Memo

Date: April 5, 2004

To: Bart Hewitt, Program Analyst
Cooperative State Research, Education, and Extension Service

From: Dr. Stephen H. Kolison, Dean and Director
Institute of Agricultural and Environmental Research
Tennessee State University

RE: 2003 Annual Report

Attached is our 2003 Annual Report. If you have questions or correspondence pertaining to this report please contact me at skolison@tnstate.edu (615.963.2194) or Dr. Nick Gawel at gaweln@blomand.net (931.668.3023).

PLAN OF WORK

Annual Report of Accomplishments and Results

Institute of Agricultural and Environmental Research
Tennessee State University

Federal Fiscal Year 2003

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Programs

Goal 1: An agricultural system that is highly competitive in the global economy

Overview

Food animal production in Tennessee and the nation is diverse with farmers and ranchers raising traditional livestock and considering non-traditional livestock. Research at Tennessee State University is addressing issues concerning the basic physiology, general performance, and marketing of selected livestock types for Tennessee and other states. Research efforts in non-traditional alternative livestock include guinea fowl and meat goats. Beef cattle and chickens are represented in research activities on traditional livestock. This program is focused on developing competitive animal production systems for limited resource farmers in Tennessee and in the surrounding states. Work with alternative livestock is aimed at providing limited resource producers in Tennessee and the Southeast with options to cattle, tobacco, and other traditional farming activities where farmers are losing or are likely to lose market shares.

Nursery crop research is focusing on improvement of selected plant genera to broaden their appeal to consumers and thus enhancing the competitiveness of the Tennessee nursery industry, and on improving the efficiency of nursery crop production. We are also developing a system to improve certain ornamental plants for powdery mildew resistance and bacterial wilt resistance caused by *Ralstonia solanacearum* in certain ornamentals and field crops. Resistant field crops to bacteria could be deployed in tomato and potato growing areas in case of an accidental or malicious dispersal of *R. solanacearum*. Additionally, our researchers are analyzing the structure of the green industry in Tennessee. Other related activities include the development of hands-on teaching and demonstration areas on the TSU campus. These demonstration areas will strengthen teaching, aid in stimulating interest in the plant sciences among high school students, and transfer new discoveries into the hands of limited resource farmers.

Many small farms face a number of challenges including the reduction of government subsidies for certain crops such as tobacco, the decline in farm-generated incomes, and the loss of markets due to the aggregation of agriculture by major corporations. Our efforts towards this concern have included research aimed at enhancing the viability of small farms. These efforts have included production and marketing studies, and studying and developing non-traditional high value niche-crops such as medicinal plants (botanical supplements) for adoption by small farmers. The increased popularity of medicinal plants as alternative medicine in the U.S. and other countries has led to a revived interest in their growth. Current pharmaceutical research has suggested that extracts derived from various *Hypericum* species have a range of medicinally important qualities, such as antibacterial, antidepressant and anti-inflammatory effects. Consequently, propagation and cultivation studies are being explored to capitalize on the promising nature of this genus.

Forestland ownership among minorities in the southern states is significant. However these lands are not contributing significantly to the income of the landowners. Among the reasons that have been attributed to this condition is the lack of sustainable forest management knowledge among these owners. In view of this, we proposed in our Plan of Work to assess the constraints faced by minority forestland owners in Tennessee, and develop innovative technical assistance programs that will empower them to generate more income from their lands. This effort is in an early stage of development. We are working to build the capacity necessary to address this very important issue. There is a dearth of information on the minority or limited resource Private

non-industrial forest (PNIF) owners of Tennessee. We are currently searching census, real estate tax assessment, counties and municipal records in an effort to develop a comprehensive database for Tennessee's underserved forest owners. This data base will form the basis for subsequent research components of the project. Future annual reports will include information and outcomes of our efforts on this subject.

Total Expenditures (Section 1445 Funds under NARETPA of 1977) - $1,911,301

Full-time Equivalents – 17.9

Key Theme: Ruminant and Poultry Production Systems

Project Title: Evaluating Economic Impact and Marketing Strategies for Goat Industry in Tennessee.

. The demand for goat meat has increased significantly over the last few decades due to fast growing ethnic populations in the U.S. An increase in domestic production, import and ethnic population indicates that prospects to promote the goat meat industry are promising. The main goal of this study is to promote the goat industry as an alternative enterprise in order to supplement income of small and limited resource farmers in Tennessee.

. Beside production and management practices, efficient marketing is an important factor in the success of the business. A good marketing strategy will help to understand the needs of consumers and create higher profit margins for producers. The study will evaluate the current marketing structure and identify more efficient way to reach consumers. Consumers' survey will assist in identifying specific needs and problems in accessing goat markets. Such an analysis will be useful to design programs to create niche markets for goat meat products. Possibilities of e- marketing for the goat industry will also be evaluated and introduced which has tremendous potential for the industry to reach consumers at a very low cost.

. Impact
No impacts to report at this time.

. Source of Federal Funds: USDA Evans-Allen

. Scope of Impact: State-specific

Key Theme - Ruminant and Poultry Production Systems

Project Title Improved production practices in ruminant and poultry systems

a. Research is designed to improve production efficiency in beef cattle enterprises and develop management programs for alternative livestock species (*i.e*., guinea fowl and meat goats). Three key objectives are: 1) assessing profiles of blood constituents for possible metabolic disruptions in cattle exposed to ergot alkaloids linked to fescue toxicosis, 2) characterizing management techniques for optimal performance of caged

guinea fowl, and 3) evaluating meat goat maternal breeds for reproductive and maternal traits under conditions typical of the southeastern United States.

b. Impact

- Optimum cage and floor space requirement for guinea fowl were published and recommended to guinea fowl producers.
- Optimum concentrations of metabolizable energy and crude protein in guinea fowl rations were published and recommended to guinea fowl producers.
- Improved management practices and feed efficiency have reduced the cost of producing guinea fowl.
- Four students were trained in research. These students completed their independent senior research projects and demonstrated improved research skills.
- Heat-tolerant cattle genetics were shown to beneficially alter steer growth response to endophyte-infected tall fescue. This result provides for an animal genetics option to addressing the issue of fescue toxicosis. Hormonal profiles may provide some insight on how endophyte-infected tall fescue lowers cattle growth. Understanding how endocrine regulators of metabolic function are affected by endophytic fescue and how genetic variation in cattle can modify responses to endophytic fescue will help in future endeavors focused on overcoming fescue toxicosis in cattle production systems.
- Recently introduced meat goat breeds may vary for fitness and performance under conditions of the southeastern United States. Awareness that genetic diversity among maternal meat goat breeds can influence herd productivity has been increased as a result of outreach activities held in the state and region highlighting meat goat research activities.

c. Source of Federal Funds: USDA Evans-Allen

d. Scope of Impact: State Specific

Key Theme - Nursery Crop/Green Industry Enhancement

a. This is a multi-faceted project designed to enhance the profitability of the regional nursery industry by developing new plants, improving propagation/production practices of existing plants, and improving the ornamental horticulture teaching capacity at TSU by developing teaching and demonstration areas on the TSU Institute of Agricultural and Environmental Research farm.

Nutrient Use Efficiency: Greenhouse experiments were conducted with controlled release fertilizers on chrysanthemum and poinsettia. With ‘Sandusky’ chrysanthemum, leachate electrical conductivity decreased by over one-third and plant dry weight increased when low levels of an attapulgite-type clay were incorporated into a peat-based container substrate. Growth of ‘Freedom’ and ‘Prestige’ poinsettia was higher in peat-based substrate than in peat plus pine bark.

Cultivar Improvement: Application of genetic engineering technique to *Phlox paniculata* (garden phlox) and *Monarda* spp. (beebalm) to improve their resistance to powdery mildew. Through the use of this technology, diseases resistant herbaceous ornamentals can be produced using foreign genes.

Regional poinsettia trials were conducted in conjunction with Kansas State University and the University of Illinois. A total of 18 cultivars from Dummen USA and nine from Paul Ecke Ranch were evaluated. Dummen's 'Spotlight Dark Red' was a superior cultivar at all locations due to its vigor, form and foliage color. A consumer preferences survey conducted as part of a poinsettia open house revealed that participants prefer the traditional red poinsettia, although some unique forms also caught consumers' interest.

Establishment of Teaching/Demonstration Areas: We are continuing to acquire and install new plant species while maintaining existing plants. Infrastructure to support this endeavor continues to be installed.

Applied research in areas suggested directly by growers included examination of propagation strategies for niche ornamentals, use of alternative substrates of nursery crop growth and expert, unbiased evaluation of nursery production products.

b. Impact

- The use of genetic engineering technologies developed will greatly speed the development of new disease resistant cultivars in herbaceous ornamentals with antimicrobial peptide genes.
- Poinsettia varieties amenable to production in Tennessee were identified, allowing Tennessee greenhouse owners to participate in the production of this high-value niche crop.

c. Source of Federal Funds: USDA Evans-Allen, 1890 Capacity Building Grants Program, USDA/ARS

d. Scope of Impact: Multi-State NC, AL.

Key Theme - Global Information Systems

a. Geographic Information Systems (GIS) is a computer-based tool with capabilities of inputting, storing, manipulating, and presenting geographically referenced data. At present, it is one of the most useful tools available for analyzing complex geographic data. GIS is fast becoming an indispensable tool for decision-making in the management of natural resources. The goal of this project is to produce a core of agricultural researchers and faculty at Tennessee State University in tune with an advanced approach to presenting and solving agricultural problems.

b. Impact

- A permanent GIS training and research lab was established. Twenty-two faculty and staff completed basic training and six completed advanced training in GIS applications. A Natural Resources Conservation Service GIS training workshop was hosted by TSU, with certificates of completion awarded to 20 NRCS and TSU employees. A website for the recently formed National GIS/GPS Integration Team was developed and is being hosted by the Cooperative Agricultural Research Program.

c. Source of Federal Funds: 1890 Capacity Building Grants Program

d. Scope of Impact: State Specific

Key Theme - Small Farm Viability

a. Exploring, developing and introduction of alternative agronomic crops for small farm operators is considered an approach to keeping small farms viable. During the period under review, IAgER scientists were involved in the identification and improvement of selected genera for their pharmaceutical and other values using conventional and biotechnological means. Researchers are developing propagation and production protocols for superior plants. In addition, another project is examining various issues such as production, sources of information; marketing; research and outreach needs of small farm operators that affect their operations and identify strategies to enhance their viability. The results were presented to farmers, extension agents, community development specialists, policy makers and land grant University researchers at various forums including the Professional Agricultural workers conference at Tuskegee University, the Southern Agricultural Economics Association, the Southern Rural Sociological Association, the 1890 Association of Research Directors' Symposium, National Small Farm Conferences, the American Agricultural Economics Association, and Tennessee State University Wide Research Symposiums. Results of this project underscore the importance of adopting strategies involving both research and outreach activities to address the issue of achieving profitability by small farm operators. In addition to the above presentations, the findings will be published in the *Journal of Extension* and are expected to provide an important input for small farm operators, extension personnel, policy makers and researchers not only in Tennessee but also other states and countries

b. Impacts:

- Tissue culture protocols for the Tennessee coneflower, the daylily 'Stella de Oro' and a Chinese elm were published; this protocol is a first step in using genetic engineering technologies to improve levels of desirable compounds in these genera.
- Three species of *Echinacea* (*purpurea*, *pallida* and *augustifolia*) have been evaluated for growth under field conditions during 2000-2003 seasons. Results indicated that *E. purpurea* can be grown successfully in Tennessee under field conditions; this information will be used to inform growers of proper cultural practices for this niche crop.
- Results of a survey project will provide input for the Extension Program in designing education and outreach activities that will better assist small farmers in Tennessee. Other states can also use the framework developed for this project to assess the various issues involving factors affecting success in farming, exit and entry decisions as well as field day attendance. Incorporating some of the project survey questions into the USDA/ERS annual survey of Agricultural Resource Management Survey (ARMS) will enrich the database used to analyze farm sector performance at the national level that provides input for policy making.

c. Source of Federal Funds: USDA Evans-Allen, 1890 Capacity Building Grants Program

d. Scope of Impact: State Specific

Goal 2: A safe and secure food and fiber system

Overview

The health and well-being of Americans is necessary for a secure, productive nation. A safe food supply is an essential component in the development of human potential. Knowledge of how food is handled, especially how consumers store perishable and ready-to-eat foods to keep them safe, are key areas in which the Institute of Agricultural and Environmental Research Food Safety, Nutrition, and Family Well-Being Research Team are focusing their efforts. Projects address concerns about the impact and application of food safety messages, evaluating handling practices, and reducing exposure to food contaminants.

Total Expenditures (Section 1445 Funds under NARETPA of 1977) - $205,212

Full-time Equivalents - 2.2

Key Theme - Food Refrigeration Practices of Economically Disadvantaged Consumers in Middle Tennessee

. To help assess the risk level associated with refrigeration of potentially hazardous foods, the level of bacterial contamination within home refrigerators of limited resource consumers is being evaluated. Swab specimens will be taken from refrigerators during in-home visits. Refrigerator temperatures will be assessed. The residents will also answer questions related to their refrigeration practices. The specimens will be analyzed in the laboratory by microbial ATP bioluminescence assay and aerobic plate count. Temperatures will be compared to established standards. Data on the microbial contamination of consumers' home refrigerators provide essential information for the assessment of risk associated with potential contamination of foods during storage.

b. Impacts

- Preliminary results from this study have been requested for use as part of a *C. perfringens* risk assessment being conducted by USDA; the Partnership for Food Safety Education will use information obtained from this project for dissemination via consumer education packages.

c. Source of Federal Funds: USDA Evans-Allen

d. Scope of Project: State Specific

Key Theme - Innovative Methods for Rapid Detection of Food-borne Pathogens

a. This project has focused on developing innovative methods utilizing phage-displayed recombinant antibodies for rapid detection and identification of Salmonella in foods. The techniques to be developed, including the recombinant antibodies and the detection methodology, are important tools for identification of food-borne pathogens in food system. The use of recombinant antibodies for detection of food-borne pathogens offers advantages over the traditional detection reagents. These bio-engineered molecules

provide solutions to improve and potentially replace the conventional antibodies. The novel recombinant antibodies developed are the essential part of several new detection technologies, such as biosensors and microarray chips. This project will enhance safety of the nation's food supplies by providing advanced detection techniques to food producers, processors and distributor, as well as federal and state regulatory agency (USDA, FDA, and State Health Department) for identifying microbial safety problems.

b. Impact
No impact to report at this time.

c. Source of Federal Funds – USDA Evans-Allen

d. Scope of Project – State Specific

Key Theme – Exploring Food Safety Risk Preferences, Willingness to Pay for Safer Foods, and Impact of Food Safety Education of Under-served Consumers

a. This research proposes to categorize food safety risk preferences for rural and under-served areas of Tennessee, examine factors that explain the differences among these perceptions, and obtain estimates of willingness to pay for safer foods.

. Impact
No impact to report at this time.

c. Source of Federal Funds – USDA Evans-Allen

d. Scope of Project – State Specific

Key Theme - Safer Fruits and Vegetables for Tennesseans

a. Common methods used by consumers to prepare fruits and vegetables before eating them raw are being assessed. Consumers were asked which fruits and vegetables they most commonly eat, those they eat raw, and then what they did to them before they ate them. Those methods are being investigated for effects on microbial reduction.

b. Impact
- Methods are that are found to be effective in reducing bacterial contamination will be recommended as continuing practices. Consumers will be informed about those that do not work, and recommendations will be made for more effective procedures. Thus, consumers will be able to reduce their changes of contracting a food-borne illness from eating fresh produce.

c. Source of Funds – State of Tennessee Vitamin Settlement

d. Scope of Project – State Specific

Key Theme - Home Refrigeration Knowledge and Practices of Consumers

a. This project investigated the purchase, storage and use of cold foods by consumers in 6 states. In addition to in person interviews, refrigerators in home were assessed and temperatures were logged for extended periods of time. Information from this project will be used in risk assessments to better predict the possible incidence of occurrence of food-borne illnesses, specifically in this case listeriosis. It will also provide insight into areas where greater education of consumers is needed and where new policies need to be invoked. Information on food practices of Hispanics was obtained

b. Impact
No impact to report at this time.

c. Source of Federal Funds: Food and Drug Administration, Department of Health and Human Services

d. Scope of Project - TN, KY, MO, FL, KS and MS.

Key Theme - Assessing Risk and Communicating Food Irradiation Benefits to High Risk Consumers

a. This project allows for further development of a proposal submitted that incorporates other investigators and experts in food irradiation, strengthening the nature of the interdisciplinary team.

b. Impact
No impact to report at this time.

c. Source of Federal Funds: USDA Integrated Food Safety Initiative Bridge Grant

d. Scope of Project: Tennessee

Goal 3: A healthy, well-nourished population

Overview

Good dietary practices and adequate food distribution are essential components in the development of human potential. Knowledge of what people eat and how they manage their food are key areas in which the Institute of Agricultural and Environmental Research Food Safety, Nutrition, and Family Well-Being Research Team are focusing their efforts. The team has developed tools that currently are being used in national dietary studies and have established collaborative projects with many government agencies and other private and public entities.

Total Expenditures (Section 1445 Funds under NARETPA of 1977) - $407,735

Full-time Equivalents - 2.1

Key Theme - Food Shopping Habits, Consumption Patterns, and Food Security Status of Limited Resource Households-Implications and Strategies for Change

a. This program has focused on assessing the educational needs of economically disadvantaged individuals in Tennessee by evaluating the food security status, food stamp usage, nutrient intake, and nutrition knowledge of limited resource individuals and households. Specifically, this project analyzes food purchasing habits and consumption patterns of food assistance recipients and non-recipients in relation to their food security status. Strategies will be developed that will encourage them to adopt wise shopping habits and consumption of nutritionally balanced food.
Results: Previous research has determined that consumers do not appear to be making wise choices with the limited funds that they have at their disposal. No significant relationships were found between receiving federal food assistance and food security status. This suggests the need to provide nutrition education and budget allocation training for federal food assistance recipients. Thus, results indicate that food and money management education is needed for all limited resource individuals. Since the participants in this study receive food assistance from some sources that are not under their control *i.e.* food banks, shelters, churches, it is important for them to use their available funds wisely when making food choices to improve their chances of preventing nutrition-related diseases. Intense nutrition education programs that provide practical experiences are needed.
No relationship between food security status and nutrient intake was found in previous studies (though almost half of the respondents in the study were rated as food insecure, almost everyone in the study met the minimum requirements for most nutrients). Reasons for the food insecurity rating are being investigated.
This research will shed light on how low income households allocate their income and the type of foods they consume. Results derived can assist in developing strategies to promote optimal use of their limited income and encourage consumption of healthy foods. Implications for food marketers will also be derived.

b. Impact
No impact to report at this time.

c. Source of Federal Funds: USDA Evans-Allen

d. Scope of Project: State Specific

Key Theme - Assessing the Barriers to Increasing Fruit and Vegetable Consumption Among Economically Disadvantaged Population Groups

a. This program has focused on assessing fruit and vegetable consumption of Tennesseans, especially limited resource individuals. Methods of reporting amounts consumed, types of fruits and vegetables eaten, and preparation methods were investigated. The overall goal is to increase the number of fruits and vegetables consumed by participants, and to improve the methods used to assess dietary intakes of fruits and vegetables.
Results: To affect a change in fruit and vegetable consumption, ways to overcome barriers to that increase, either real or perceived, must be addressed. If barriers are real, identifying means for possible removal of those barriers should help increase consumption, leading to a healthier population.

b. Impacts:
No impact to report at this time.

c. Source of Federal Funds: USDA Evans-Allen

d. Scope of Project: State Specific

Key Theme - Techniques for Effective Recruiting of Minority and other Hard-to-Reach Populations for Participation in Consumer Health-Related Research

a. Reasons why various ethnic groups do not participate in health related studies are being investigated through the use of focus groups, interviews and surveys. Ways to more effectively recruit underrepresented groups will be identified, thus increasing their participation in health studies.

b. Impact
- Data will be used in future policy making by government and other health organizations.

c. Source of Federal Funds: USDA Evans-Allen

d. Scope of Project: State Specific

Key Theme - A Simplified, Rapid Tool for Estimating Portion Size in Dietary Studies

a. Estimating what one ate is difficult, especially if you do not know you are going to asked to report that information. Techniques currently used for reporting such information lead to large errors in reporting for many foods. Additionally, the task is cognitively challenging and even highly intimidating for some persons. Thus, the purpose of this study is to investigate whether a more simplified method can be used for reporting such

data, one using descriptive size terms. This research found most people did not believe the three word scale was adequate to report the intake of so many different amounts of foods.

. Impact

- Use of a descriptive size scale that gives reliable results will reduce the number of portion size estimation aides needed by investigators and increase the potential participation in dietary studies by those who felt overwhelmed by the previous methods of data collection; it will also increase the accuracy of the data collected over the previous methods. Results of this research change the scales that are currently being used in the nationwide studies, and make the portion size amounts used when assessing nutrient intake more accurate. National dietary surveys currently use a three point scale *i.e.* small, medium, large, for estimating the portion size of some hard-to-report foods.

. Source of Federal Funds – USDA Capacity Building

. Scope of Project: Tennessee and Kansas

Key Theme - Assessing the Food Security Status of Non-Profit Food Assistance Recipients in Alabama, North Carolina and Tennessee

. Various studies show that the number of non-profit food assistance centers as well as recipients of such assistance increased in recent years. This project is aimed at assessing the food security status of those served by selected non-profit food assistance agencies in metro and non-metro counties in Alabama, North Carolina and Tennessee and compare the results within and among the states

. Impact

- The results will provide better insights into the degree of food security/insecurity among vulnerable populations, and ultimately assist those managing non-profit food assistance centers and policy makers in formulating strategies to better serve recipients of non-profit food assistance. This project is having a major impact in Tennessee on the participation by very low income persons and minority groups in studies. Persons who never heard of Tennessee State University or its research and services are now aware and call on us for advice.

. Source of Federal Funds: Southern Rural Development Center

. Scope of Project : Tennessee, North Carolina and Alabama

Goal 4: Greater harmony between agriculture and the environment

Overview

The invasion of highly destructive pests and diseases into agriculture has required the rapid development of pest and disease control programs, most of which rely on the use of toxic chemicals. Public perception about the safety of these chemicals requires studies of their persistence and movement in soil and surface waters, and studies of alternative pest and disease control methods. IAgER's Environmental Protection and Enhancement Researchers are directing their research efforts toward identifying and reducing the effects of hazardous agricultural chemicals on the environment.

Total Expenditures (Section 1445 Funds under NARETPA of 1977) - $949,142

Full-time Equivalents – 9.8

Key Theme - Integrated Pest Management; Improving Environmental Quality

a. Our research efforts have included the following: (1) the evaluation of Japanese beetle and other potential insect pest control measures in nursery production; (2) the evaluation and development of alternative control measures for plant-parasitic nematodes in nursery crop production, and (3) the evaluation and development of environmentally friendly alternatives to fungicides for powdery mildew disease management in dogwood production.

b. Impacts:

- Newly identified dogwood cultivars resistant to powdery mildew will result in substantial savings on treatment costs by eliminating the need for fungicides.
- Biorational compounds used as alternatives to traditional fungicides have been identified for powdery mildew control. Growers who wish to use these compounds along with fungicides can reduce fungicide use by about 56-66%, and growers who wish to abstain from using traditional fungicides can reduce fungicide use to zero.
- Effective chemical treatments against Japanese beetle and imported fire ant will facilitate the development of new treatment protocols for balled and burlapped nursery stock, enabling the markets for millions of pieces of Tennessee nursery stock to remain open. Multiple pesticide alternatives to the current chlorpyrifos/imidacloprid-only treatment of balled and burlapped nursery stock have been identified for inclusion in the Federal Imported Fire Ant Quarantine and U.S. Domestic Japanese Beetle Harmonization Plan. New pesticide treatments ensure growers have viable and low cost options for shipping millions of pieces of Tennessee nursery stock in the event currently approved treatments become unavailable.
- Establishment of new biological controls in Tennessee against Japanese beetle and imported fire ants will reduce reliance on chemical management and provide self-sustaining area-wide pest management. Two species of phorid-decapitating flies that parasitize imported fire ants were established in a major Tennessee nursery-production county and subsequently recovered on multiple post-evaluation dates. The parasitic flies can provide self-sustaining and region-wide reduction of imported fire ant populations,

which will reduce the cost and environmental impact of chemical management of these pests by both society and the agricultural community.

- New and effective trapping methods for buprestid borers will allow monitoring of wood-boring beetle activity and development of degree-day prediction models, and will enable the survey of new invasive buprestids, enabling reductions in production costs for growers. Buprestid borers impact production nurseries by killing or reducing the market value of nursery trees. Research has identified a specific color that is highly attractive to borers in this beetle family, which will facilitate trap development and monitoring efforts. The color has been effectively used to trap the new invasive emerald ash borer in Michigan, which threatens to eliminate ash as a component of the entire North American forest system. Effective monitoring of emerald ash borer is critical for surveys and eradication efforts. Although emerald ash borer has not been found in Tennessee, ash sales by Tennessee nurseries have been seriously impacted, and therefore, research is critical for re-establishing these lost nursery markets.
- Triclopyr soil activity monitoring showed that it is safe to overseed fescue after 17 days at the recommended rate of 2 lb/A.

c. Source of Federal Funds: USDA Evans-Allen; CSREES 1890 Capacity Building Grants, USDA/APHIS

Other Sources of funding: Tennessee State University/State of Tennessee

d. Scope of Impact: Multi-State, KY, FL, MS, MI, OH

Key Theme - Sustainable Agriculture

a. Adsorption and desorption of five widely used pesticides were utilizing both batch technique and column of soil materials. In batch studies, the factors affecting pesticide adsorption-desorption include time, temperature, soil type, organic matter, pesticide concentration, temperature, pH, and inorganic electrolytes. Column studies with the above soils/soil materials and all the pesticides examine various pesticide concentrations, and different water fluxes. Applicability of a mathematical model, based on chromatographic theory to predict pesticide movement, will be tested.

b. Impacts
Improved methods of measuring the movement of the pesticide triclopyr were developed The new method requires less time and eliminates the generation of diazomethane, a potentially explosive chemical, during analysis This finding improves the efficiency and safety of the technique used to measure this pesticide.

c. Source of Federal Funds: USDA Evans-Allen

d. Scope of Impact: State Specific

Key Theme - Water Quality

- a. The overall goal of this research is to explore the potential use of wood fibers as part of best management practice (BMPs) for the production of field nursery crops. This study characterizes pine park wood fiber for its organic carbon content and its adsorption

capacity for a widely used selective herbicide (Princep®), that is used for the control of broadleaf and grass weeds in ornamental production systems. The transport of the test herbicide in soil columns amended with pine park wood fibers was determined. Breakthrough curves were used to determine flow parameters. A mass balance for the applied herbicide was performed. Due to the relatively high organic carbon content, wood fibers such as pine park, when spread in fields, can be used as sorbent to prevent herbicides or other pesticides from leaching into surface or groundwater. The application of pine park wood fibers to nursery fields and disked in during soil preparation as part of a grower's BMPs will result in a substantial increase in soil organic matter. Soil organic matter governs adsorption processes, thus retards the transport of pesticides to ground water.

b. Impact
No impact to be reported at this time.

c. Source of Federal Funds: USDA Evans-Allen

d. Scope of Impact: State Specific

Goal 5: Enhanced economic opportunity and quality of life for Americans

Overview
The nursery crop sector of the green industry is one of the most profitable and important economic sectors in Tennessee. As an agricultural crop, soybeans and tobacco surpass nursery crop production in the state. Conspicuously absent from the overall ownership of this lucrative sector are minorities. A study conducted by Tennessee State University in 1996 found that most minorities in the green industry occupied or had ownership in the less lucrative landscaping or lawn care sector of the industry. As minority or limited resource farmers are forced out of farming traditional agronomic crops such as tobacco, they will need viable alternative crops.

In addition to studies dealing specifically with enhancing opportunities for minorities in nursery sector, our team is working on several projects on involving the nursery industry in Tennessee, small farms, rural development, welfare reform, food assistance and food security. Team members are collaborating with government agencies at the federal, state and local levels, land grant universities, stakeholders, agribusinesses, and nonprofit organizations. The overall objective of research performed under this goal is to conduct economic and policy analyses of issues that affect the well being of local, state, regional, national, and global communities. Results from this research will be useful for policy making and thus contribute the economic enhancement of communities in our state and in other regions.

Research is also being conducted in the area of social acceptability of agricultural biotechnology, specifically, genetically modified crops. Data will be gathered on the attitudes of US consumers and producers towards genetically modified organisms in the food system.

Total Expenditures (Section 1445 Funds under NARETPA of 1977) - $557,685

Full-time Equivalents – 5.3

Key Theme - The Green Industry in Tennessee; Structure, Marketing, Economic Impact and Prospects

a. Information on structure and performance of the industry, impacts generated by the industry, and prospects for long-term growth of the industry will be collected from the study. The project will collect and disseminate information that may be used in facilitating economically sound decisions by industry participants in the state of Tennessee. Issues facing minority and other producers interested in participating in the industry will also be examined.

The overall goals of proposed project are to analyze current structure of the green industry in Tennessee, and examine current marketing channels used by wholesalers and retailers of nursery products and services in addition to assessing opportunities for minority, small and limited resource farmer participation in the nursery. Finally, the project will examine risks faced by participants in the industry. Specific objectives of this study include: (1) describing and analyzing the current structure and problems of the green industry in Tennessee, (2) assessing the size of selected segments of the green industry and determining the economic impacts of the nursery industry on selected local communities and the economy of the state; (3) determining factors affecting consumer

demand for nursery products and landscape services in the state and assessing the short, medium and long-term growth prospects of the industry; (4) identifying, and evaluating marketing channels, marketing and merchandising practices, and investigating presence of barriers to development of domestic and international markets for nursery and greenhouse products; (5) assessing opportunities for minorities, small, and limited resource farmers to participate in the state's nursery and greenhouse industry, and (6) examining risks that face new, minority, small and limited resource farmers desiring to diversify into the industry.

During the period covered in this report, two bulletins that discuss the structure and the economic contributions of the industry to the economy of the state have been prepared. A questionnaire to be used in collecting data from businesses selected to participate in the survey has been pilot tested for use in collecting data. Temporary data collectors have been hired and trained on how to administer the questionnaires developed for the project. Student workers needed for the project have been recruited. They have assisted in developing profile for the industry in Tennessee and generating the random samples of businesses to be surveyed for the study. They are also assisting in preparing the mail survey to be conducted.

b. Impact:

- Students working with researchers have improved their research, computer, writing and oral communication skills. These students are currently preparing papers for oral and poster presentations at regional and national meetings.
- Copies of findings to date have been distributed to nurserymen and other producers of nursery products via the TSU Nursery Crop Research Station in McMinnville, Tennessee. This bulletin provides very useful information to the producers and will help them understand more about the structure of this complicated industry and improve their marketing skills.

c. Source of Federal Funds: USDA Evans-Allen

d. Scope of Impact: Multi-State AL, MS

Key Theme - Contributions of agriculture and manufacturing to rural development in Southern states.

a. The overall goal of this grant is to assess the contributions of the agricultural and manufacturing sectors to the economy of rural areas in Alabama, Mississippi, and Tennessee. During the period January 2002 to December 2002, the U.S. Forest Service (USFS) offered a mini-IMPLAN training to project researchers from Tennessee State University. The small workshop was given by Dr. Rodney Busby of the Research Station in New Orleans, Louisiana. The USFS also assisted with the updating of the IMPLAN data file to be used in estimating impacts of manufacturing and agriculture to rural economies of the states previously identified in the project. Contacts were made with Middle Tennessee State University and Tuskegee University, collaborators on the project. Middle Tennessee State and Tennessee State Universities acquired databases to be used in selecting businesses to be surveyed. These databases will be used in conjunction with other selection tools to ensure that participants targeted are representative of the businesses actually selected for the survey. Participating states are continuing their work

with identifying the specific companies to be surveyed and the extent to which face-to-face interviews may be used to supplement information collected from mailed questionnaires. The Southern Rural Development Center, the Mississippi Rural Development Council, the Economic Research service, and the US Forest Service continued with their advisory role in the project.

b. Impact:

- Grant funds made available to Tennessee State University, Tuskegee University, and Middle Tennessee State University have expanded the skills of researchers from the Universities and strengthened collaborations among the Economic Research Service, the US Forest Service and collaborating institutions. The IMPLAN skills for researchers, which have continued to improve, will build capacity for Tennessee State University researchers and faculty working on the project. Also, students at Tennessee State University have improved their computer skills from working on the project through learning how to search for data, conducting qualitative/quantitative analyses and other important components of research. This project will provide useful information on the relative importance of agriculture and manufacturing to the economies of rural areas in Tennessee, Alabama, and Mississippi. The project will lead to research-based recommendations with useful policy implications for rural development in the south.

c. Source of Federal Funds: USAD/CSREES 1890 Capacity Building Grants Program

d. Scope of Impact: Multi State Research AL ,MS

Key Theme - Acceptability of agricultural biotechnology; the case of genetically modified crops.

a. The goal of this research is to evaluate the social acceptability of agricultural biotechnology, specifically, genetically modified crops. Data will be gathered on the attitudes of consumers and producers towards genetically modified organisms in the food system. Three meetings of collaborators were held at the University of Arkansas, Fayetteville, the University Arkansas, Pine Bluff, and North Carolina A&T State University. Tennessee State University took the lead in developing the producer and consumer materials needed for the focus group meetings. During this period, extension professionals and researchers jointly developed the materials needed to implement the focus group meetings. In all institutions, extension was very helpful in identifying potential contacts in counties selected for the meetings. Focus group meetings (consisting of producers and consumers, separately) were conducted in all states; the focus group meetings were used in developing a survey questionnaire. This survey will be formally pilot-tested for use in collecting data in a nation-wide survey. In addition to project group meetings, conference calls of project collaborators were used in finalizing the language of the survey and clarifying any issues that were unresolved during the previous group meeting(s). A timeline for completion of tasks assigned to all universities was developed and agreed upon by all institutions involved in the project.

b. Impact:

- The relationship between the 1890 and 1862 schools involved in the project has been strengthened through interactions by different researchers and faculty on the project.

Extension's involvement with the project from the early stages of this project will ensure that relevant stakeholders have their share in the conduct and outcome of this research. Links between extension and research has been strengthened because of this project. This strengthened linkage will allow the research team to develop a strong dissemination plan for the findings of the research project.

c. Source of Federal Funds: USDA/CSREES

d. Scope of Impact: State-specific

Key Theme - Strengthening a Collaborative Proposal on Small and Medium-Sized Farms Using Bridge Grant

a. This project was aimed at solidifying partnership between land grant universities seeking to undertake research and outreach activities and local stakeholders and institutions that will facilitate effective implementation of research and outreach activities.

b. Impact:

- This project developed a strong linkage with various local stakeholders including governmental, non-governmental and community based organizations to undertake priority research and outreach tasks. It will also assist in conducting assessment of local resources and for evaluating impacts of small and medium-sized farm operations on local communities. Project results have been presented at national meetings attended by researchers, extension personnel and policy makers. The approach used in this study can be adopted by other states to enhance profitability of small and medium sized farm operations.

c. Source of Federal Funds: USDA/CSREES

d. Scope of Impact: Multi state Integrated Research and Extension with AL, NC, KY and MS.

Key Theme - Southern Agricultural Biotechnology Consortium for Underserved Communities

a. The Southern Agricultural biotechnology Consortium for Underserved Communities (SACUC) is a multi-state, multi-disciplinary project involving joint effort of eleven 1890 institutions, industrial partners, governmental agencies, and farm organizations to promote agricultural biotechnology outreach to farmers and consumers and strengthen K-12 Life science education.

b. Impact:

- In the last three years the project provided training, laboratory equipment and supplies and other resources for teachers in five counties in the state as part of its education outreach; community outreach was conducted through meetings with extension agents, farmers and others; commodity outreach was conducted through trials and demonstration of six commodities on farmers' plots in five counties. Scio-economic studies involving knowledge of producers and consumers in underserved communities about biotechnology and related issues show the need to provide education about the technology by various

groups. The project is expected to yield benefits arising from utilization of the technology for rural development, small farm sustainability and enhancement of science education. Project results from all eleven collaborating institutions including Tennessee State University can be found at http://sacuc.subr.edu.

c. Source of Federal Funds: USDA/CSREES

d. Scope of Impact: Multi state Integrated Research and Extension with AL, MS, FL, LA, OK, NC, TX, GA, and AR.

B. Stakeholder Input Process

Various actions were taken to seek stakeholder input and incorporate this input into research plans. These actions were tailored to fit individual goals and stakeholder groups. For example in Goal 1 (An agricultural system that is highly competitive in the global economy) the Institute of Agricultural and Environmental Research has maintained a standing Nursery Advisory Group since 1995. The group is composed of small, medium and large nursery producers from across the state and meets annually to review the methods and outcomes of applicable research conducted in the department. Comments from the group are used in formulation of research plans and methodologies.

In Goals 2 and 3 (A safe and secure food and fiber system; A healthy well-nourished population), an Advisory Council was formed that includes persons who work with disadvantaged populations, including 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 participates in a review process of targeted research areas.

Research conducted under the 'Greater harmony between agriculture and the environment' goal (Goal 4) sought stakeholder input through professional meetings, field days, demonstrations, consultations, and informal contacts. This input was discussed by the research team and used to identify and assess insect and nematode pests, plant diseases, species of experimental plants, pesticides, and cultural practices included as part of the overall research projects. Agricultural statistics published by the Tennessee Department of Agriculture, the National Agricultural Statistics Service, and the Tennessee Agricultural Statistics Service were consulted to determine the economic importance of crops, pests, and diseases.

In the case of Goal 5, 'Enhanced economic opportunity and quality of life for Americans', information provided in identified areas of research will be of significant value to stakeholders, who are identified through: (1) the participation of Non-Governmental Organizations (NGOs) and private organizations in our projects, (2) the inclusion of farmers as cooperators, collaborators, or advisors on projects, and (3) publication and distribution of research bulletins, industry magazines, and leaflets that are widely circulated among growers, producers and extension workers. The involvement of extension colleagues (formally and informally) has extended our outreach efforts to more stakeholders. Through attendance at nursery industry trade shows, farmer field days, farmer meetings, and workshops, we have been able to identify growers who have stakes in our research. Also we are able to identify stakeholders through our interactions with other researchers, and extension personnel, we have identified stakeholders with interest in our programs.

C. Program Review Process

There have been no significant changes in our program review process since submission of our Plan of Work.

D. Multi State and Joint Activities / Integrated Research and Extension Activities

Although not discussed in great detail in the individual reports and impact statements, the research activities outlined in this report involve a fair amount of multi state and joint activities.

In Goal 1, Nursery Crop Green Industry Enhancement, the nutrient use efficiency research is being conducted as part of a multi-state project involving scientists from North Carolina, Georgia and Alabama. Also under Goal 1, the Small Farm Viability research has as a direct output defined crop growth and culture parameters for the Extension Service to incorporate into their outreach programs targeting small farm operators. Additionally, researchers have conducted outreach efforts via workshops and symposia presented in the important cattle and goat production areas of the state.

Researchers from Kansas State University are significantly involved in the portion aid research described in Goal 3, Nutrition Education for Disadvantaged Populations. The Kansas researchers are performing portions of the research as well as providing consultation on methodological approaches.

The research conducted as part of the Integrated Pest Management theme (Goal 4) utilizes collaborative arrangement with scientists from the University of Kentucky and North Carolina Sate University to evaluate putative resistant dogwood varieties under their respective growing conditions. The fire ant and Japanese beetle research utilizes collaborators from USDA/ARS Biocontrol and Mass Rearing Research Lab (MS), USDA/APHIS Gulfport Plant Protection Station (MS), USDA/ARS Center for Medical, Agricultural and Veterinary Entomology (Gainesville, FL), USDA/ARS Horticultural Insect Research Laboratory (Wooster, OH), USDA/APHIS Niles Biological Control Laboratory (MI), and the USDA/APHIS Otis Pest Survey, Detection, and Exclusion Laboratory (MA). These locations are performing integral parts of the analysis of the insect research and/or providing labor to gather data on experiments conducted in Tennessee.

A large number of multi state collaborations take place in the activities described in Goal 5, Enhanced Economic Activity and Quality of Life for Americans. Scientists and extension personnel from Alabama A&M, Kentucky State University, North Carolina A&T, Alcorn State University, and the University of Tennessee work jointly with TSU scientists to gather data and formulate contacts to be used in future research proposals dealing with economic opportunity in the Southern US. Other activities described under this goal involve collaborators with research and extension personnel from Florida A&M University, Fort Valley State University, Langston University, Middle Tennessee State University, Prairie View A&M University, Southern University, South Dakota State University, Tuskegee University, University of Arkansas (Fayetteville), University of Arkansas (Pine Bluff) and the University of California at Davis.