0.0	0.0	0.0	2.2
2012	0.0	0.0	0.0	2.2

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

Provide information to green industry and related sub-sector service providers at special events such as trade shows and field days.

**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"> <li>Other 1 (None, not an Extension program)</li> </ul>	<ul style="list-style-type: none"> <li>Other 1 (None, not an Extension program)</li> </ul>

**3. Description of targeted audience**

Green industry producers, landscape businesses, consumers of green industry products and services, and policy makers.

**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 Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0

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

**Expected Patent Applications**

2008 :0                      2009 :0                      2010 :0                      2011 :0                      2012 :0





**2. Outcome Type :** Change in Action Outcome Measure

2008 :75                      2009 : 75                      2010 : 75                      2011 :75                      2012 : 75

**3. Associated Knowledge Area(s)**

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

**1. Outcome Target**

Percentage of program participants with increased knowledge of exports potential and opportunities by producers

**2. Outcome Type :** Change in Action Outcome Measure

2008 :50                      2009 : 50                      2010 : 50                      2011 :50                      2012 : 50

**3. Associated Knowledge Area(s)**

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

**V(J). Planned Program (External Factors)**

**1. External Factors which may affect Outcomes**

- Economy
- Public Policy changes
- Government Regulations
- Populations changes (immigration,new cultural groupings,etc.)

**Description**

{NO DATA ENTERED}

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

**1. Evaluation Studies Planned**

- Before-After (before and after program)
- During (during program)
- Case Study

**Description**

{NO DATA ENTERED}

**2. Data Collection Methods**

- Sampling
- On-Site
- Case Study
- Other (Focus groups)

**Description**

{NO DATA ENTERED}

**V(A). Planned Program (Summary)**

**1. Name of the Planned Program**

Assessment of nutrients in the Collins River basin

**2. Brief summary about Planned Program**

The protection of surface water from agricultural pollutants continues to be a major challenge. As such, state and federal water quality regulatory agencies require that emphasis be placed on identifying and restoring impacted water bodies. Therefore, the assessment of streams, lakes and reservoirs requires sound monitoring strategies at the watershed scale. Phosphorus (P) and nitrogen (N) are essential nutrients for crop production. They are also the primary factors that enhance eutrophication. The USEPA has identified eutrophication as the most widespread water quality impairment in the United States, and agriculture as a major source of nutrient loading to surface waters. In middle Tennessee, large concentrations of nursery crop production operations exist in the Collins River watershed. Therefore, the potential for nutrient loading by overland and subsurface flow from these agricultural producers to the Collins River exists. The planned program uses a watershed-based approach and state-of-the-art technologies to evaluate the impacts of nursery crop production on soil and water quality of the Collins River basin. The data collected will be made available to growers and small-scale farmers in forums such as field days and nursery associations' conferences to inform growers of the impact of good and bad environmental stewardship on water quality. Additionally, the data will also be made available to state and local regulatory agencies to help in validating nutrient TMDL for the Collins River.

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

**4. Program duration :** Long-Term (More than 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**

● 112	100%	Watershed Protection and Management
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**V(C). Planned Program (Situation and Scope)**

**1. Situation and priorities**

Many states are concerned about the impact of non-point source pollution on the quality of surface water in their watersheds. Agricultural production contributes to non-point source pollution. The USEPA is now strictly enforcing provisions of the 1972 Federal Clean Water Act by ensuring that states implement a Total Maximum Daily Load (TMDL) for contaminants. In turn, many state regulatory agencies are promulgating laws to ensure that non-point source pollutants are assessed and regulated. Phosphorus (P) and nitrogen (N) are essential nutrients for crop production and are the primary factors contributing to eutrophication. In middle Tennessee, large concentrations of nursery crop production operations exist. The need to produce ornamental and nursery crops of high aesthetic quality has caused a heavy reliance on synthetic fertilizers. Additionally, in nursery crop production systems, non-target application of nursery fertilizer has been reported in published literature; this can result in the migration of the nutrients into water resources. There is a dearth of research on the impact of nursery crop production systems on surface water quality, thus growers are not aware of the impact of their fertilizer and lime management on surface waters, especially when most of the nursery fields lack nutrient management plans. The proposed program will assess nutrient loading from nursery fields and subsequently will help in the development of TMDL of nutrients in impaired water bodies as well as in the development of nutrient management plans for nursery production operations.

**2. Scope of the Program**

- In-State Research

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

**1. Assumptions made for the Program**

Agricultural producers will continue to use fertilizers to improve the quality of their nursery stock. Some of these substances will be detected in streams and lakes. To our knowledge, most growers are not aware of the impact of these chemicals in surface water.

It is expected that the research conducted in this program will replace conjecture with sound data and therefore form the basis for scientifically sound recommendations for determining water protection policy. The planned program is an important advancement in pollution abatement strategy.

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

To assess the concentration of essential nutrients of agricultural fertilizer and lime in surface water to provide needed information for developing Total Maximum Daily Load (TMDL) for essential crop nutrients; thus providing accurate data on which to develop nutrient management plans for nursery production operations.

**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
2008	0.0	0.0	0.0	2.6
2009	0.0	0.0	0.0	2.5
2010	0.0	0.0	0.0	2.5
2011	0.0	0.0	0.0	2.5
2012	0.0	0.0	0.0	2.5

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

Characterize sub-watershed. Assess concentrations of nitrogen, phosphorous, suspended sediments in streams in the Collins river basin. Provide experiential learning opportunities to TSU students. Communicate research findings to appropriate scientific and stakeholder groups.

**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"> <li>Other 1 (None, not an Extension program)</li> </ul>	<ul style="list-style-type: none"> <li>Other 1 (None, not an Extension program)</li> </ul>

**3. Description of targeted audience**

Nursery and other agricultural producers. Fertilizer producers. Regulatory and watchdog 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 Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0

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

**Expected Patent Applications**

2008 :0                      2009 :0                      2010 :0                      2011 :0                      2012 :0

**3. Expected Peer Review Publications**

Year	Research Target	Extension Target	Total
2008	1	0	0
2009	1	0	0
2010	1	0	0
2011	2	0	0
2012	2	0	0

**V(H). State Defined Outputs**

**1. Output Target**

- Scientific publications pertaining to water quality measurement techniques and watershed analysis results

2008 :1                      2009 :1                      2010 :1                      2011 :2                      2012 :2

- Development of water quality analysis techniques

2008 :1                      2009 :1                      2010 :1                      2011 :0                      2012 :0

**V(I). State Defined Outcome**

**1. Outcome Target**

Increase in number of nursery producers with increased awareness of problem/situation

**2. Outcome Type :** Change in Action Outcome Measure

2008 :10                      2009 : 10                      2010 : 10                      2011 :20                      2012 : 20

**3. Associated Knowledge Area(s)**

- 112 - Watershed Protection and Management

**1. Outcome Target**

Number of water bodies removed from 303(d) list

**2. Outcome Type :** Change in Condition Outcome Measure

**2008 :0                      2009 : 0                      2010 : 0                      2011 :1                      2012 : 0**

**3. Associated Knowledge Area(s)**

- 112 - Watershed Protection and Management

**1. Outcome Target**

Number of agricultural producers per year developing a nutrient management plan

**2. Outcome Type :** Change in Action Outcome Measure

**2008 :5                      2009 : 5                      2010 : 5                      2011 :10                      2012 : 10**

**3. Associated Knowledge Area(s)**

- 112 - Watershed Protection and Management

**1. Outcome Target**

Number of students per year gaining experiential learning in water quality analysis

**2. Outcome Type :** Change in Knowledge Outcome Measure

**2008 :1                      2009 : 1                      2010 : 2                      2011 :2                      2012 : 2**

**3. Associated Knowledge Area(s)**

- 112 - Watershed Protection and Management

**V(J). Planned Program (External Factors)**

**1. External Factors which may affect Outcomes**

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

**Description**

{NO DATA ENTERED}

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

**1. Evaluation Studies Planned**

- Before-After (before and after program)
- During (during program)
- Comparisons between program participants (individuals,group,organizations) and non-participants
- Comparisons between different groups of individuals or program participants experiencing different levels of program intensity.

**Description**

{NO DATA ENTERED}

**2. Data Collection Methods**

- Sampling
- Mail
- Observation

**Description**

{NO DATA ENTERED}

**V(A). Planned Program (Summary)**

**1. Name of the Planned Program**

Biopesticides to control diseases and insects and improve water quality from container nursery stock

**2. Brief summary about Planned Program**

Insects and pathogens are common problems in the production of containerized nursery stock. Container nurseries utilize overhead or emitter irrigation systems to promote plant growth. However, the damp conditions in soil media can favor soil-borne pathogens like Phytophthora and Pythium and soil-borne insects like fire ants, scarab larvae, and fungus gnats. These insect pests attack plant roots and reduce the quality of nursery plants and are potential quarantine issues during plant shipments. Soil-borne pathogens cause root and collar rots that reduce growth and may cause plant mortality. To combat pest and disease problems, growers frequently employ the use of conventional insecticides and fungicides. Although pesticides can eliminate pest problems, they are also a source of environmental contamination in water runoff. Environmental regulations governing the quality of water emissions from nurseries are becoming more stringent. In addition, exposure of farm labor to toxic pesticides is always an issue of concern. Alternative biopesticide treatments are one option that could allow nursery producers to manage their pest and disease problems, while at the same time providing good environmental stewardship and reducing the pesticide exposure risk for farm labor. The U.S. Environmental Protection Agency defines biopesticides as a pesticide derived from natural materials like plants, bacteria, and certain minerals. Biopesticides have a number of advantages over conventional pesticides, including: 1) inherently less toxic, 2) generally affect only the target pest, 3) often effective in small quantities, 4) decompose quickly, and 5) can reduce reliance on conventional pesticides. Many of the biopesticides listed by the EPA are plant oils, which can be registered as pesticides, and often used in mixtures. Many plant essential oils and botanical products have known efficacy against insect pests and disease. At the same time, biopesticides are often safer to handlers than conventional synthetic agrochemicals. For example, the EPA Plant Oil Summary section indicates that these oils do not present any known risks to humans or the environment. Therefore, the incorporation of efficacious biopesticides into existing nursery pest management programs.

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

**4. Program duration :** Long-Term (More than 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**

● 133	20%	Pollution Prevention and Mitigation
● 215	80%	Biological Control of Pests Affecting Plants

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

**1. Situation and priorities**

Soil-borne pathogens and insects are common production problems for containerized nurseries. Producers often use pesticides to manage pest and disease problems. However, conventional pesticides can have a number of negative aspects, like toxicity to farm labor and environmental contamination in water runoff from the nursery sites. The priorities for this project are to identify alternative biopesticides that are as effective as conventional pesticides, but at the same time offer greater safety to workers and reduced risk of environmental contamination. A number of biopesticide compounds will be screened against common pathogen and insect agents that routinely infest containerized nursery stock. Effective biopesticide treatments will be identified and incorporated into field-testing to determine treatment efficacy and longevity under standard growing practices. Treatments will also be evaluated for their potential to cause environmental contamination through assessment of chemical contaminants in nursery water. To ensure that treatments are compatible with production nurseries, plant growth and quality will be compared to non-treated plants. A major priority for this project will be to identify efficacious treatments that are safe to the environment and farm labor, yet are compatible with existing production systems.

**2. Scope of the Program**

- In-State Research

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

**1. Assumptions made for the Program**

The proposed project assumes that new biopesticide treatments can be identified, field enhanced for longevity, and that impacts on the environment and plant growth can be measured. Preliminary research by TSU pathology and entomology scientists has determined that biopesticides have potential to manage disease and insect pests comparable to conventional pesticides. For example, kaolin clay was comparable to carbaryl and commercial fungicides in managing the feeding of foliar insects like Japanese beetle and pathogens like powdery mildew. Likewise, preliminary laboratory and field screening has identified a number of plant and essential oil compounds with toxic and repellent properties to imported fire ants and Japanese beetle adults. A major limitation to widespread usage of biopesticides is their short field longevity, which may be remedied by enhancements in formulation. Initial studies provide a basis for successful implementation of the proposed project. We presently have the internal infrastructure, capacity, and experience to perform the research to accomplish these outcomes in the areas of pathology, entomology, chemical ecology, and chemical analysis of water contaminants. The work proposed assumes biopesticide treatments can be developed that will offer growers pest management equivalent to conventional pesticides. At the same time, it is assumed growers will benefit from less regulatory action on their environmental inputs and safer treatments for farm labor.

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

This program will develop environmentally friendly biopesticide treatments to manage diseases and insect pests that commonly infest containerized nursery stock. In addition to identifying new pest management treatments, this program will examine the environmental benefits of using biopesticides as alternatives to conventional pesticides. Chemical leachates will be measured from containerized nursery stock to determine offsite movement of biopesticides and traditional pesticides. Treatment impacts on plant quality will be assessed to determine compatibility of treatments with production of nursery crops.

**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
2008	0.0	0.0	0.0	4.4
2009	0.0	0.0	0.0	4.4
2010	0.0	0.0	0.0	4.4
2011	0.0	0.0	0.0	4.4
2012	0.0	0.0	0.0	4.4

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

The research proposed under this project will identify multiple new biopesticide compounds that can manage soil-borne pathogen and insect problems in container nurseries. The research will be used to expand grower options and offer alternatives that are safer for farm labor and the environment. In addition to finding and developing alternative pest management options, we intend to demonstrate that a significant reduction in offsite environmental contamination can be accomplished by grower adoption of biopesticide pest management options.

**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"> <li>Other 1 (None, not an Extension program)</li> </ul>	<ul style="list-style-type: none"> <li>Other 1 (None, not an Extension program)</li> </ul>

**3. Description of targeted audience**

Nursery producers. Policy makers for regulatory pests like fire ants (e.g., regulatory entities involved with decision making on quarantine treatment approval). Pesticide and chemical 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 Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0

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

**Expected Patent Applications**

2008 :0                      2009 :0                      2010 :0                      2011 :0                      2012 :0

**3. Expected Peer Review Publications**

Year	Research Target	Extension Target	Total
2008	0	0	0
2009	1	0	0
2010	2	0	0
2011	2	0	0
2012	2	0	0

**V(H). State Defined Outputs**

**1. Output Target**

- Scientific publications documenting the efficacy of biopesticides in container nursery crops



2008 :1

2009 :2

2010 : 2

2011 :2

2012 :2

**V(I). State Defined Outcome**

**1. Outcome Target**

New strategies to reduce the offsite movement of conventional pesticides in container nurseries using biorational insect and pathogen treatments.

**2. Outcome Type :** Change in Action Outcome Measure

2008 :1

2009 : 1

2010 : 1

2011 :0

2012 : 0

**3. Associated Knowledge Area(s)**

- 133 - Pollution Prevention and Mitigation
- 215 - Biological Control of Pests Affecting Plants

**1. Outcome Target**

Increase in number of producers aware and educated about the problem

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :200

2009 : 150

2010 : 150

2011 :150

2012 : 150

**3. Associated Knowledge Area(s)**

- 133 - Pollution Prevention and Mitigation
- 215 - Biological Control of Pests Affecting Plants

**1. Outcome Target**

Number of new biopesticide treatments developed

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :1

2009 : 1

2010 : 1

2011 :0

2012 : 0

**3. Associated Knowledge Area(s)**

- 133 - Pollution Prevention and Mitigation
- 215 - Biological Control of Pests Affecting Plants

**1. Outcome Target**

Percent reduction in pesticide movement offsite of research facility

**2. Outcome Type :** Change in Condition Outcome Measure

2008 :0

2009 : 0

2010 : 0

2011 :0

2012 : 20

**3. Associated Knowledge Area(s)**

- 133 - Pollution Prevention and Mitigation
- 215 - Biological Control of Pests Affecting Plants

**V(J). Planned Program (External Factors)**

**1. External Factors which may affect Outcomes**

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

**Description**

{NO DATA ENTERED}

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

**1. Evaluation Studies Planned**

- Before-After (before and after program)
- During (during program)

**Description**

{NO DATA ENTERED}

**2. Data Collection Methods**

- Sampling

**Description**

{NO DATA ENTERED}

**V(A). Planned Program (Summary)**

**1. Name of the Planned Program**

Controlling imported fire ants in the nursery industry using behavior modifying chemicals

**2. Brief summary about Planned Program**

Most insecticide treatments currently available to the nursery industry as well as residential, institutional, and public entities, have broad-spectrum activity on many arthropod species in addition to imported fire ants. The widespread use of general insecticides however, has brought with it environmental and human health concerns including: pesticide contamination of rivers and streams via runoff from treated fields and nurseries; drinking water contamination from the infiltration of pesticides through the soil; and the destruction of wildlife and beneficial insects and mites. A common problem following a fire ant treatment is rapid resurgence of the fire ant population at the treated site. The resurgence occurs for two reasons: 1) fire ants have a very high reproductive rate and can re-colonize areas rapidly, and 2) native ants and other beneficial insects are also eliminated by treatments directed at fire ants. Field nursery producers have three treatment options currently available, including: 1) an in-field broadcast treatment of an approved fire ant bait followed by granular chlorpyrifos (a contact insecticide), 2) a drench of balled and burlapped (B&B) trees in chlorpyrifos, or 3) a B&B dip in chlorpyrifos. The field treatment is cost prohibitive at about \$190 per acre. The dip and drench treatments are cheaper (about \$2.36 and 14.16 per 100 gallon solution used), but the labor, hazard to workers, and environmental consequences of insecticide disposal make these treatments unfeasible. All field nursery treatments require the usage of some form of chlorpyrifos. Slow acting toxic baits are much more effective at long-term control. Those commercially available and effective in imported fire ant control include Amdro with the active ingredient hydramethylnon, and Affirm, with the active ingredient abamectin. This project will isolate and identify attractant chemicals produced by fire ants that can be used to attract foraging imported fire ants to the toxic baits. This treatment measure will specifically target imported fire ants and exclude native ant species and beneficial insects and will be more effective at reducing imported fire ant densities in an area without adverse effects to the environment.

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

**4. Program duration :** Long-Term (More than 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**

● 211	100%	Insects, Mites, and Other Arthropods Affecting Plants
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**V(C). Planned Program (Situation and Scope)**

**1. Situation and priorities**

Compounds of interest in the planned program are ant-produced pheromones and plant-derived essential oils. Repellents will be useful in keeping fire ants out of nursery plants that are being held for shipment as well as in disrupting imported fire ant colony organization. Attractants are useful for delivery of insecticides to fire ant colonies. Reducing fire ant populations would help restore the natural biodiversity of animals that existed before the fire ant invasion. It is a priority of IAgER to continue research into improving best management practices and disseminating these practices to the State's producers of nursery products.

**2. Scope of the Program**

- In-State Research

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

**1. Assumptions made for the Program**

The proposed project assumes that imported fire ant-produced semiochemicals such as alarm and aggregation pheromones as well as plant-produced kairomones can be isolated and identified; that these chemicals can be enhanced for longevity under field conditions; that the chemicals can be used to attract foraging imported fire ants to the toxic baits; and can be used to disrupt imported fire ant colonies without adverse effects to the environment.

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

This project will: 1) isolate and identify attractant chemicals produced by imported fire ants (IFA) and certain plant volatiles that can be used to attract foraging IFAs to insecticide-laden baits; 2) isolate and identify repellent chemicals produced by certain plants that can be used in disrupting imported fire ant colony organization; and 3) evaluate how safe the identified chemicals are to a range of beneficial insects such as phorid flies, that generally predate on imported fire ants.

**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
2008	0.0	0.0	0.0	2.6
2009	0.0	0.0	0.0	2.4
2010	0.0	0.0	0.0	2.4
2011	0.0	0.0	0.0	2.4
2012	0.0	0.0	0.0	2.4

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

The research proposed under this project will identify compounds useful in keeping fire ants out of nursery plants that are being held for shipment as well as from areas where they are a nuisance and where it is not practical to use conventional insecticides because of health and environmental concerns.

**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"> <li>Other 1 (None, not an Extension program)</li> </ul>	<ul style="list-style-type: none"> <li>Other 1 (None, not an Extension program)</li> </ul>

**3. Description of targeted audience**

Nursery producers, schools, parks and recreational facilities, nursing homes.

**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 Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0

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

**Expected Patent Applications**

2008 :0                      2009 :0                      2010 :0                      2011 :0                      2012 :0

**3. Expected Peer Review Publications**

Year	Research Target	Extension Target	Total
2008	1	0	0
2009	2	0	0
2010	1	0	0
2011	1	0	0
2012	1	0	0

**V(H). State Defined Outputs**

**1. Output Target**

- Scientific publications describing the isolation, characterization and efficacy of behavior modifying chemicals in fire ant.

2008 :1                      2009 :2                      2010 :1                      2011 :1                      2012 :1

**V(I). State Defined Outcome**

**1. Outcome Target**

Increase in number of growers with increased awareness of issue

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :100                      2009 : 100                      2010 : 50                      2011 :50                      2012 : 50

**3. Associated Knowledge Area(s)**

- 211 - Insects, Mites, and Other Arthropods Affecting Plants

**1. Outcome Target**

Percentage of nurseries adopting control strategies using newly discovered chemicals

**2. Outcome Type :** Change in Action Outcome Measure

2008 :0                      2009 : 0                      2010 : 5                      2011 :5                      2012 : 10

**3. Associated Knowledge Area(s)**

- 211 - Insects, Mites, and Other Arthropods Affecting Plants

#### **V(J). Planned Program (External Factors)**

##### **1. External Factors which may affect Outcomes**

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

###### **Description**

{NO DATA ENTERED}

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

##### **1. Evaluation Studies Planned**

- Before-After (before and after program)
- During (during program)

###### **Description**

{NO DATA ENTERED}

##### **2. Data Collection Methods**

- Sampling

###### **Description**

{NO DATA ENTERED}

**V(A). Planned Program (Summary)**

**1. Name of the Planned Program**

Developing a recombinant antibody-based biosensor for rapid detection of salmonella in foods

**2. Brief summary about Planned Program**

The incidences of food-borne illness have prompted increased public health concerns. There is an urgent need to explore new detection methods to facilitate implementation of preventive measurements and intervention strategies for foodborne pathogens. The overall goal of this project is to develop an innovative biosensor utilizing recombinant antibodies for rapid detection and identification of Salmonella in foods. The specific objectives of the planned program are to: (1) fabricate a biosensor platform using recombinant antibodies specific to Salmonella (2) characterize overall performance of the biosensor, and (3) validate the biosensor performance in field tests. The project will advance current detection technology for ensuring safety of nation's food supply. Through technology disclosure and transfer, it is anticipated the biosensor will be adapted by food safety inspection agencies and food industries as a surveillance tool to reduce public exposure to Salmonella.

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

**4. Program duration :** Long-Term (More than 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**

● 712	100%	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occuring Toxins
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**V(C). Planned Program (Situation and Scope)**

**1. Situation and priorities**

Microbial pathogens in food cause between 6.5 million and 33 million cases of human illness and up to 9,000 deaths in the United States each year. These illnesses and deaths cost the United States billions of dollars in medical costs and lost productivity. The prevention of foodborne infection requires control measures at all stages of the food chain, from agricultural production, to processing, manufacturing, and preparation of foods in both commercial establishments and the domestic environment. Due to the prevalence of Salmonella species in the food supply, routine and reliable monitoring for these pathogens is necessary to reduce their impact upon human health. Traditional testing methods involving enrichment, isolation, and biochemical characterization require 4 to 5 days to complete. Due to the perishable nature of many food items, a more rapid detection method is necessary to feasibly monitor the potential contaminations. The USDA Food Safety and Inspection Service (FSIS) has established as a research priority the development of sensitive high throughput and/or automated laboratory methods for quantifying foodborne microbial in raw and ready to eat meat and poultry products. These quantitative methods are needed to develop data to utilize dose response estimates in risk assessments, to evaluate intervention strategies, to evaluate process control in plants and to develop meaningful baseline data.

**2. Scope of the Program**

- In-State Research

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

**1. Assumptions made for the Program**

Results from the proposed work will be used by both government agencies and academia to facilitate the development of new pathogen detection technology for ensuring food safety. The products to be developed, including the recombinant antibodies and the detection methodology, are of great interest to companies marketing diagnostic assays for foodborne pathogen detection. These methods will provide advanced detection techniques to food producers, processors and distributors, as well as federal and state health and regulatory agencies (USDA, FDA, and State Health Department) for surveillance and investigation of food safety problems. The biosensor would provide a smaller, inexpensive, and portable device for field applications. The main advantage of the biosensor over conventional assay is its ability to monitor binding rapidly, in real time, and without labels. The development of SPR

sensor would offer cost-effective consumables and an optical design that allows simultaneous analysis of arrayed samples.

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

A safe food supply is an essential component for the development of human potential. The goal of this planned program is to reduce the risk of foodborne illness by providing advanced surveillance technology to food safety inspectors, meat and poultry producers/processors to facilitate identifying and eliminating risk of contaminations.

**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
2008	0.0	0.0	0.0	1.8
2009	0.0	0.0	0.0	1.9
2010	0.0	0.0	0.0	1.9
2011	0.0	0.0	0.0	1.9
2012	0.0	0.0	0.0	1.9

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

Conduct laboratory experiments to develop a biosensor  
 Conduct field trials to evaluate the biosensor  
 Transfer the developed technology to end users

**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"> <li>Other 1 (None, not an Extension program)</li> </ul>	<ul style="list-style-type: none"> <li>Other 1 (None, not an Extension program)</li> </ul>

**3. Description of targeted audience**

Food processors  
 Packaged foods industry

**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 Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0

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

**Expected Patent Applications**

2008 :0                      2009 :0                      2010 :0                      2011 :0                      2012 :0

**3. Expected Peer Review Publications**

Year	Research Target	Extension Target	Total
2008	1	0	0
2009	1	0	0
2010	0	0	0
2011	1	0	0
2012	0	0	0

**V(H). State Defined Outputs**

**1. Output Target**

- Commercializable diagnostic assay for rapid detection of Salmonella in food.

2008 :0                      2009 :1                      2010 :0                      2011 :1                      2012 :0

- Publications relating to rapid detection of Salmonella in foods

2008 :1                      2009 :1                      2010 :0                      2011 :1                      2012 :0

**V(I). State Defined Outcome**

**1. Outcome Target**

Scientific publications concerning rapid detection of Salmonella in foods

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :1                      2009 : 1                      2010 : 0                      2011 :1                      2012 : 0

**3. Associated Knowledge Area(s)**

- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occuring Toxins

**1. Outcome Target**

New technologies developed to detect Salmonella in foods

**2. Outcome Type :** Change in Action Outcome Measure

2008 :0                      2009 : 1                      2010 : 0                      2011 :1                      2012 : 0

**3. Associated Knowledge Area(s)**

- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occuring Toxins

**1. Outcome Target**

Transfer of new Salmonella detection procedures to commercial food industry

**2. Outcome Type :** Change in Condition Outcome Measure

2008 :0                      2009 : 1                      2010 : 0                      2011 :1                      2012 : 0

**3. Associated Knowledge Area(s)**

- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occuring Toxins

**V(J). Planned Program (External Factors)**

**1. External Factors which may affect Outcomes**

- Appropriations changes
- Government Regulations
- Competing Programatic Challenges

**Description**

{NO DATA ENTERED}

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

**1. Evaluation Studies Planned**

- Retrospective (post program)
- During (during program)

**Description**

{NO DATA ENTERED}

**2. Data Collection Methods**

- Sampling

**Description**

{NO DATA ENTERED}

**V(A). Planned Program (Summary)**

**1. Name of the Planned Program**

Development of treatments to manage quarantine insects in field nursery production

**2. Brief summary about Planned Program**

Invasive insects are a serious threat to the sustainability of the nursery industry in the United States. Invasive species have multiple characteristics that are detrimental to society at large, including the ability to easily move in commerce, rapid establishment, disruption of natural ecosystems, harm to human health and property, and damage to agricultural and forest systems. Due to the negative aspects associated with invasive insects, federal and state quarantines are routinely imposed to prevent the artificial movement of these insects into new regions. Quarantines generally require the use of insecticides to certify nursery plants free of invasive insects. Unfortunately, treatment options are often limited to only a few active ingredients that have undergone rigorous certification testing. In situations where only a few insecticide options are available, the ability of nursery growers to ship their plants may be seriously jeopardized if the insecticide becomes unavailable (e.g., manufacturer removal or regulatory action by agencies like the Environmental Protection Agency). Likewise, producers may have little flexibility in the selection of low cost insecticides or active ingredients that are safer to handlers. Two invasive insects currently impacting the Tennessee nursery industry are the imported fire ant (*Solenopsis* spp.) and the Japanese beetle (*Popillia japonica* Newman). Fire ants and Japanese beetle are good examples of quarantined insects with limited treatment options. Field nursery stock treatments for Japanese beetle are limited to a surface band of imidacloprid during May, June, or July or a post-harvest root ball dip in chlorpyrifos. Field nursery stock treatments for fire ants are even more limited and include either a pre-harvest broadcast bait plus granular chlorpyrifos, a post-harvest twice daily for three consecutive day drench in chlorpyrifos, or a post-harvest root ball dip in chlorpyrifos. Four out of five Japanese beetle and fire ant quarantine treatments require chlorpyrifos. If chlorpyrifos were removed from the market, field nursery producers in Tennessee and other states would not be able to ship plants out of the quarantined region. In Tennessee, most plant sales are destined for northern states that are fully quarantined against fire ants, which would represent a loss of about 80% of their market. The proposed study will 1) identify new insecticides that can substitute for chlorpyrifos treatment of field nursery stock and 2) will develop new or improved methodologies for application of insecticide treatments. Multiple insecticide rates will be tested to identify the lowest effective rate, which will minimize environmental impact of treatments and lower worker exposure risk.

**3. Program existence :** Mature (More than five years)

**4. Program duration :** Long-Term (More than 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**

● 211	100%	Insects, Mites, and Other Arthropods Affecting Plants
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**V(C). Planned Program (Situation and Scope)**

**1. Situation and priorities**

Two invasive insects (imported fire ants [IFA] and Japanese beetle [JB]) threaten the farm economy of nursery producers in Tennessee and other southern states. Quarantine treatment methodologies for these two pests are expensive, impractical, and limited to one primary insecticide active ingredient, chlorpyrifos. Most nursery plants transported from southern markets to northern or western states require quarantine treatments for either IFA or JB. The limitation of chlorpyrifos as the major active ingredient in the IFA quarantine (and to a lesser extent the JB quarantine) seriously jeopardizes the entire southern nursery industry if this product becomes unavailable. In addition, most treatment methodologies like dipping or six consecutive drenches are too expensive, harmful to the environment, labor intensive, and impractical for treating large numbers of trees. Existing research indicates other insecticides can function as chlorpyrifos substitutes, but insecticide efficacy and optimal rates must be verified over multiple years to satisfy the adoption standards of regulatory agencies. Likewise, new insecticide active ingredients, surfactants, and plant handling methods may allow for improvement of existing treatment methodologies (e.g., reduction in the number of consecutive drenches required in the IFA drench protocol). The identification of the multiple insecticides, improved rates and handling methodologies will give growers greater latitude in insecticide selection, reduce their costs, and allow continued

shipment of their plant commodities.

**2. Scope of the Program**

- In-State Research

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

**1. Assumptions made for the Program**

Imported fire ants (IFA) and Japanese beetle (JB) are major threats to the economic viability of the U.S. nursery industry. In Tennessee, IFA and JB quarantines impact ~ 80% and 20% of total plant sales, respectively. These quarantines require treatment of nursery plants prior to shipping, impacting profitability of limited use nursery operations. IFA treatment development has primarily targeted container nurseries, resulting in few viable options for major field nursery states like Tennessee and North Carolina. Chlorpyrifos is the main field nursery quarantine treatment. This study assumes new insecticide treatments can be identified that will provide quarantine level management of both IFA and JB. Past trials at TSU demonstrate some insecticides can fit into quarantine programs, forming a basis for the research. The work proposed assumes a cost reduction for growers will be achieved as more insecticide options are available and lower rates are identified. The proposed study assumes grower labor costs can be reduced by improved application methodologies. The TSU Program has the internal infrastructure, capacity, and experience to perform the research to accomplish these outcomes. In addition, an external collaboration base exists with Dr. Michael Reding (USDA-ARS Horticultural Insects Research Laboratory [HIRL]) and Anne-Marie Callcott (USDA-APHIS Soil Inhabiting Pests Laboratory), facilitating objective completion and adoption of new treatments by regulatory agencies. The TSU entomology program is currently part of the 3-Year HIRL Strategic and Tactical Plan.

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

Environmental protection and enhancement through the development of treatments and technologies for managing invasive biotic threats to agricultural and forest resources.

**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
2008	0.0	0.0	0.0	4.6
2009	0.0	0.0	0.0	4.4
2010	0.0	0.0	0.0	4.4
2011	0.0	0.0	0.0	4.4
2012	0.0	0.0	0.0	4.4

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

Research experiments will be conducted with labeled and experimental insecticide compounds that will lead to new or improved fire ant and Japanese beetle quarantine treatments for field nursery plants. The research will be used to expand grower options in the Federal Imported Fire Ant Quarantine and the U.S. Domestic Japanese Beetle Harmonization Plan. The TSU Entomology Program will partner with USDA-ARS and USDA-APHIS collaborators to achieve these outcomes.

**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"> <li>Other 1 (None, not an Extension program)</li> </ul>	<ul style="list-style-type: none"> <li>Other 1 (None, not an Extension program)</li> </ul>

**3. Description of targeted audience**

Nursery producers and policy makers (i.e., regulatory entities involved with decision making on quarantine treatment approval).  
Pesticide and chemical 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 Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0

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

**Expected Patent Applications**

2008 :0                      2009 :0                      2010 :0                      2011 :0                      2012 :0

**3. Expected Peer Review Publications**

Year	Research Target	Extension Target	Total
2008	2	0	0
2009	1	0	0
2010	1	0	0
2011	1	0	0
2012	0	0	0

**V(H). State Defined Outputs**

**1. Output Target**

- Refereed publications pertaining to research findings

2008 :2                      2009 :1                      2010 :1                      2011 :1                      2012 :0

- New techniques for control of Japanese beetle and imported fire ant

2008 :1                      2009 :0                      2010 :0                      2011 :0                      2012 :0

**V(I). State Defined Outcome**

**1. Outcome Target**

Numerical increase in grower awareness via educational talks

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :100                      2009 : 100                      2010 : 100                      2011 :100                      2012 : 100

**3. Associated Knowledge Area(s)**

- 211 - Insects, Mites, and Other Arthropods Affecting Plants

**1. Outcome Target**

Number of educational trade articles to increase grower awareness

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :1                      2009 : 0                      2010 : 1                      2011 :1                      2012 : 0

**3. Associated Knowledge Area(s)**

- 211 - Insects, Mites, and Other Arthropods Affecting Plants

**1. Outcome Target**

Number of refereed manuscripts produced

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :2                      2009 : 1                      2010 : 1                      2011 :1                      2012 : 0

**3. Associated Knowledge Area(s)**

- 211 - Insects, Mites, and Other Arthropods Affecting Plants

**1. Outcome Target**

Development of an improved treatment method for Japanese beetle and imported fire ant

**2. Outcome Type :** Change in Action Outcome Measure

2008 :0                      2009 : 1                      2010 : 0                      2011 :1                      2012 : 0

**3. Associated Knowledge Area(s)**

- 211 - Insects, Mites, and Other Arthropods Affecting Plants

**1. Outcome Target**

Approval of new insecticides or lower rates of existing insecticides in Fire Ant and Japanese Beetle quarantines

**2. Outcome Type :** Change in Condition Outcome Measure

2008 :0                      2009 : 0                      2010 : 0                      2011 :1                      2012 : 1

**3. Associated Knowledge Area(s)**

- 211 - Insects, Mites, and Other Arthropods Affecting Plants

**1. Outcome Target**

Insecticide label changes based on research

**2. Outcome Type :** Change in Condition Outcome Measure

2008 :0

2009 : 0

2010 : 0

2011 :1

2012 : 1

**3. Associated Knowledge Area(s)**

- 211 - Insects, Mites, and Other Arthropods Affecting Plants

**V(J). Planned Program (External Factors)**

**1. External Factors which may affect Outcomes**

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

**Description**

{NO DATA ENTERED}

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

**1. Evaluation Studies Planned**

- Before-After (before and after program)
- During (during program)

**Description**

{NO DATA ENTERED}

**2. Data Collection Methods**

- Sampling

**Description**

{NO DATA ENTERED}

**V(A). Planned Program (Summary)**

**1. Name of the Planned Program**

Evaluating strategies to promote the goat meat industry in Tennessee

**2. Brief summary about Planned Program**

This planned program will explore and evaluate several strategies to promote the goat meat industry in Tennessee. These strategies include economic evaluation of available marketing channels, addressing issues faced by current consumers of goat meat and tier willingness to pay for desired goat meat products, introduction of goat meat to non-traditional individual consumers and restaurants, and assessing the potential for goat meat availability at local mainstream markets. The project results will contribute significantly to promoting the goat meat industry and enhancing the income of small and limited resource farmers.

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

**4. Program duration :** Long-Term (More than 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**

● 502	10%	New and Improved Food Products
● 604	90%	Marketing and Distribution Practices

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

**1. Situation and priorities**

Both the demand and the production of goat meat in the U.S. has increased significantly over the last few decades. Despite this increase in domestic production, the United States is a net importer of goat meat. The demand for domestic production, level of imports, and increasing ethnic population indicate that prospects for the goat meat industry in the United States are promising. Due to its nutritional characteristics, such as it being lean and low fat as compared to other red meat, goat meat has the potential to attract non-traditional (mainstream) consumers. The planned program will evaluate the acceptance of goat meat by non-traditional consumers; assessing potential for goat meat availability at local mainstream markets; and addressing issues faced by current consumers of goat meat and their willingness to pay for desired quality products. There are no organized markets available to the rapidly growing goat meat industry in Tennessee and surrounding states. The majority of producers have no choice but to sell their live animals at local auctions. Lack of competitiveness in the local goat markets is one of the main reasons for producers to receive low prices for animals. The economic evaluation of several available marketing channels will help goat producers to market their animals through efficient channels and receive higher prices for their products. The purpose of this program is to explore several strategies that will assist in promoting the goat meat industry and ultimately result in enhancing the income of small and limited resource farmers in Tennessee.

**2. Scope of the Program**

- In-State Research

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

**1. Assumptions made for the Program**

Over the last several years, there has been a growing demand for goat meat in the United States. The main factor contributing to increased demand for goat meat is the influx of immigrants who have a preference for goat meat in their diet. The largest goat-consuming ethnic populations in the United States are Hispanic, Muslims and Caribbean Islanders. It is assumed that the goat meat industry will grow at a pace parallel with the immigrant population.



It is also assumed that goat meat will attract non-traditional consumers due to its nutritional characteristics such as it being lean and lower in fat as compared to other red meat.

Estimating price spread of different marketing channels will result in identifying efficient and profitable channels which will enhance the income of goat producers.

The success of the goat meat industry in the U.S. will not only depend on efficient marketing channels and consumer acceptance of goat meat, but production efficiency, food safety practices, value added opportunities, animal health and parasite management, market information resources for goat producers and other key areas.

The PI and other staff in the planned program have the necessary skills and abilities to carry out proposed activities successfully.

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

This planned program will explore and evaluate several strategies to assist in promoting and expanding the goat meat industry and will ultimately result in enhancing the income of small and limited resource farmers in Tennessee.

**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
2008	0.0	0.0	0.0	2.6
2009	0.0	0.0	0.0	2.5
2010	0.0	0.0	0.0	2.5
2011	0.0	0.0	0.0	2.5
2012	0.0	0.0	0.0	2.5

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

Case studies with representative goat producers to conduct economic analysis of various marketing channels in use.

Focus group meetings with local retail businesses to assess the potential to make goat meat available at mainstream local retail markets.

Primary survey of non-traditional consumers to evaluate the extent of goat meat acceptance.

Primary survey of traditional goat consumers to identify issues and problems faced in local goat meat markets and their willingness to pay for desired quality and preferences.

Meetings with goat producers, association and other related groups to promote goat industry.

**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"> <li>Other 1 (None, not an Extension program)</li> </ul>	<ul style="list-style-type: none"> <li>Other 1 (None, not an Extension program)</li> </ul>

**3. Description of targeted audience**

Goat producers

Traditional consumers ( individuals who eat goat meat)

Non-traditional consumers ( individuals who have never eaten goat meat before)

Goat producers and marketing associations

Local restaurants and food businesses  
 Policy makers

**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 Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0

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

**Expected Patent Applications**

2008 :0                      2009 :0                      2010 :0                      2011 :0                      2012 :0

**3. Expected Peer Review Publications**

Year	Research Target	Extension Target	Total
2008	2	0	0
2009	2	0	0
2010	2	0	0
2011	2	0	0
2012	2	0	0

**V(H). State Defined Outputs**

**1. Output Target**

- Scientific publications concerning strategies to promote the goat meat industry in Tennessee

2008 :2                      2009 :2                      2010 :2                      2011 :2                      2012 :2

**V(I). State Defined Outcome**

**1. Outcome Target**

Increase in number of goat producers with knowledge of efficient marketing techniques

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :100                      2009 : 100                      2010 : 100                      2011 :100                      2012 : 100

**3. Associated Knowledge Area(s)**

- 502 - New and Improved Food Products
- 604 - Marketing and Distribution Practices

**1. Outcome Target**

Increase in number of local restaurants and businesses with knowledge of potential goat meat demand by consumers.

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :50                      2009 : 50                      2010 : 50                      2011 :50                      2012 : 50

**3. Associated Knowledge Area(s)**

- 604 - Marketing and Distribution Practices

**1. Outcome Target**

Increase in number of goat producers educated in specific consumer preferences

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :75                      2009 : 75                      2010 : 75                      2011 :75                      2012 : 75

**3. Associated Knowledge Area(s)**

- 502 - New and Improved Food Products
- 604 - Marketing and Distribution Practices

**1. Outcome Target**

Increase in demand for goat meat in Tennessee by non-traditional new consumers in Tennessee.

**2. Outcome Type :** Change in Action Outcome Measure

2008 :75                      2009 : 75                      2010 : 75                      2011 :75                      2012 : 75

**3. Associated Knowledge Area(s)**

- 502 - New and Improved Food Products
- 604 - Marketing and Distribution Practices

**1. Outcome Target**

Percent increase in goat meat production in Tennessee

**2. Outcome Type :** Change in Condition Outcome Measure

2008 :25                      2009 : 25                      2010 : 25                      2011 :25                      2012 : 25

**3. Associated Knowledge Area(s)**

- 502 - New and Improved Food Products
- 604 - Marketing and Distribution Practices

**V(J). Planned Program (External Factors)**

**1. External Factors which may affect Outcomes**

- Natural Disasters (drought,weather extremes,etc.)
- Government Regulations
- Populations changes (immigration,new cultural groupings,etc.)

**Description**

{NO DATA ENTERED}

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

### 1. Evaluation Studies Planned

- Retrospective (post program)
- During (during program)

#### Description

{NO DATA ENTERED}

### 2. Data Collection Methods

- Sampling
- On-Site
- Observation

#### Description

{NO DATA ENTERED}

**V(A). Planned Program (Summary)**

**1. Name of the Planned Program**

Evaluation and characterization of heirloom varieties of tomato, pepper and eggplant

**2. Brief summary about Planned Program**

The project will evaluate a number of heirloom varieties of the common solanaceous vegetables: eggplant, pepper and tomato. Field evaluations will be conducted to determine those forms and cultural methods suitable for production in Tennessee. Genetic characterization studies will assist with genetic improvement, and functional components isolated from vegetables will be quantified to promote human health benefits

**3. Program existence :** New (One year or less)

**4. Program duration :** Long-Term (More than 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**

● 202	50%	Plant Genetic Resources
● 205	50%	Plant Management Systems

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

**1. Situation and priorities**

Interest in heirloom varieties of vegetables for human consumption and as ornamentals is increasing as a response to the loss of unique qualities of plants and their produce during commercial breeding of hybrid forms. Historically, open pollinated heirloom varieties are selected due to favorable attributes such as superior flavor of produce and, over time, adaptation to local conditions. Identification of heirloom forms suitable for Tennessee production and demonstration of their beneficial attributes to producers and other stakeholders will increase their production for niche markets in Tennessee and lead ultimately to further genetic improvements of these crops

**2. Scope of the Program**

- In-State Research

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

**1. Assumptions made for the Program**

Consumer interest in value-added crops will continue.  
 Crops that are tolerant to disease, insect and drought stress can be identified.  
 These crops can be profitable in niche markets for small-scale, limited resource producers.

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

To promote heirloom varieties of eggplant, pepper and tomato as niche crops through field evaluations and demonstrations, and to address related areas of plant breeding and human health.

**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
2008	0.0	0.0	0.0	4.2
2009	0.0	0.0	0.0	4.2
2010	0.0	0.0	0.0	4.2
2011	0.0	0.0	0.0	4.2
2012	0.0	0.0	0.0	4.2

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

Conduct field, greenhouse and laboratory research experiments; install and evaluate field demonstration plots.

**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"> <li>Other 1 (None, not an Extension program)</li> </ul>	<ul style="list-style-type: none"> <li>Other 1 (None, not an Extension program)</li> </ul>

**3. Description of targeted audience**

Agricultural research community, crop producers, plant breeders, retailers of vegetable and ornamental plant seeds, Extension agents, policy makers, homeowners.

**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

Year	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
	Target	Target	Target	Target
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0

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

**Expected Patent Applications**

2008 :0                      2009 :0                      2010 :0                      2011 :0                      2012 :0



**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :0                      2009 : 1                      2010 : 1                      2011 :1                      2012 : 0

**3. Associated Knowledge Area(s)**

- 202 - Plant Genetic Resources

**1. Outcome Target**

Number of graduate students trained in DNA based plant characterization techniques

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :0                      2009 : 1                      2010 : 1                      2011 :0                      2012 : 0

**3. Associated Knowledge Area(s)**

- 202 - Plant Genetic Resources

**1. Outcome Target**

Number of DNA fingerprinting protocols established for true-to-type identification

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :0                      2009 : 1                      2010 : 0                      2011 :0                      2012 : 0

**3. Associated Knowledge Area(s)**

- 202 - Plant Genetic Resources

**1. Outcome Target**

Number of protocols for DNA characterization to establish true-to-type identification of varieties examined in project

**2. Outcome Type :** Change in Action Outcome Measure

2008 :0                      2009 : 0                      2010 : 1                      2011 :0                      2012 : 0

**3. Associated Knowledge Area(s)**

- 202 - Plant Genetic Resources

**1. Outcome Target**

Number of significant functional elements (such as amino acids and vitamins) characterized in heirloom varieties

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :0                      2009 : 4                      2010 : 4                      2011 :4                      2012 : 4

**3. Associated Knowledge Area(s)**

- 202 - Plant Genetic Resources

**V(J). Planned Program (External Factors)**

**1. External Factors which may affect Outcomes**

- Populations changes (immigration,new cultural groupings,etc.)
- Natural Disasters (drought,weather extremes,etc.)
- Appropriations changes
- Public Policy changes
- Government Regulations

**Description**

{NO DATA ENTERED}



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

**1. Evaluation Studies Planned**

- Retrospective (post program)
- During (during program)

**Description**

{NO DATA ENTERED}

**2. Data Collection Methods**

- Sampling

**Description**

{NO DATA ENTERED}

**V(A). Planned Program (Summary)**

**1. Name of the Planned Program**

Evaluation of doe reproductive output, fitness and longevity among three meat goat breeds

**2. Brief summary about Planned Program**

The meat goat industry is an immature, expanding industry in Tennessee and across the southeastern US. Presently, the industry is based on doe reproductive output and requires mature does to sustain thier productivity for years to meet consumer demand for chevon or cabrito and to generate replacement doelings to continue herd expansion. This project assess the ability of does, representing distinct breeds, to stay in the herd and be productive over many years under semi-intensive, pasture management conditions that are typical of commercial production systems of the Southeast.

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

**4. Program duration :** Long-Term (More than 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**

● 301	70%	Reproductive Performance of Animals
● 307	30%	Animal Management Systems

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

**1. Situation and priorities**

Many new entrants to the meat goat industry have experienced problems with does remaining healthy and productive because of poor genetic/environmental combinations. Many of the problems stem from environmental constraints that can adversely impact the well-being of meat goats. The course taken by producers has often been to increase inputs to the point that the chance of profit in low and long-term enterprise sustainability is compromised. On the biological side, does unable to remain healthy and productive will have poor reproductive output and likely leave the herd naturally (i.e. die) or by culling.

Increased management inputs and early doe exits from the herd are each costly to the producer, as is the acquisition of replacements that potentially may also suffer from poor fitness and reproductive output. It is generally understood that young does are not as productive as mature females, thus adding another biological and subsequent economic cost. It would be of benefit to producers to maintain a viable herd of mature does that do not require a very intensive, resource demanding management scheme. This can be achieved to a large extent by a better understanding of genetic influences on doe fitness, productivity, and longevity.

**2. Scope of the Program**

- In-State Research

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

**1. Assumptions made for the Program**

Longevity in the meat goat doe herd has not been addressed in the scientific community to date. Among the traditional ruminant livestock industries, female longevity and lifetime productivity are growing in importance and have been the focus of numerous reports in beef and dairy cattle. Many of these reports have included

various approaches to genetic assessment. There are economic costs associated with purchasing or raising replacement females as well as biological costs associated with lower productivity in young females. In the absence of selection based on production level, longevity in females is based on maintaining reproductive function and good health. Genetic fitness and longevity is of increased importance for the meat goat industry because FDA-approved pharmaceuticals for goats are very few in number. Meat goat fitness and longevity is of major concern in Tennessee and across the Southeast because without significant management inputs, environmental conditions in the region create major obstacles to maintaining adequate goat health . Preliminary results from this program indicate significant differences among young straightbred does of three breeds for reproductive and fitness traits, including retention rates in the herd under semi-intensive management. The approach planned here is to follow the founder does of the herd for an extended period of time to better characterize longevity and associated reproductive performance and fitness indicators and assess the impact of attrition and replacement with younger females on annual herd weaning weight output.

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

Improve efficiency of commercial meat goat production in the Southeast by understanding how animal genetics can be managed to enhance doe reproductive output using low to moderate management inputs under southeastern pasture conditions.

**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
2008	0.0	0.0	0.0	2.3
2009	0.0	0.0	0.0	2.3
2010	0.0	0.0	0.0	2.3
2011	0.0	0.0	0.0	2.3
2012	0.0	0.0	0.0	2.3

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

Conduct meat goat experiments on longitudinal doe performance, conduct producer workshops on assessing does for fitness and reproductive output

**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"> <li>Other 1 (None, not an Extension program)</li> </ul>	<ul style="list-style-type: none"> <li>Other 1 (None, not an Extension program)</li> </ul>

**3. Description of targeted audience**

Southeastern meat goat producers

**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 Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0

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

Expected Patent Applications

2008 :0                      2009 :0                      2010 :0                      2011 :0                      2012 :0

**3. Expected Peer Review Publications**

Year	Research Target	Extension Target	Total
2008	1	0	0
2009	2	0	0
2010	1	0	0
2011	1	0	0
2012	1	0	0

**V(H). State Defined Outputs**

**1. Output Target**

- Number of techniques to improve productivity and longevity of meat goat does.

2008 :0                      2009 :0                      2010 :1                      2011 :0                      2012 :0

- Publications to inform producers and researchers of the effects of breed and age on lifetime productivity and longevity of meat goat does managed under Southeastern pastures

2008 :1                      2009 :2                      2010 :1                      2011 :1                      2012 :1

**V(I). State Defined Outcome**

**1. Outcome Target**

Percentage of Tennessee meat goat producers participating in doe record keeping

**2. Outcome Type :** Change in Action Outcome Measure

2008 :10                      2009 : 20                      2010 : 30                      2011 :40                      2012 : 50

**3. Associated Knowledge Area(s)**

- 301 - Reproductive Performance of Animals
- 307 - Animal Management Systems

**1. Outcome Target**

Average increase per herd of doe retention rate

**2. Outcome Type :** Change in Condition Outcome Measure

2008 :0                      2009 : 0                      2010 : 1                      2011 :1                      2012 : 2

**3. Associated Knowledge Area(s)**

- 301 - Reproductive Performance of Animals
- 307 - Animal Management Systems

**V(J). Planned Program (External Factors)**

**1. External Factors which may affect Outcomes**

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

**Description**

{NO DATA ENTERED}

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

**1. Evaluation Studies Planned**

- During (during program)
- Retrospective (post program)
- Time series (multiple points before and after program)

**Description**

{NO DATA ENTERED}

**2. Data Collection Methods**

- Sampling

**Description**

{NO DATA ENTERED}

**V(A). Planned Program (Summary)**

**1. Name of the Planned Program**

Evaluation of pathogen infectivity in stressed plants.

**2. Brief summary about Planned Program**

Stress can influence the severity of pathogen-induced infections of a host. Plants respond to stress by producing proteins that act as molecular chaperones (chaperonins) to protect other host proteins. However, the stress response of the plant may render it susceptible to diseases due to the ability of pathogens to exploit the presence of these host stress proteins. Plants grown in controlled environments can easily be stressed by raising or lowering the temperature regimes. Temperature stress results in a ubiquitous stress response from plants and has been extensively used in molecular studies. Some studies have reported that animals as well as plants under stress are more prone to infection. This planned program will explore the relationship between host stress proteins and pathogen infectivity. The molecular response of in vitro cultures of Solanum spp. to different temperature regimes will be identified. Control and in vitro experimental units subjected to temperature regimes that induce production of partial and complete sets of chaperonins will be exposed to necrotrophic pathogens (e.g. Pithium/Phytophthora). The degree of host susceptibility to the infection will be determined in presence and absence of host chaperonins. Production of host stress proteins will be blocked with anti-sense RNA to elucidate the relationship between the stress proteins and pathogen infectivity. The severity of infection will then be studied to develop strategies to co-manage stress and disease prevention in cultivated plants.

**3. Program existence :** New (One year or less)

**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**

● 203	30%	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
● 212	50%	Pathogens and Nematodes Affecting Plants
● 216	20%	Integrated Pest Management Systems

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

**1. Situation and priorities**

Plant stress response and the development of stress resistant crops is key to the sustainability of modern agriculture and the reduction of the use of pesticides. Crops that undergo stress are more susceptible to pathogen infection. Understanding the molecular basis of a pathogen's ability to exploit the stress response in plants will lead to the development of tools to reduce infections.

**2. Scope of the Program**

- In-State Research

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

**1. Assumptions made for the Program**

Various kinds of environmental stresses such as salinity, high/low temperature, water-logging/drought induce the production of stress proteins that function as molecular chaperones to protect other host proteins. Temperature stress will elicit or induce the requisite ubiquitous stress response from plants and will be used in this study. Though not thoroughly investigated, there have been reports that animals and plants under stress are more prone to infection. Apparently host chaperonins may be recruited by pathogens to aid in the pathogen's survival and to inflict aggressive infectivity. This research will determine the interaction between host stress proteins and increased pathogen infectivity. Development of stress-resistant as well as disease-resistant plants will

remain a priority.

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

Evaluate the interaction of host stress proteins and pathogen infectivity to elucidate the underlying mechanism(s) and thereby contribute in the development of integrated pest management strategies.

**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
2008	0.0	0.0	0.0	1.9
2009	0.0	0.0	0.0	2.0
2010	0.0	0.0	0.0	2.0
2011	0.0	0.0	0.0	2.0
2012	0.0	0.0	0.0	2.0

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

Research in the molecular response of plants to stress and subsequent pathogen establishment.  
 Development of techniques to mitigate the exploitation of plant stress proteins by plants.  
 Development of pathogen resistant plants.

**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"> <li>Other 1 (None, not an Extension program)</li> </ul>	<ul style="list-style-type: none"> <li>Other 1 (None, not an Extension program)</li> </ul>

**3. Description of targeted audience**

Plant pest management researchers and agricultural producers.

**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 Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0

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

**Expected Patent Applications**

2008 :0                      2009 :0                      2010 :0                      2011 :0                      2012 :0

**3. Expected Peer Review Publications**

Year	Research Target	Extension Target	Total
2008	0	0	0
2009	1	0	0
2010	1	0	0
2011	0	0	0
2012	0	0	0

**V(H). State Defined Outputs**

**1. Output Target**

- Techniques for inducing, detecting, and exploiting stress related proteins in plant disease resistance research

2008 :1                      2009 :2                      2010 :2                      2011 :0                      2012 :0

- Scientific publications concerning pathogen infectivity in stress induced plants

2008 :1                      2009 :0                      2010 :1                      2011 :0                      2012 :0

**V(I). State Defined Outcome**

**1. Outcome Target**

Number of integrated stress management and disease prevention strategies developed

**2. Outcome Type :** Change in Action Outcome Measure

2008 :0                      2009 : 1                      2010 : 1                      2011 :1                      2012 :0

**3. Associated Knowledge Area(s)**

- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants
- 212 - Pathogens and Nematodes Affecting Plants
- 216 - Integrated Pest Management Systems



**1. Outcome Target**

Number of molecular mechanisms for plant stress identified

**2. Outcome Type :** Change in Knowledge Outcome Measure

**2008 :1                      2009 : 2                      2010 : 2                      2011 :0                      2012 : 0**

**3. Associated Knowledge Area(s)**

- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants
- 212 - Pathogens and Nematodes Affecting Plants
- 216 - Integrated Pest Management Systems

**1. Outcome Target**

Number of stress and disease resistant plants developed

**2. Outcome Type :** Change in Knowledge Outcome Measure

**2008 :0                      2009 : 1                      2010 : 1                      2011 :0                      2012 : 0**

**3. Associated Knowledge Area(s)**

- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants
- 212 - Pathogens and Nematodes Affecting Plants
- 216 - Integrated Pest Management Systems

**1. Outcome Target**

Number of additional growers, scientists and pest managers aware of issue

**2. Outcome Type :** Change in Knowledge Outcome Measure

**2008 :10                      2009 : 30                      2010 : 40                      2011 :60                      2012 : 60**

**3. Associated Knowledge Area(s)**

- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants
- 212 - Pathogens and Nematodes Affecting Plants
- 216 - Integrated Pest Management Systems

**V(J). Planned Program (External Factors)**

**1. External Factors which may affect Outcomes**

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

**Description**

{NO DATA ENTERED}

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

**1. Evaluation Studies Planned**

- Before-After (before and after program)
- During (during program)
- Time series (multiple points before and after program)

**Description**

{NO DATA ENTERED}

**2. Data Collection Methods**

- Sampling
- Observation

**Description**

{NO DATA ENTERED}

**V(A). Planned Program (Summary)**

**1. Name of the Planned Program**

Evaluation of poinsettias and seasonal alternative crops for production in Tennessee

**2. Brief summary about Planned Program**

The planned program will generate and release data on performance of a wide range of poinsettias and other seasonal alternative crops grown according to industry practices, and will promote superior traditional and newly introduced plant forms that will meet consumer demand. Production and marketing data for these crops will be generated and disseminated to seasonal crop producers.

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

**4. Program duration :** Long-Term (More than 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**

● 202	50%	Plant Genetic Resources
● 205	25%	Plant Management Systems
● 211	25%	Insects, Mites, and Other Arthropods Affecting Plants

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

**1. Situation and priorities**

Poinsettia is the predominant potted flowering crop in the U.S.; this crop generates more revenue than all other potted floral crops combined. Thus, many new cultivars are introduced yearly. Some introductions are not adequately tested for performance prior to release. As fuel costs increase dramatically, it is difficult for producers of greenhouse crops to remain financially sound. It is important for growers, especially small growers, to know which cultivars will perform as expected to meet market demands without plant losses or unnecessary cultural inputs. These evaluations will identify superior cultivars for the Southern U.S. to maintain the financial health of producers. Similar constraints effect other seasonal crops. Furthermore, there is a high consumer demand for new and different crops for various seasons of the year, and the green industry is interested in development of novel crops to augment sales.

**2. Scope of the Program**

- In-State Research

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

**1. Assumptions made for the Program**

Governmental regulations related to agricultural inputs (water quality standards, water use limitations) will continue. Poinsettia will continue to be the predominant potted flowering crop in the U.S. Consumer demand for seasonal floriculture crops will be steady or increase. Growers are interested in selecting crops and production practices appropriate for the price points of their market niche.

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

Evaluate existing and new poinsettia cultivars and alternative seasonal floricultural crops for suitability of production in Tennessee. Only those cultivars with exceptional traits and suitable growing requirements will be promoted for production in the Southern U.S.

**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
2008	0.0	0.0	0.0	2.3
2009	0.0	0.0	0.0	2.3
2010	0.0	0.0	0.0	2.3
2011	0.0	0.0	0.0	2.3
2012	0.0	0.0	0.0	2.3

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

Conduct greenhouse trials of a range of poinsettia cultivars and other seasonal crops. Partner with major U.S. suppliers. Provide training to growers, industry customer reps, and homeowners. Conduct poinsettia open house at which consumer preferences will be surveyed. Generate production and marketing information on new and established poinsettia cultivars as well as alternative seasonal crops.

**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"> <li>Other 1 (None, not an Extension program)</li> </ul>	<ul style="list-style-type: none"> <li>Other 1 (None, not an Extension program)</li> </ul>

**3. Description of targeted audience**

Crop producers, plant breeders, retailers and marketers of ornamental plants, extension agents, homeowners

**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 Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0

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

**Expected Patent Applications**

2008 :0                      2009 :0                      2010 :0                      2011 :0                      2012 :0

**3. Expected Peer Review Publications**

Year	Research Target	Extension Target	Total
2008	1	0	0
2009	1	0	0
2010	0	0	0
2011	1	0	0
2012	1	0	0

**V(H). State Defined Outputs**

**1. Output Target**

- Scientific publications concerning traditional and novelty poinsettias and marketing trends with poinsettias and seasonal crops.

2008 :1                      2009 :1                      2010 :0                      2011 :1                      2012 :1

- Number of students receiving training in seasonal crop production and marketing

2008 :1                      2009 :2                      2010 :2                      2011 :1                      2012 :1

**V(I). State Defined Outcome**

**1. Outcome Target**

Number of cultivars of seasonal crops evaluated

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :50                      2009 : 50                      2010 : 50                      2011 :50                      2012 : 50

**3. Associated Knowledge Area(s)**

- 202 - Plant Genetic Resources
- 205 - Plant Management Systems
- 211 - Insects, Mites, and Other Arthropods Affecting Plants

**1. Outcome Target**

Number of participants in consumer preference analysis

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :250                      2009 : 300                      2010 : 300                      2011 :300                      2012 : 300

**3. Associated Knowledge Area(s)**

- 202 - Plant Genetic Resources
- 205 - Plant Management Systems

**1. Outcome Target**

Number of students receiving training in seasonal crop production and marketing

**2. Outcome Type :** Change in Action Outcome Measure

2008 :1

2009 : 2

2010 : 2

2011 :1

2012 : 1

**3. Associated Knowledge Area(s)**

- 202 - Plant Genetic Resources
- 205 - Plant Management Systems
- 211 - Insects, Mites, and Other Arthropods Affecting Plants

**V(J). Planned Program (External Factors)**

**1. External Factors which may affect Outcomes**

- Natural Disasters (drought,weather extremes,etc.)
- Economy
- Other (Producer profitability)

**Description**

{NO DATA ENTERED}

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

**1. Evaluation Studies Planned**

- During (during program)
- Time series (multiple points before and after program)

**Description**

{NO DATA ENTERED}

**2. Data Collection Methods**

- Sampling
- Observation

**Description**

{NO DATA ENTERED}

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

Functional studies on cold and heat-regulated genes using tomato as a model plant

**2. Brief summary about Planned Program**

High and low temperature stresses adversely affect the growth and yield of agricultural crops. Several genes regulated by low and high temperature have been isolated during studies on molecular mechanisms of cold and heat tolerance in different plant species. The objective of this planned program is to test the function of these genes in sensitive plant species by making gene constructs with sense and anti-sense sequences of the genes and then incorporating these genes into tomatoes, which is sensitive to both low and high temperatures. The transgenic plants will be evaluated for resistance/tolerance to low temperature for seed germination, degree of damages in seedling and floral buds at 4-10C. The heat tolerance will be evaluated for fruit setting and seeds development at 35-40C. Previous observations have shown these temperature extremes (below 10C and above 35C) can affect plants growth, fruit setting and seed development of tomatoes. Genes conferring tolerance in transgenic tomatoes will be patented and used for transforming other plant species to improve their productivity under stress conditions.

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

**4. Program duration :** Long-Term (More than 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**

- |       |      |  |
|-------|------|--|
| ● 201 | 100% | Plant Genome, Genetics, and Genetic Mechanisms |
|-------|------|--|

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

High and low temperature stresses limit crop production area and yield. Genes from other plant species that appear to be responsible for tolerance to temperature extremes have been isolated by this program in other plant species. Tomato is an economic important crop and also a good model plant for genetic studies. It is sensitive to both high and low temperature. This project will incorporate genes cloned from tolerant species into tomato plants. By testing plant growth and yield in transgenic tomato plants, it is possible to determine the function of the isolated genes. Those genes that confer tolerance to high and/or low temperature stress will be patented and used for transformation of other crop species.

**2. Scope of the Program**

- In-State Research

**V(D). Planned Program (Assumptions and Goals)****1. Assumptions made for the Program**

Environmental stresses, especially high and low temperatures will remain a priority item in agricultural research. Occurrence of extreme temperatures caused by climatic changes and pollution has made, and will continue to make, a major impact on agricultural productivity. Increasing and improving temperature tolerances in different plant species is the primary choice, and in some cases the only choice, to maintain the sustainability of agricultural production systems. The availability of gene resources with known functions will ensure the leading role of the US in agricultural research and production in the world.

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

Genes that putatively will enhance resistance to low and high temperature will be tested and characterized. The selected genes will be patented and incorporated into important agricultural crops.

**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
2008	0.0	0.0	0.0	2.1
2009	0.0	0.0	0.0	2.2
2010	0.0	0.0	0.0	2.2
2011	0.0	0.0	0.0	2.2
2012	0.0	0.0	0.0	2.2

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

Conduct gene expression research experiments, provide training for graduate students, develop products and services.

**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"> <li>Other 1 (None, not an Extension program)</li> </ul>	<ul style="list-style-type: none"> <li>Other 1 (None, not an Extension program)</li> </ul>

**3. Description of targeted audience**

Plant breeders, seed companies, scientific colleagues, extension service.

**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 Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0

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



**Expected Patent Applications**

2008 :1                      2009 :2                      2010 :0                      2011 :0                      2012 :0

**3. Expected Peer Review Publications**

Year	Research Target	Extension Target	Total
2008	1	0	0
2009	0	0	0
2010	1	0	0
2011	0	0	0
2012	0	0	0

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

- Scientific publications pertaining to expression of temperature stress genes in plants

2008 :1                      2009 :0                      2010 :1                      2011 :0                      2012 :0

- Patents for temperature stress genes

2008 :1                      2009 :2                      2010 :0                      2011 :0                      2012 :0

- Temperature stress tolerant plant cultivars

2008 :1                      2009 :0                      2010 :1                      2011 :0                      2012 :0

- Techniques to quantify heat and chilling stress tolerance in plants

2008 :0                      2009 :1                      2010 :1                      2011 :0                      2012 :0

**V(I). State Defined Outcome****1. Outcome Target**

Temperature stress tolerant genes identified

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :0                      2009 :1                      2010 :1                      2011 :0                      2012 :0

**3. Associated Knowledge Area(s)**

- 201 - Plant Genome, Genetics, and Genetic Mechanisms

**1. Outcome Target**

Temperature stress tolerant plant cultivars developed

**2. Outcome Type :** Change in Action Outcome Measure

2008 :0                      2009 :1                      2010 :0                      2011 :0                      2012 :0

**3. Associated Knowledge Area(s)**

- 201 - Plant Genome, Genetics, and Genetic Mechanisms

## **V(J). Planned Program (External Factors)**

### **1. External Factors which may affect Outcomes**

- Competing Programatic Challenges
- Economy
- Natural Disasters (drought,weather extremes,etc.)

#### **Description**

{NO DATA ENTERED}

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

### **1. Evaluation Studies Planned**

- During (during program)
- Time series (multiple points before and after program)

#### **Description**

{NO DATA ENTERED}

### **2. Data Collection Methods**

- Sampling

#### **Description**

{NO DATA ENTERED}

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

Germplasm collection and evaluation of Goldenseal clones with superior properties

**2. Brief summary about Planned Program**

This planned program will collect goldenseal (*Hydrastis canadensis*) from different colonies in their native habitats, develop a production system in ground beds and evaluate selections for high production of bioactive ingredient content. Plants with superior ornamental qualities will also be selected. Economic analysis of establishment, production, and marketing costs will be performed to aid new potential producers in initiating activity in this crop.

**3. Program existence :** New (One year or less)

**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**

● 202	100%	Plant Genetic Resources
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**V(C). Planned Program (Situation and Scope)****1. Situation and priorities**

Goldenseal is favored by naturopathists for its ability to heal numerous ailments from hemorrhoids to allergies. It has been used as a remedy for the symptoms of many conditions including sore mouth, sore throat, canker sores, gingivitis, stomachache, diarrhea, indigestion, constipation, ulcers, colds and flu; vaginal irritation; earaches; mild conjunctivitis ("pink eye") or other eye irritations. Externally, goldenseal has been used to treat wounds and skin and eye infections. One of the problems that exist for manufacturers producing standardized medicinal plant products is variability of raw material. Most medicinal plant products are produced from material which has been collected from the wild resulting in a wide range of bioactive ingredient content. The increasing demand for these products has resulted in some of the more effective plants, such as goldenseal, being over-collected to the point of being declared endangered or threatened. Science based agricultural production systems for goldenseal offer logical solutions to these problems while at the same time presenting opportunities for small farmers to enhance efficiency and profitability by producing them as a crop. Present obstacles that impede development of this opportunity are the lack of production information combined with low quality planting stock. This circumstance makes ventures in goldenseal production risky. Development of efficient methods of plantation establishment and identification of high alkaloid yielding cultivars are areas that will benefit from additional research.

**2. Scope of the Program**

- In-State Research

**V(D). Planned Program (Assumptions and Goals)****1. Assumptions made for the Program**

Small farm operations need high value crops to remain viable. Goldenseal is a potentially high value crop that can be produced on small farms. Staff and facilities for the proposed research are available at Tennessee State University. Adequate wild goldenseal germplasm is available in the Southeastern US. Clones with high alkaloid and ornamental characteristics can be identified and multiplied. Cultural methods can be developed to increase small farm production of this crop.

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

Selection of goldenseal (*Hydrastis canadensis*) clones with superior medicinal and ornamental characteristics, and development of cultural practices to maximize the yield of goldenseal clones with superior characteristics. The cultural practices will be tailored to small or limited-resource farmers.

**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
2008	0.0	0.0	0.0	2.3
2009	0.0	0.0	0.0	2.3
2010	0.0	0.0	0.0	2.6
2011	0.0	0.0	0.0	2.6
2012	0.0	0.0	0.0	2.6

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

Germplasm evaluation, DNA analysis, cultivation method development

**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"> <li>Other 1 (None, not an Extension program)</li> </ul>	<ul style="list-style-type: none"> <li>Other 1 (None, not an Extension program)</li> </ul>

**3. Description of targeted audience**

Medicinal plant industry, small farmers, plant breeders, woodland garden designers, homeowners

**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 Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0

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

**Expected Patent Applications**

2008 :0                      2009 :0                      2010 :0                      2011 :1                      2012 :1

**3. Expected Peer Review Publications**

Year	Research Target	Extension Target	Total
2008	1	0	0
2009	1	0	0
2010	1	0	0
2011	2	0	0
2012	1	0	0

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

- Scientific articles pertaining to the identification and improved production practices of Goldenseal.

2008 :1                      2009 :1                      2010 :1                      2011 :2                      2012 :1

- Development of new Goldenseal cultivars

2008 :0                      2009 :0                      2010 :2                      2011 :2                      2012 :2

- Development of microproagation techniques for high berberine/hydrastine yielding cultivars

2008 :1                      2009 :1                      2010 :0                      2011 :0                      2012 :0

- Establishment of demonstration areas for improved cultural practices of Goldenseal

2008 :0                      2009 :2                      2010 :2                      2011 :2                      2012 :2

- Cost analysis for Goldenseal production

2008 :0                      2009 :1                      2010 :1                      2011 :0                      2012 :1

**V(I). State Defined Outcome****1. Outcome Target**

Number of improved Goldenseal cultivars released

**2. Outcome Type :** Change in Condition Outcome Measure

2008 :0                      2009 :0                      2010 :0                      2011 :2                      2012 :2

**3. Associated Knowledge Area(s)**

- 202 - Plant Genetic Resources

**1. Outcome Target**

Number of techniques defined for improved Goldenseal production

**2. Outcome Type :** Change in Action Outcome Measure

2008 :0                      2009 :0                      2010 :1                      2011 :2                      2012 :2

**3. Associated Knowledge Area(s)**

- 202 - Plant Genetic Resources

**1. Outcome Target**

Number of demonstration areas for improved Goldenseal production practices established

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :0

2009 : 1

2010 : 1

2011 :1

2012 : 1

**3. Associated Knowledge Area(s)**

- 202 - Plant Genetic Resources

**V(J). Planned Program (External Factors)**

**1. External Factors which may affect Outcomes**

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

**Description**

{NO DATA ENTERED}

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

**1. Evaluation Studies Planned**

- During (during program)

**Description**

{NO DATA ENTERED}

**2. Data Collection Methods**

- Sampling
- Observation

**Description**

{NO DATA ENTERED}

**V(A). Planned Program (Summary)**

**1. Name of the Planned Program**

Impact of the tobacco buyout program and strategies to promote economic viability of small farmers

**2. Brief summary about Planned Program**

This planned program will focus on increasing awareness, improving record keeping, and increased knowledge in the management and adoption of alternative crops that will enable small farmers to operate economically viable enterprises based on analysis of farm enterprise budgets and assessment of alternative market channels. Results will be shared with extension agents and others working with small farmers to ensure optimal use of limited resources. In addition, the role of frequent direct delivery of assistance to farmers in increasing their income will be examined. Thus, this project will provide practical solutions to address economic challenges faced by small farmers, which has been exacerbated by the tobacco buyout program. The project results are expected to enhance viability of small farm operations.

**3. Program existence :** New (One year or less)

**4. Program duration :** Long-Term (More than 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**

● 604	80%	Marketing and Distribution Practices
● 610	20%	Domestic Policy Analysis

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

**1. Situation and priorities**

Small farmers, who historically have derived a significant portion of their income from growing tobacco, are presently especially economically vulnerable under the tobacco buyout program. One reason for this vulnerability is their operations are not as diversified as those of large agricultural producers. A key question is: what strategies and programs should be pursued to ensure that small farmers will remain economically viable under this circumstance? Economic viability of such farmers will be realized when the farmers are equipped with research-based economic tools that they can apply to their operations.

**2. Scope of the Program**

- In-State Research

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

**1. Assumptions made for the Program**

Results of this project will enhance the knowledge of small farmers and lead to economically viable farm operations. It is assumed that farmers and extension agents will be supportive of this project both in the data collection phase and in delivery of results.

Farmers are also expected to indicate what other (non-tobacco) enterprises they want to operate—if they are staying in farming, or what they plan to do if they exit from farming.

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

To improve the post-tobacco buyout economic well being of small farmers through selection of economically viable alternative enterprises and outreach.

**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
2008	0.0	0.0	0.0	2.2
2009	0.0	0.0	0.0	2.2
2010	0.0	0.0	0.0	2.2
2011	0.0	0.0	0.0	2.2
2012	0.0	0.0	0.0	2.2

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

Focus group meetings will be used to develop a comprehensive survey instrument to be used for collecting data on the current situation and future prospects on various issues in small farm operations. Enterprise budget forms will also be developed to collect data necessary to conduct economic analysis. Results derived from analyses will be made available to farmers to assist them to be economically viable. Brochures, fact sheets and other publications containing project results will be developed and distributed to various stakeholders.

**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"> <li>Other 1 (None, not an Extension program)</li> </ul>	<ul style="list-style-type: none"> <li>Other 1 (None, not an Extension program)</li> </ul>

**3. Description of targeted audience**

Small farmers, extension educators, and policy makers.

**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 Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0



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

**Expected Patent Applications**

2008 :0                      2009 :0                      2010 :0                      2011 :0                      2012 :0

**3. Expected Peer Review Publications**

Year	Research Target	Extension Target	Total
2008	2	0	0
2009	2	0	0
2010	2	0	0
2011	2	0	0
2012	2	0	0

**V(H). State Defined Outputs**

**1. Output Target**

- Scientific publications pertaining to the impact of the tobacco buyout program and strategies to promote economic viability of small farmers

2008 :2                      2009 :2                      2010 :2                      2011 :2                      2012 :2

**V(I). State Defined Outcome**

**1. Outcome Target**

Percentage of program participants with increased awareness about alternative crops

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :100                      2009 : 100                      2010 : 100                      2011 :100                      2012 : 100

**3. Associated Knowledge Area(s)**

- 604 - Marketing and Distribution Practices

**1. Outcome Target**

Percentage of program participants with improved record keeping, management and marketing skills

**2. Outcome Type :** Change in Action Outcome Measure

2008 :75                      2009 : 75                      2010 : 75                      2011 :75                      2012 : 75

**3. Associated Knowledge Area(s)**

- 604 - Marketing and Distribution Practices
- 610 - Domestic Policy Analysis

**1. Outcome Target**

Percentage of program participants adopting alternative crop production

**2. Outcome Type :** Change in Action Outcome Measure

2008 :50                      2009 : 50                      2010 : 50                      2011 :50                      2012 : 50

**3. Associated Knowledge Area(s)**

- 604 - Marketing and Distribution Practices

**1. Outcome Target**

Percentage of program participants with increased farm income

**2. Outcome Type :** Change in Condition Outcome Measure

2008 :20                      2009 : 20                      2010 : 20                      2011 :20                      2012 : 20

**3. Associated Knowledge Area(s)**

- 604 - Marketing and Distribution Practices

**1. Outcome Target**

Percentage of program participants with increased farm diversification

**2. Outcome Type :** Change in Condition Outcome Measure

2008 :50                      2009 : 50                      2010 : 50                      2011 :50                      2012 : 50

**3. Associated Knowledge Area(s)**

- 604 - Marketing and Distribution Practices

**V(J). Planned Program (External Factors)**

**1. External Factors which may affect Outcomes**

- Economy
- Public Policy changes
- Government Regulations

**Description**

{NO DATA ENTERED}

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

**1. Evaluation Studies Planned**

- Before-After (before and after program)
- During (during program)
- Case Study
- Comparisons between program participants (individuals,group,organizations) and non-participants

**Description**

{NO DATA ENTERED}

**2. Data Collection Methods**

- Sampling
- Mail
- Telephone
- On-Site
- Case Study
- Other (Focus groups)

**Description**

{NO DATA ENTERED}

**V(A). Planned Program (Summary)**

**1. Name of the Planned Program**

Improving families through improved nutrition and well-being of limited resource households

**2. Brief summary about Planned Program**

This planned program will focus on the development of programs for children that teach nutrition and health, and will employ innovative strategies for sharing this knowledge with parents/grandparents and other relatives. Emphasis will be placed on techniques for implementing the 2005 Dietary Guidelines when on a limited budget. Additionally, techniques will be used to stimulate the participation of adult males in the project, a group that is often lacking in educational programs. This multigenerational, intergender transmission of beneficial health and nutrition behaviors should lead to enhanced quality of family well-being.

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

**4. Program duration :** Long-Term (More than 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**

● 703	50%	Nutrition Education and Behavior
● 724	50%	Healthy Lifestyle

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

**1. Situation and priorities**

Children who are in poor health have a more difficult time in school, both socially and academically, a situation which is exacerbated by high absenteeism. The Food Safety, Nutrition and Family Well-being Team places a high priority on the development of healthy practices that focus on solutions to challenges faced by socially and economically disadvantaged groups. Family well-being is promoted when children engage their parents/caregivers/relatives in health-promoting activities.

**2. Scope of the Program**

- In-State Research

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

**1. Assumptions made for the Program**

Increased knowledge of healthy behaviors will lead to an increase in healthier behaviors. Analysis of a combination of reported and actual behaviors will lead to a more complete understanding of the link between knowledge and behavior. It is assumed that permission will be given by parents for their children to participate in this planned program. It is further assumed that the children will be able to engage their relatives in the activities.

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

To improve nutrition and health-related behaviors of limited resource households through innovative, family centered educational programs.

**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
2008	0.0	0.0	0.0	3.4
2009	0.0	0.0	0.0	3.4
2010	0.0	0.0	0.0	3.4
2011	0.0	0.0	0.0	3.4
2012	0.0	0.0	0.0	3.4

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

A program will be developed and activities will be designed to educate adults and children in a long-term healthy living lifestyle. Participants will be pre-and post-tested on behavioral changes after participation in the program. The participants will exhibit improved parameters such as healthier weight, lower blood pressure, more desirable percent body fat, better school attendance, and improved family well-being. Targeted stakeholder agencies will benefit from increased parental participation in their programs.

**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"> <li>Other 1 (None, not an Extension program)</li> </ul>	<ul style="list-style-type: none"> <li>Other 1 (None, not an Extension program)</li> </ul>

**3. Description of targeted audience**

Limited resource families in Nashville with children ages 3-8.

**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 Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0

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

**Expected Patent Applications**

2008 :0                      2009 :0                      2010 :0                      2011 :0                      2012 :0

**3. Expected Peer Review Publications**

Year	Research Target	Extension Target	Total
2008	2	0	0
2009	2	0	0
2010	1	0	0
2011	1	0	0
2012	1	0	0

**V(H). State Defined Outputs**

**1. Output Target**

- Scientific publications concerning the challenges of limited resource households in meeting dietary guidelines and food purchasing practices of economically disadvantaged families.

2008 :2                      2009 :2                      2010 :1                      2011 :1                      2012 :1

- Development of complete set of games for project use

2008 :1                      2009 :0                      2010 :0                      2011 :0                      2012 :0

- Development of healthy mini-camp curricula

2008 :0                      2009 :1                      2010 :1                      2011 :0                      2012 :0

- Development of complete set of online lessons for parents

2008 :0                      2009 :0                      2010 :1                      2011 :0                      2012 :0

**V(I). State Defined Outcome**

**1. Outcome Target**

Percentage of participants with increased nutrition knowledge

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :20                      2009 : 20                      2010 : 25                      2011 :25                      2012 : 30

**3. Associated Knowledge Area(s)**

- 703 - Nutrition Education and Behavior
- 724 - Healthy Lifestyle

**1. Outcome Target**

Percentage of participants with improved reported behaviors

**2. Outcome Type :** Change in Action Outcome Measure

2008 :10                      2009 : 12                      2010 : 12                      2011 :12                      2012 : 15

**3. Associated Knowledge Area(s)**

- 703 - Nutrition Education and Behavior

- 724 - Healthy Lifestyle

**1. Outcome Target**

Quarterly percent increase in participation points

**2. Outcome Type :** Change in Action Outcome Measure

2008 :10                      2009 : 10                      2010 : 10                      2011 :10                      2012 : 10

**3. Associated Knowledge Area(s)**

- 703 - Nutrition Education and Behavior
- 724 - Healthy Lifestyle

**1. Outcome Target**

Annual percent increase in number of males participating

**2. Outcome Type :** Change in Action Outcome Measure

2008 :10                      2009 : 10                      2010 : 10                      2011 :10                      2012 : 10

**3. Associated Knowledge Area(s)**

- 703 - Nutrition Education and Behavior
- 724 - Healthy Lifestyle

**1. Outcome Target**

Percentage decrease in school absenteeism

**2. Outcome Type :** Change in Condition Outcome Measure

2008 :0                      2009 : 10                      2010 : 10                      2011 :20                      2012 : 20

**3. Associated Knowledge Area(s)**

- 703 - Nutrition Education and Behavior
- 724 - Healthy Lifestyle

**V(J). Planned Program (External Factors)**

**1. External Factors which may affect Outcomes**

- Natural Disasters (drought,weather extremes,etc.)
- Populations changes (immigration,new cultural groupings,etc.)
- Other (Competition for time of partic.)

**Description**

{NO DATA ENTERED}

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

**1. Evaluation Studies Planned**

- Before-After (before and after program)
- During (during program)

**Description**

{NO DATA ENTERED}

**2. Data Collection Methods**

- Sampling
- On-Site
- Portfolio Reviews
- Other (Participation point charts)

**Description**

{NO DATA ENTERED}

**V(A). Planned Program (Summary)**

**1. Name of the Planned Program**

Management strategies to improve meat goat and guinea fowl production

**2. Brief summary about Planned Program**

The goal of the planned program is to develop and introduce a competitive meat goat and guinea fowl production system for small farmers in Tennessee as an alternative to beef cattle production, tobacco farming, and other farming activities for which small farmers are losing markets, or are likely to lose market share. This multi-disciplinary project will introduce classical and contemporary animal breeding tools (marker assisted selection) to improve production and reproductive efficiency of meat goat and guinea fowl. Major genes that affect economically important traits such as carcass quality and disease resistance will be identified. There has not been much effort in the past to map the goat and guinea fowl genomes. The most comprehensive map for the goat was published in 1998 and there has not been much progress since then. There is also very little reported work on goats and guinea fowl from 1890 Land Grant Institutions. Since the genetic resource information on the guinea fowl is limited, the chicken will be utilized through comparative genomics to provide better understanding of the processes underlying excessive fat deposition which compromises carcass quality of food animals. The effects of amount and duration of nutrient concentrate supplementation, dietary energy and protein content and monensin on goat growth rate on carcass characteristics, net return, nutrient digestibility and nitrogen balance of growing-finishing meat goat will be evaluated. Economic evaluation of various management schemes to determine their feasibility in commercial livestock production systems will be conducted.

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

**4. Program duration :** Long-Term (More than 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**

● 302	20%	Nutrient Utilization in Animals
● 303	20%	Genetic Improvement of Animals
● 304	60%	Animal Genome

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

**1. Situation and priorities**

Poor fitness has been a major obstacle to efficient meat goat production in the southeastern United States. Producers are seeking ways to overcome some of the common feeding and health problems (primarily internal parasitism) experienced in their meat goat herds. Rapid growth rate of meat-type chickens and guinea fowl has compromised carcass quality due to excessive fat deposition, a liability to the processor and consumers. Birds that attain market weight at an early age and yet deposit less carcass fat will be highly desirable. Improvement in management practices and genetic selection through traditional and marker assisted selection is the approach of choice to overcome these problems. Marker assisted selection will facilitate selection for hard-to-evaluate traits. Reduction in abdominal fat content and increased growth rate is the key target in poultry genetic improvement programs. The availability of chicken genetic marker system and genome data makes this approach feasible for both chickens and guinea fowl genetic improvement. Through comparative genomics, available genetic resource information for the chicken will be used to improve guinea fowl selection. Major genes that control growth and adipose accumulation will be identified by analyzing growth and adipose specific transcriptome in chicken, then testing the influence of these genes on growth and fat content in both chicken and guinea fowl reference populations. The proposed model will identify genotypes (alleles) that are favorable for improving guinea fowl genetic performance and meat goat disease resistance.

**2. Scope of the Program**

- In-State Research



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

**1. Assumptions made for the Program**

Enhanced animal performance through improved management techniques and genetic stock will result in greater economic returns. There are genomic loci in meat goat and guinea fowl that control disease resistance and carcass traits. These loci will be identified and successfully applied to marker assisted selection. Some of the genetic variation within the study populations for indicator traits will be associated with the genetic markers. Improved livestock feeding programs will be cost effective. Supplementation of feed with nutrient concentrates and optimization of dietary energy and protein utilization by meat goat will improve carcass characteristics and net returns.

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

Enhance the adoption of meat goat and guinea fowl as alternative livestock for small scale farmers and to ensure sustainability and profitability of the enterprise through improved animal breeding, management and feeding programs.

**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
2008	0.0	0.0	0.0	3.9
2009	0.0	0.0	0.0	3.9
2010	0.0	0.0	0.0	3.9
2011	0.0	0.0	0.0	3.9
2012	0.0	0.0	0.0	3.9

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

Generate a cDNA library for the guinea fowl. Develop chicken, guinea fowl and meat goat genetic resource populations. Use microArray to identify adipose specific transcriptome. Evaluate concentrate supplementation options for meat goat performance.

**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"> <li>Other 1 (None, not an Extension program)</li> </ul>	<ul style="list-style-type: none"> <li>Other 1 (None, not an Extension program)</li> </ul>

**3. Description of targeted audience**

Meat goat industry Poultry industry 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 Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0

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

### Expected Patent Applications

2008 :0                      2009 :0                      2010 :0                      2011 :0                      2012 :0

## 3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2008	2	0	0
2009	4	0	0
2010	3	0	0
2011	3	0	0
2012	2	0	0

## V(H). State Defined Outputs

### 1. Output Target

- Evaluation of livestock management techniques for economic feasibility

2008 :1                      2009 :1                      2010 :1                      2011 :1                      2012 :1

- Development of chicken, Guinea fowl and meat goat genetic resource populations

2008 :1                      2009 :2                      2010 :1                      2011 :1                      2012 :0

- Construction of cDNA library for Guinea fowl

2008 :1                      2009 :0                      2010 :1                      2011 :1                      2012 :0

- Scientific publications relating to management strategies to improve meat goat and guinea fowl production

2008 :2                      2009 :4                      2010 :3                      2011 :3                      2012 :2

## V(I). State Defined Outcome

### 1. Outcome Target

Number of adipose-specific genes identified

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :0                      2009 : 20                      2010 : 30                      2011 :40                      2012 : 50

**3. Associated Knowledge Area(s)**

- 303 - Genetic Improvement of Animals
- 304 - Animal Genome

**1. Outcome Target**

Percentage of overall reduction in fat deposition

**2. Outcome Type :** Change in Condition Outcome Measure

2008 :0                      2009 : 0                      2010 : 5                      2011 :5                      2012 : 5

**3. Associated Knowledge Area(s)**

- 302 - Nutrient Utilization in Animals
- 303 - Genetic Improvement of Animals

**1. Outcome Target**

Number of birds examined in genetic resource population

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :0                      2009 : 200                      2010 : 200                      2011 :200                      2012 : 0

**3. Associated Knowledge Area(s)**

- 304 - Animal Genome

**1. Outcome Target**

Number of meat goats screened for genetic markers

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :0                      2009 : 40                      2010 : 40                      2011 :60                      2012 : 40

**3. Associated Knowledge Area(s)**

- 303 - Genetic Improvement of Animals
- 304 - Animal Genome

**1. Outcome Target**

Number of adipose-specific genes identified

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :0                      2009 : 25                      2010 : 25                      2011 :25                      2012 : 10

**3. Associated Knowledge Area(s)**

- 304 - Animal Genome

**V(J). Planned Program (External Factors)**

**1. External Factors which may affect Outcomes**

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

**Description**

{NO DATA ENTERED}

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

**1. Evaluation Studies Planned**

- After Only (post program)
- Retrospective (post program)
- During (during program)

**Description**

{NO DATA ENTERED}

**2. Data Collection Methods**

- Sampling
- Whole population
- On-Site
- Observation

**Description**

{NO DATA ENTERED}

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

Molecular approaches for the study of leaf surface microorganisms in ornamental crops

**2. Brief summary about Planned Program**

Plant pathogenic pseudomonads, typified by *Pseudomonas syringae* pathovars are a very diverse group of bacteria with respect to their genetics, ecology, and the types of diseases they cause. *Pseudomonas syringae*, which is normally an epiphyte, but can change into a pathogen, has approximately 50 pathovars attacking different hosts in all climatic zones and is arguably the most important plant pathogenic bacterium. This bacterium inhabits the leaf surface simultaneously with a yet uncharacterized diverse population of other microbes. In this planned program, a pathosystem between *Pseudomonas syringae* and ornamental host plants will be established and the microbial diversity of the leaf surface will be characterized. Interactions, such as cell-cell communication between *Pseudomonas* and these other bacteria, will be studied and with the goal of identifying the trigger mechanism for the switch from epiphyte to pathogen.

**3. Program existence :** New (One year or less)

**4. Program duration :** Long-Term (More than 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**

- |       |      |  |
|-------|------|--|
| ● 212 | 100% | Pathogens and Nematodes Affecting Plants |
|-------|------|--|

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

Plant diseases harm the US and the world in many ways; the most obvious and most quantifiable of which is the dollars lost in agriculture, landscape, and forestry through low yields, poor product quality or shelf-life, and decreasing aesthetic or nutritional value. Other, less tangible, costs such as environmental degradation due to heavy use of pesticides and pollution of water resources also exist. Plant disease results from the interaction of three factors: a susceptible host plant, a disease-causing organism, and environmental conditions favorable for pathogen growth. The main tactic of plant disease control/management strategies is to disrupt the disease cycle and break the continuity of the disease. A good plant disease control strategy therefore requires an intimate knowledge of the interactions among these three factors, as well as other external factors influencing these interactions. This planned program seeks to gain an understanding at the mechanistic level of the interactions necessary to initiate the infection process between the important bacterial pathogen *Pseudomonas syringae* and the niche and ornamental crops of importance to Tennessee.

**2. Scope of the Program**

- In-State Research

**V(D). Planned Program (Assumptions and Goals)****1. Assumptions made for the Program**

*Pseudomonas syringae* survives as an epiphyte on leaf surfaces, including surfaces of susceptible plants. When induced by a yet unknown signal, the harmless bacterium switches from the epiphytic mode to a pathogenic mode. The plant leaf surface is also inhabited by a wide diversity of microorganisms which cohabit with *Pseudomonas syringae*. Additionally, many strains of *Pseudomonas syringae* produce the widely prevalent bacterial cell-to-cell (quorum-sensing) signal molecules known as autoinducers (AI). Bacterial cell-to-cell communication is influenced by the concentration of these molecules in the environment. Some *Pseudomonas* strains produce AI but do not respond to it, suggesting that there is some interaction between *Pseudomonas* and other members of the leaf surface community, either in the peaceful coexistence process or the epiphyte-pathogen switch of *Pseudomonas*. Therefore, an understanding of the microbial diversity of the leaf surface and the interaction between these microbes and *Pseudomonas* could reveal the nature of this interaction and offer an opportunity to use this knowledge to block the

epiphyte-pathogen switch possibly by using one of the newly characterized leaf surface neighbors of Pseudomonas.

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

An increased understanding of the diversity of leaf surface microbes and their interactions with each other and the ornamental host plant, leading to new disease control techniques.

**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
2008	0.0	0.0	0.0	2.5
2009	0.0	0.0	0.0	2.5
2010	0.0	0.0	0.0	2.5
2011	0.0	0.0	0.0	2.5
2012	0.0	0.0	0.0	2.5

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

Development of a pathosystem between Pseudomonas and ornamental/nursery crops. Optimize the parameters important for the pathogenicity process. Characterize the diversity and community structure of leaf surface microorganisms in the natural environments under diseased and healthy conditions. Characterize the interactions between epiphytic populations of Pseudomonas. Make comparisons between epiphytic microbial populations in diseased and healthy plants. Make comparisons between epiphytic microbial populations on different hosts. Make comparisons between epiphytic microbial populations in plants grown under different conditions. Generate a list of microbial organisms which cohabitate the phyllosphere with the Pseudomonas bacteria. Assess the possible use of any of these epiphytic organism as a biocontrol agent to be armed with anti-pathogen activities. Provide experiential learning to TSU students on agricultural biotechnology.

**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"> <li>Other 1 (None, not an Extension program)</li> </ul>	<ul style="list-style-type: none"> <li>Other 1 (None, not an Extension program)</li> </ul>

**3. Description of targeted audience**

The immediate primary audience is the agricultural research community interested in understanding plant disease at the molecular level and using this understanding to design alternative disease management strategies. Regulatory agencies will also use the knowledge generated for policy formulation and growers will benefit from improved disease management strategies developed.

**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 Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0

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

2008 :0                      2009 :0                      2010 :0                      2011 :0                      2012 :0

**3. Expected Peer Review Publications**

Year	Research Target	Extension Target	Total
2008	1	0	0
2009	2	0	0
2010	1	0	0
2011	1	0	0
2012	1	0	0

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

- Scientific publications relating to plant/leaf microbe interactions

2008 :1                      2009 :2                      2010 :1                      2011 :1                      2012 :1

- Number of techniques to evaluate host/leaf surface microbe interactions

2008 :1                      2009 :1                      2010 :0                      2011 :1                      2012 :1

- Number of pertinent bacterial strains identified

2008 :2                      2009 :2                      2010 :0                      2011 :2                      2012 :2

**V(I). State Defined Outcome****1. Outcome Target**

Number of host/Pseudomonas pathosystems elucidated

**2. Outcome Type :** Change in Knowledge Outcome Measure

**2008 :1                      2009 : 0                      2010 : 0                      2011 :0                      2012 : 0**

**3. Associated Knowledge Area(s)**

- 212 - Pathogens and Nematodes Affecting Plants

**1. Outcome Target**

Number of potential biocontrol candidates identified

**2. Outcome Type :** Change in Knowledge Outcome Measure

**2008 :0                      2009 : 1                      2010 : 0                      2011 :1                      2012 : 1**

**3. Associated Knowledge Area(s)**

- 212 - Pathogens and Nematodes Affecting Plants

**1. Outcome Target**

Number of crops with blocked epiphyte-pathogen switch identified

**2. Outcome Type :** Change in Condition Outcome Measure

**2008 :0                      2009 : 0                      2010 : 1                      2011 :1                      2012 : 1**

**3. Associated Knowledge Area(s)**

- 212 - Pathogens and Nematodes Affecting Plants

**V(J). Planned Program (External Factors)**

**1. External Factors which may affect Outcomes**

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

**Description**

{NO DATA ENTERED}

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

**1. Evaluation Studies Planned**

- During (during program)
- Time series (multiple points before and after program)

**Description**

{NO DATA ENTERED}

**2. Data Collection Methods**

- Sampling
- Observation

**Description**

{NO DATA ENTERED}



**V(A). Planned Program (Summary)**

**1. Name of the Planned Program**

Nutritional and management strategies to improve growth and production performance of guinea fowl

**2. Brief summary about Planned Program**

The goal of this planned program is to enhance production efficiency, adoption and profitability of the guinea fowl as alternative poultry for small scale and limited resource farmers in Tennessee. The requirements for cage space, metabolizable energy and crude protein by the guinea fowl have previously been determined; however, lacking in these requirements is optimum floor requirement for guinea fowl as well as the requirement for macro-minerals such as calcium and phosphorus and essential amino acids such as methionine and lysine for optimum performance of the guinea fowl. The requirement for floor space and selected macro-minerals (calcium and phosphorus) and essential amino acids (methionine and lysine) for optimum performance of the guinea fowl will be evaluated. Dose response experiments with varying dietary levels of each individual macro-minerals and essential amino acid will be conducted with French and Pearl Grey guinea fowl from hatch to ten weeks of age and during the laying period. The optimum levels of these nutrients will be determined by growth performance, carcass characteristics and egg production of the experimental birds. Findings from this research will be published in the Journal of Poultry Science and optimum levels of these nutrients will be recommended to guinea fowl producers.

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

**4. Program duration :** Long-Term (More than 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**

● 302	50%	Nutrient Utilization in Animals
● 307	50%	Animal Management Systems

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

**1. Situation and priorities**

The guinea fowl can serve as alternative poultry crop for small scale and limited resource farmers in Tennessee since tobacco farming and other farming activities are losing markets or are likely to lose market share. The potential for guinea fowl production for food and profit has increased in the last few years. However, feeding cost, which accounts for about 75-80% of the total cost of poultry production, is a major constraint to guinea fowl production. Optimum cage space allowance as well as dietary crude protein and metabolizable energy requirements of the guinea fowl have been evaluated. Optimization of other parameters, such as optimum floor space requirement for the guinea fowl and the requirement for macro-minerals such as calcium and phosphorus and essential amino acids such as methionine and lysine for optimum performance of the guinea fowl are needed. Calcium and phosphorus are primarily necessary for bone and egg formation as well as other biochemical functions. Amino acids are the building blocks of the body. Phosphorus is also required in the metabolism of carbohydrates and fats and it is a component of all living cells. Dietary protein is normally added to supply all required essential amino acids except methionine, lysine and threonine, which must be supplemented. Excesses of these nutrients in poultry feed can increase feeding cost significantly, they also contribute to environmental pollution. The optimum levels of calcium and phosphorus will complement the genetic potential for bird performance and improve efficiency of feed utilization and profitability of the guinea fowl production enterprise.

**2. Scope of the Program**

- In-State Research

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

**1. Assumptions made for the Program**

Several assumptions that will contribute to the success of the proposed project include:

- 1) Optimum nutrient levels in rations of guinea fowl will improve bird performance
- 2) Environmental factors such as temperature and humidity will be controlled successfully and not confound the studies.
- 3) Experimental birds will be readily available when needed to initiate studies
- 4) Improved feeding programs for the guinea fowl will minimize feeding cost and enhance success of the guinea fowl production enterprise.

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

To enhance production performance, adoption and profitability of the guinea fowl by small scale farmers and to ensure sustainability of the enterprise through improved management and feeding programs.

**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
2008	0.0	0.0	0.0	3.3
2009	0.0	0.0	0.0	3.3
2010	0.0	0.0	0.0	3.3
2011	0.0	0.0	0.0	3.3
2012	0.0	0.0	0.0	3.0

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

To enhance performance and adoption of guinea fowl as alternative livestock for small scale farmers the following activities will be carried out:

- Determine optimum floor space allowance for guinea fowl;
- Determine optimum requirement for dietary calcium and phosphorus by guinea fowl; and
- Determine optimum dietary requirement for methionine and lysine by guinea fowl.

**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"> <li>● Other 1 (None, not an Extension program)</li> </ul>	<ul style="list-style-type: none"> <li>● Other 1 (None, not an Extension program)</li> </ul>

**3. Description of targeted audience**

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 Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0

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

**Expected Patent Applications**

2008 :0                      2009 :0                      2010 :0                      2011 :0                      2012 :0

**3. Expected Peer Review Publications**

Year	Research Target	Extension Target	Total
2008	1	0	0
2009	2	0	0
2010	3	0	0
2011	2	0	0
2012	2	0	0

**V(H). State Defined Outputs**

**1. Output Target**

- Scientific publications concerning the optimization of parameters for guinea fowl production

2008 :1                      2009 :2                      2010 :3                      2011 :2                      2012 :2

- Dietary recommendations to guinea fowl producers for optimal production

2008 :1                      2009 :1                      2010 :1                      2011 :1                      2012 :1

- Technique to determine optimal nutrient composition of guinea fowl diet

2008 :0                      2009 :1                      2010 :0                      2011 :1                      2012 :0

**V(I). State Defined Outcome**

**1. Outcome Target**

Dietary recommendations for amino acid and mineral nutrition of guinea fowl

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :1                      2009 : 1                      2010 : 0                      2011 :1                      2012 : 0

**3. Associated Knowledge Area(s)**

- 302 - Nutrient Utilization in Animals
- 307 - Animal Management Systems

**1. Outcome Target**

Percentage of producers realizing savings in feeding costs

**2. Outcome Type :** Change in Condition Outcome Measure

2008 :0                      2009 : 0                      2010 : 90                      2011 :90                      2012 : 90

**3. Associated Knowledge Area(s)**

- 307 - Animal Management Systems

**1. Outcome Target**

Percentage of producers aware of recommendations for floor space, calcium and phosphorus

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :80                      2009 : 90                      2010 : 90                      2011 :95                      2012 : 95

**3. Associated Knowledge Area(s)**

- 302 - Nutrient Utilization in Animals
- 307 - Animal Management Systems

**1. Outcome Target**

Percentage of producers implementing recommendations

**2. Outcome Type :** Change in Condition Outcome Measure

2008 :0                      2009 : 80                      2010 : 90                      2011 :95                      2012 : 95

**3. Associated Knowledge Area(s)**

- 302 - Nutrient Utilization in Animals
- 307 - Animal Management Systems

**1. Outcome Target**

Percentage of producers realizing profitability after adoption of recommendations

**2. Outcome Type :** Change in Condition Outcome Measure

2008 :0                      2009 : 80                      2010 : 90                      2011 :95                      2012 : 95

**3. Associated Knowledge Area(s)**

- 302 - Nutrient Utilization in Animals
- 307 - Animal Management Systems

**V(J). Planned Program (External Factors)**

**1. External Factors which may affect Outcomes**

- Natural Disasters (drought,weather extremes,etc.)
- Appropriations changes
- Competing Programatic Challenges

**Description**

{NO DATA ENTERED}

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

**1. Evaluation Studies Planned**

- After Only (post program)
- During (during program)

**Description**

{NO DATA ENTERED}

**2. Data Collection Methods**

- Sampling
- Observation

**Description**

{NO DATA ENTERED}

**V(A). Planned Program (Summary)**

**1. Name of the Planned Program**

Pathology research to benefit the Tennessee nursery industry

**2. Brief summary about Planned Program**

Diseases that impact nursery production of woody ornamentals include foliage diseases such as powdery mildew, leaf spots, leaf blights, and anthracnose and soil-borne diseases include root and collar rots, cankers, wilts and die-backs. In addition to reducing the aesthetic value of infected plants, disease problems cause loss of revenue to growers by impacting plant growth and causing plant mortality. Some ornamental plants such as hydrangea have recently increased in popularity and many cultivars are available. However there is no information on genetic resistance that may be available in different cultivars. Due to the high cash value of woody ornamentals, chemical pesticides are routinely used to control diseases and this increases production costs, increases the potential for environmental contamination and increases safety concerns over accidental exposures to hazardous chemicals. Soil-borne pathogens affecting woody ornamentals include Phytophthora spp., Armillaria spp, and Botryosphaeria. However, other soil-borne pathogens such as Pythium, Rhizoctonia, Verticillium, and Fusarium are economically important on other crop systems and their importance in woody ornamentals is not known. Some of the pathogens may interact to produce disease complexes that may be difficult to control with a single chemical. The objectives of this planned program are as follows: (1) Evaluate and identify disease resistance to powdery mildew and Cercospora leaf spot/blight in commercial cultivars of Hydrangea macrophylla; (2) Survey mid-Tennessee nurseries and identify soil-borne pathogens that impact the production of woody ornamentals; (3) Assess the prevalence of different soil-borne pathogens and their effect on different hosts in relation to environmental conditions; and (4) Identify potential disease complexes that may result from the interaction of different pathogens. Information on disease resistance in hydrangea cultivars will allow growers to make informed decisions on cultivars to grow. The use of resistant cultivars will likely reduce fungicide use and production costs and increase grower profit from plant sales. Information on soil-borne pathogens will facilitate the development of improved disease management strategies.

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

**4. Program duration :** Long-Term (More than 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**

● 212	50%	Pathogens and Nematodes Affecting Plants
● 215	50%	Biological Control of Pests Affecting Plants

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

**1. Situation and priorities**

Disease problems are important constraints in production and landscape planting of woody ornamentals. These diseases include powdery mildew, leafspots and blights, anthracnose, root and collar rot, cankers, die-back and viruses. Foliage diseases are routinely controlled with chemical pesticides, but this practice increases production costs and reduces profit. Genetic resistance is the best method for disease control. Plant wilting, chlorosis, drooping of leaves, die-back of top branches, root and collar rot, cankers and swellings on the stem or sudden death are all symptoms associated with soil-borne pathogens. The recommended treatment of the soil-borne pathogens commonly involves chemical pesticides, but incorrect identification of the pathogen(s) may result in treatment failures. Soil-borne fungi that are often associated with woody ornamentals include Phytophthora spp., Armillaria spp., and Botryosphaeria spp. However, soil-borne fungi such as Pythium, Rhizoctonia, Verticillium, and Fusarium, are also important pathogens commonly found in the soil. These pathogens have been associated with root rots, wilts and stem infections. However, little is known about these pathogens in woody ornamentals. Although Phytophthora is the best known soil borne pathogen, specific species affecting different ornamental plants are not well documented. Phytophthora species differ in their life cycles and stages in which they are vulnerable for disease intervention. There are more than 50 species of Phytophthora and information on the identity of species important in woody ornamentals will enhance the development of disease management strategies.

**2. Scope of the Program**

- In-State Research

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

**1. Assumptions made for the Program**

Hydrangea has emerged as an important ornamental plant; foliage diseases such as powdery mildew and cercospora leaf spot are the two most important diseases of hydrangea. Although many cultivars are available to nursery growers and the landscape industry, there is no centralized data on the relative resistance or susceptibility of commercial cultivars to the two most important diseases. It is reasonable to assume that commercial cultivars exhibit different levels of susceptibility. Nursery growers often use fungicides to control foliage diseases, but genetic resistance is the best economical method for growers. The identification of genetic resistance in commercial cultivars will provide important information that will allow growers and the landscape industry to make informed decisions on the choices of cultivars they grow. Symptoms from soil-borne pathogens are often non-specific to a particular pathogen and similar symptoms such as root rots, collar rot, wilts, etc. may result from Phytophthora, Pythium, Rhizoctonia, Fusarium or Verticillium infections. Application of fungicides without knowing the pathogen is often risky because specific fungicides are effective against specific pathogens. Furthermore, symptoms from soil-borne pathogens often are observed when infection is advanced and their control is difficult. Information on the pathogen identity is important in selecting the best product for disease management. Thus, the documentation of soil-borne pathogens that occur in different woody ornamentals will facilitate early detection and identification and enhance early intervention using appropriate disease control products. Results from this project will benefit nursery and landscape industries by increasing efficiency and disease control effectiveness. Although Phytophthora is the best known soil borne pathogen, specific species affecting different ornamental plants are not well documented. Phytophthora species differ in their life cycles and stages in which they are vulnerable for disease intervention. There are more than 50 species of Phytophthora and information on the identity of species important in woody ornamentals will enhance the development of disease management strategies.

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

Disease constraints on nursery production systems increase production costs and reduce grower profits. This planned program will identify disease constraints that are economically important and develop disease management strategies that are economically feasible and environmentally friendly to all growers and particularly suited to growers with limited resources.

**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
2008	0.0	0.0	0.0	4.5
2009	0.0	0.0	0.0	4.4
2010	0.0	0.0	0.0	4.4
2011	0.0	0.0	0.0	4.4
2012	0.0	0.0	0.0	4.4

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

Research to identify powdery mildew resistance, resistance to cercospora leafspot/blight. Research to identify and catalog soil-borne pathogens prevalent in the Tennessee nursery industry.

**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"> <li>Other 1 (None, not an Extension program)</li> </ul>	<ul style="list-style-type: none"> <li>Other 1 (None, not an Extension program)</li> </ul>

**3. Description of targeted audience**

Nursery producers, landscape industry, home owners, pathology scientists.

**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 Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0

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

**Expected Patent Applications**

2008 :0                      2009 :0                      2010 :0                      2011 :0                      2012 :0

**3. Expected Peer Review Publications**

Year	Research Target	Extension Target	Total
2008	1	2	0
2009	1	2	0
2010	1	2	0
2011	1	2	0
2012	1	2	0

**V(H). State Defined Outputs**

**1. Output Target**

- Scientific publication concerning disease resistance/susceptibility in hydrangea and identification of soil borne diseases

2008 :1                      2009 :2                      2010 :1                      2011 :0                      2012 :0



**V(I). State Defined Outcome**

**1. Outcome Target**

Increase in number of growers aware of resistant cultivars

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :75                      2009 : 75                      2010 : 75                      2011 :75                      2012 : 125

**3. Associated Knowledge Area(s)**

- 212 - Pathogens and Nematodes Affecting Plants
- 215 - Biological Control of Pests Affecting Plants

**1. Outcome Target**

Increase in number of growers aware of causes of pathogens and their survival

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :75                      2009 : 75                      2010 : 75                      2011 :75                      2012 : 100

**3. Associated Knowledge Area(s)**

- 212 - Pathogens and Nematodes Affecting Plants
- 215 - Biological Control of Pests Affecting Plants

**1. Outcome Target**

Increase in number of growers aware of soil-borne disease prevention methods

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :75                      2009 : 75                      2010 : 75                      2011 :100                      2012 : 100

**3. Associated Knowledge Area(s)**

- 212 - Pathogens and Nematodes Affecting Plants
- 215 - Biological Control of Pests Affecting Plants

**1. Outcome Target**

Percentage of growers with reduced plant mortality by exercising preventative measures

**2. Outcome Type :** Change in Condition Outcome Measure

2008 :0                      2009 : 0                      2010 : 20                      2011 :50                      2012 : 50

**3. Associated Knowledge Area(s)**

- 212 - Pathogens and Nematodes Affecting Plants
- 215 - Biological Control of Pests Affecting Plants

**1. Outcome Target**

Compendium of soil borne pathogens of economic importance to the Tennessee nursery industry

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :0                      2009 : 0                      2010 : 1                      2011 :0                      2012 : 0

**3. Associated Knowledge Area(s)**

- 212 - Pathogens and Nematodes Affecting Plants

**1. Outcome Target**

Percentage of Tennessee growers aware of disease resistant hydrangea cultivars

**2. Outcome Type :** Change in Action Outcome Measure

2008 :0

2009 : 10

2010 : 20

2011 :50

2012 : 50

**3. Associated Knowledge Area(s)**

- 212 - Pathogens and Nematodes Affecting Plants
- 215 - Biological Control of Pests Affecting Plants

**V(J). Planned Program (External Factors)**

**1. External Factors which may affect Outcomes**

- Natural Disasters (drought,weather extremes,etc.)

**Description**

{NO DATA ENTERED}

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

**1. Evaluation Studies Planned**

- Before-After (before and after program)

**Description**

{NO DATA ENTERED}

**2. Data Collection Methods**

- Sampling
- Observation

**Description**

{NO DATA ENTERED}

**V(A). Planned Program (Summary)**

**1. Name of the Planned Program**

Reducing risk of food borne illness by characterizing food pathogens and risky consumer practices

**2. Brief summary about Planned Program**

Through a multi-disciplinary, multi-faceted approach, including the analysis of consumer practice data and microbial characterization, the potential for cross contamination of foods within the home environment will be investigated. Risky food handling practices will be identified. Food borne pathogens originating from meat goat and guinea fowl will be evaluated. Management strategies to reduce the prevalence of these organisms in these meat animals will be communicated. Following the identification of risk factors, targeted educational materials will be developed and made available to end-users. Follow-up assessment to measure implementation of recommendations will be conducted.

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

**4. Program duration :** Long-Term (More than 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**

● 504	10%	Home and Commercial Food Service
● 712	90%	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occuring Toxins

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

**1. Situation and priorities**

Food safety is an increasingly important public health issue. Food borne illness continues to be the cause of many lost work hours and high medical costs. In the United States, for example, around 76 million cases of food borne diseases, resulting in 325,000 hospitalizations and 5,000 deaths, are estimated to occur each year. Known causes include improper methods of production and processing, cross contamination, and other forms of mishandling. Research on potential causes of food borne illness from farm to table is important. In the United States, interest in raising meat goat and guinea fowl as alternative livestock by small scale farmers has increased in the last few years. Intensive production, which is in most part associated with confinement, is a common practice. Such environmental conditions are quite conducive to proliferation of pathogenic microorganisms in these food animals. These microorganisms, such as Campylobacter in the case of poultry, can cause human illnesses through direct contact either in production or processing facilities or through consumption of contaminated animal products. Meat products such as goat can also be contaminated with Campylobacter which can contribute to human illness. Other risks include contact with untreated water and exposure to live birds. Little information is available on the potential for microbial contamination in alternative meat and poultry products. Although numerous studies have been conducted on commercial food handling practices, less is known about in-home practices. In a preliminary study, the prevalence of pathogens was higher in refrigerators of low income households. Further investigation into this finding is needed. No studies have been identified that looked at microbial levels of packages of ready-to-eat foods when purchased and the potential for the transfer of the microbes to the food during transportation, preparation and storage.

**2. Scope of the Program**

- In-State Research

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

**1. Assumptions made for the Program**

Implementation of proper management practices in livestock production and in the home will minimize possible sources of microorganisms. Consumers will change risky behaviors if evidence is presented that current practices are not adequate or

effective. Consumers in the needed demographic groups will give permission for data collection in the home.

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

A safe food supply is an essential component for the development of human potential. Knowledge of what people eat and how they manage their food, especially how they store perishable and ready to eat foods to keep them safe, are key areas in which the Food Safety, Nutrition, and Family Well-Being Research Team is focusing its efforts. This program will identify risky behaviors and potential sources of food contamination with the goal of developing relevant educational materials to reduce these behaviors.

**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
2008	0.0	0.0	0.0	2.4
2009	0.0	0.0	0.0	3.0
2010	0.0	0.0	0.0	3.0
2011	0.0	0.0	0.0	3.0
2012	0.0	0.0	0.0	3.0

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

Analyze survey data on consumer transportation, usage and storage of foods to identify risky behaviors and assess potential for cross contamination. Perform microbial analysis of samples collected from meat, poultry, food samples, packages and home refrigerators. Develop strategies to minimize potential for food borne illness originating from improper food handling and animal management practices.

**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"> <li>Other 1 (None, not an Extension program)</li> </ul>	<ul style="list-style-type: none"> <li>Other 1 (None, not an Extension program)</li> </ul>

**3. Description of targeted audience**

Alternative meat and poultry producers, consumers, risk assessment 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 Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0

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

**Expected Patent Applications**

**2008 :0                      2009 :0                      2010 :0                      2011 :0                      2012 :0**

**3. Expected Peer Review Publications**

Year	Research Target	Extension Target	Total
2008	2	0	0
2009	0	0	0
2010	1	0	0
2011	1	0	0
2012	1	0	0

**V(H). State Defined Outputs**

**1. Output Target**

- Scientific publications concerning parameters for food borne illness transmission and mitigation

**2008 :2                      2009 :0                      2010 :1                      2011 :1                      2012 :1**

- Consumer education materials in food handling practices

**2008 :0                      2009 :1                      2010 :1                      2011 :1                      2012 :1**

- Complete microbial profile of home refrigerators

**2008 :1                      2009 :1                      2010 :0                      2011 :0                      2012 :0**

- Microbial profile of meat goat carcasses

**2008 :1                      2009 :0                      2010 :1                      2011 :0                      2012 :0**

- Microbial profile of guinea fowl carcasses

**2008 :1                      2009 :0                      2010 :1                      2011 :0                      2012 :0**

- Strategies for improved management practices

2008 :0                      2009 :1                      2010 : 1                      2011 :0                      2012 :0

**V(I). State Defined Outcome**

**1. Outcome Target**

Additional percentage of consumers who will change their knowledge of best cleanliness practices

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :10                      2009 : 10                      2010 : 20                      2011 :10                      2012 : 10

**3. Associated Knowledge Area(s)**

- 504 - Home and Commercial Food Service
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occuring Toxins

**1. Outcome Target**

Percentage of targeted consumers that will be following best management practices for reducing microbial contamination

**2. Outcome Type :** Change in Condition Outcome Measure

2008 :0                      2009 : 0                      2010 : 50                      2011 :60                      2012 : 70

**3. Associated Knowledge Area(s)**

- 504 - Home and Commercial Food Service
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occuring Toxins

**1. Outcome Target**

Production practices to reduce contamination of meat goat and guinea fowl

**2. Outcome Type :** Change in Action Outcome Measure

2008 :0                      2009 : 1                      2010 : 0                      2011 :0                      2012 : 0

**3. Associated Knowledge Area(s)**

- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occuring Toxins

**V(J). Planned Program (External Factors)**

**1. External Factors which may affect Outcomes**

- Natural Disasters (drought,weather extremes,etc.)
- Competing Public priorities
- Other (Possible bird flu outbreak)

**Description**

{NO DATA ENTERED}

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

**1. Evaluation Studies Planned**

- Retrospective (post program)
- During (during program)

**Description**

{NO DATA ENTERED}

**2. Data Collection Methods**

- Sampling
- Unstructured

**Description**

{NO DATA ENTERED}

**V(A). Planned Program (Summary)**

**1. Name of the Planned Program**

Reducing the costs of food borne illnesses to small producers, selected food handlers and consumers

**2. Brief summary about Planned Program**

The cost of food borne illnesses will be estimated from information currently available from the Centers for Disease Control and Prevention and other publicly available data banks. Information will be disaggregated to provide specific estimates for Tennessee. Information obtained from previous studies and the planned study will be used in designing education and training to selected clients in improving food handling skills to reduce costs associated with food borne illnesses for small producers, consumers and select food handlers in Tennessee. Policy recommendations based on study findings will be made.

**3. Program existence :** New (One year or less)

**4. Program duration :** Long-Term (More than 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**

● 504	10%	Home and Commercial Food Service
● 602	40%	Business Management, Finance, and Taxation
● 712	50%	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occuring Toxins

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

**1. Situation and priorities**

Food borne illnesses impose a \$6.6 billion to \$37.1 billion cost on the US economy every year. Millions are sickened and hospitalized annually from food pathogens resulting in increased health care costs, lost wages, and lost productivity due to sicknesses. Most costs associated with food borne pathogens are highly aggregated with state difference submerged in this aggregation. This project will provide cost estimates that are disaggregated from available national data banks in determining what portion of that national cost can be attributed to Tennessee food borne illness costs. These cost estimates will be critical in designing effective training and education that will adequately address the problem, setting the stage for policy recommendation(s).

**2. Scope of the Program**

- In-State Research

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

**1. Assumptions made for the Program**

Food safety is an important area of concern for the entire food system. The current interest of the local, regional and national governments to address food safety issues will continue to be of importance as costs of foodborne illnesses continue to impose heavy health, productivity and medical costs on society. As the economy expands, with more imports of food and food products and much more integrated world economy, food safety problems will continue to be important. The threat of bioterrorism poses new food safety issues in Tennessee and other states across the country. As long as these forces continue to impact the US economy, food safety issues will need to be constantly addressed with innovative ways to address problems that will continue to arise. The need for effective policies will continue to exist. Research that leads to better policies regarding food safety will continue to provide the information needed in addressing these issues. The program also assumes that there will be reasonable cooperation from the small producers, food handlers and consumers targeted for this project. Stakeholders will actively participate in the program and provide input to be integrated into the program.



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

This program will provide useful research-based information to benefit small producers, consumers and food handlers. The program will provide food safety and safe food handling education and training to targeted groups and others interested in food safety. The education and training provided through the project will increase food safety knowledge and practices for the clients to improve food handling practices. Improved practices from training and education will consequently reduce incidence of food borne illnesses thereby reducing the cost of food borne illnesses imposed from poor food safety practices and safe food handling in Tennessee.

**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
2008	0.0	0.0	0.0	2.0
2009	0.0	0.0	0.0	2.2
2010	0.0	0.0	0.0	2.2
2011	0.0	0.0	0.0	2.2
2012	0.0	0.0	0.0	2.2

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

Collect secondary information from existing databases. Design a survey for collecting primary information from consumers, small producers and selected food handlers. Design training/education strategies and materials. Construct and review sound experimental design for the study and explore analytical and statistical method(s) for analyzing data to be collected. Analyze collected data and draw conclusions. Develop policy implication and recommendation. Develop strategies for communicating findings to stakeholders and policy makers.

**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"> <li>Other 1 (None, not an Extension program)</li> </ul>	<ul style="list-style-type: none"> <li>Other 1 (None, not an Extension program)</li> </ul>

**3. Description of targeted audience**

Food scientists, economists, extension personnel, small farmers and food handlers.

**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 Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0

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

**Expected Patent Applications**

2008 :0                      2009 :0                      2010 :0                      2011 :0                      2012 :0

**3. Expected Peer Review Publications**

Year	Research Target	Extension Target	Total
2008	1	0	0
2009	1	0	0
2010	1	1	0
2011	1	0	0
2012	1	1	0

**V(H). State Defined Outputs**

**1. Output Target**

- Scientific publications relating to the present and future causes and costs of food borne illnesses in Tennessee

2008 :1                      2009 :1                      2010 :1                      2011 :1                      2012 :1

- Bulletin publication concerning the current and future status of food safety in Tennessee

2008 :0                      2009 :0                      2010 :1                      2011 :0                      2012 :1

**V(I). State Defined Outcome**

**1. Outcome Target**

Number of people with increase knowledge of sources, estimated cost, and recommendations concerning foodborne illnesses in Tennessee

**2. Outcome Type :** Change in Knowledge Outcome Measure

2008 :50                      2009 : 50                      2010 : 50                      2011 :50                      2012 : 100

**3. Associated Knowledge Area(s)**

- 504 - Home and Commercial Food Service
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occuring Toxins

**1. Outcome Target**

Number of persons receiving training and education in foodborne illnesses and prevention

**2. Outcome Type :** Change in Action Outcome Measure

**2008 :60                      2009 : 60                      2010 : 60                      2011 :60                      2012 : 60**

**3. Associated Knowledge Area(s)**

- 504 - Home and Commercial Food Service
- 602 - Business Management, Finance, and Taxation
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occuring Toxins

**1. Outcome Target**

Number of consumers applying knowledge from education and training

**2. Outcome Type :** Change in Action Outcome Measure

**2008 :0                      2009 : 50                      2010 : 50                      2011 :50                      2012 : 50**

**3. Associated Knowledge Area(s)**

- 504 - Home and Commercial Food Service
- 602 - Business Management, Finance, and Taxation
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occuring Toxins

**1. Outcome Target**

Number of small producers applying knowledge from education and training

**2. Outcome Type :** Change in Action Outcome Measure

**2008 :0                      2009 : 25                      2010 : 25                      2011 :30                      2012 : 30**

**3. Associated Knowledge Area(s)**

- 504 - Home and Commercial Food Service
- 602 - Business Management, Finance, and Taxation
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occuring Toxins

**V(J). Planned Program (External Factors)**

**1. External Factors which may affect Outcomes**

- Economy
- Populations changes (immigration,new cultural groupings,etc.)

**Description**

{NO DATA ENTERED}

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

**1. Evaluation Studies Planned**

- Before-After (before and after program)
- During (during program)
- Case Study
- Comparisons between program participants (individuals,group,organizations) and non-participants

**Description**

{NO DATA ENTERED}

**2. Data Collection Methods**

- Sampling
- Mail
- Telephone
- On-Site

**Description**

{NO DATA ENTERED}