Memo

Date: March 30, 2007

To: Mr. 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: 2005-2006 Plan of Work Annual Report

Attached is our 2005-2006 Plan of Work 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 (931.668.3233).

PLAN OF WORK

Annual Report of Accomplishments and Results

Institute of Agricultural and Environmental Research

Tennessee State University

Federal Fiscal Year 2005-2006

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A. 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 as well as considering non-traditional livestock alternatives. Research at Tennessee State University is addressing issues concerning 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, research efforts in traditional livestock are represented by beef cattle and chickens. This program is focused on developing competitive animal production systems for limited resource farmers in Tennessee and 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 1) focusing on efficient use of nutrients and water during crop production, 2) evaluating poinsettia cultivars and their appeal to consumers, and 3) examining the feasibility of alternative (niche) and enhanced crops for limited-resources producers. The ultimate goal is to enhance the competitiveness of this portion of the green industry in Tennessee and the nation.

Additionally, our researchers are analyzing the economic 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 *Echinacea* species have a range of medicinally important qualities, such as antibacterial, antidepressant and anti-inflammatory effects. Consequently, propagation, cultivation, and genetic 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 is the lack of sustainable forest management knowledge among these landowners. 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 empowered them to generate more income from their lands. We are working to build the capacity necessary to address this very important issue.

Total Expenditures (Section 1445 Funds under NARETPA of 1977): $1,743,978

Full-time Equivalents: 30.9

Key Theme: Ruminant and poultry production systems

Project Title: Improved production practices in meat goat

a. Research is designed to improve production efficiency in meat goats. Key objectives are evaluating meat goat maternal breeds for reproductive and maternal traits under conditions typical of the southeastern United States and assessing growth rates in goats exposed to ergot alkaloids linked to fescue toxicosis.

b. Impact

Change in Knowledge

- Over 1,000 meat goat producers across the Southeast (TN, AL, KY, OK, TX, GA) have received instruction and education about the genetic and economic benefits derived from on-farm testing and to stimulate implementation of evaluation schemes.
- Recently introduced meat goat breeds were shown to vary for fitness and performance under conditions of the southeastern United States. Awareness that genetic diversity among maternal meat goat breeds for reproductive and fitness traits can influence herd productivity has been increased as a result of outreach activities held across the state and region highlighting these meat goat research findings.
- Data from this project is beginning to reveal how meat goats respond to endophyte-infected tall fescue in terms of growth and feeding behavior. When complete, these data will affect recommendations grazing management in commercial goat herds across the southeastern US.

c. Source of Federal Funds: USDA Evans-Allen

d. Scope of Impact: State Specific

Project Title: Selected nutritional and management factors for improving production efficiency of guinea fowl

a. In the United States, interest in raising guinea fowl as a meat bird has increased in the last few years. However, poor production and reproduction efficiency have been a potential constraint to increasing bird productivity and profitability. Selected nutritional and management practices for improving production efficiency of guinea fowl broilers, replacement pullets and layers have been examined.

b. Impact

Change in Knowledge

- Three undergraduate students were trained in guinea fowl production research.

Change in Action

- New feed rations developed under this project have improved feed efficiency and have reduced the cost of producing guinea fowl by approximately $0.31 per 100 pounds of feed.
- Optimum crude protein and metabolizable energy for guinea fowl replacement pullets, laying hens and broilers were recommended to guinea fowl producers and the Guinea Fowl Breeders Association and are now being utilized to formulate least cost rations.

c. Source of Federal Funds: USDA Evans-Allen

d. Scope of Impact: State Specific

Project Title: Functional genomics regulating growth, production and reproduction on guinea fowl

a. Genetic information of guinea fowl which may facilitate genetic improvement programs for the guinea fowl and other poultry species is scarce. The objective of this project is to facilitate understanding of the functionality of guinea fowl genomics through generation of genetic markers for growth, production and reproduction traits.

b. Impact

Change in Knowledge

- Several genes such as the fatty acid synthase of the guinea fowl have been partially sequenced and are being used for comparative mapping of avian species.
- Three undergraduate and two graduate students were trained in animal biotechnology research. Three undergraduate students completed their independent senior research projects and demonstrated improved research skills. Two of these students have been admitted to the graduate school and are pursuing research projects using skills developed from this project.

c. Source of Federal Funds: USDA Evans-Allen

d. Scope of Impact: State Specific

Project Title: Evaluating economic impact and marketing strategies for the goat industry in Tennessee.

a. The demand for goat meat in the United States has continued to increase significantly over the last few decades due to rapidly growing ethnic populations. Goat meat production in the U.S. also has increased significantly over the years. Despite an increase in domestic production, the United States is also a net importer of goat meat. An increase in domestic production, increases in imports and increases in ethnic populations indicate that prospects for the goat meat industry in the United States are promising.
A number of survey instruments were designed to analyze the goat industry from the producer as well as consumer perspective. Results indicate that goat producers are

unaware of consumers' needs, taste and preferences. It is critical for the goat meat industry to understand specific needs of different groups of consumers and establish niche markets for their products and serve their clients effectively. The consumers are willing to pay more for freshness, food safety practices, quality and improved customer service. This showed that the goat industry can invest in these areas in order to get higher return for their products. It is also important to organize training workshops to educate producers, processor, wholesalers, and retailers about consumers' preferences. The emphasis on developing programs and policies based on consumers needs and preferences will help in promoting goat meat industry in the U.S. The results are being used to design programs and activities that will promote goat industry among small and limited resource farmers.

b. Impact

Change in Knowledge

- This project has provided sound, accurate information about consumer awareness, health benefits of goat meat, and goat meat safety tips to approximately 200 potential new goat meat consumers (persons who do not presently consume goat meat, but have expressed an interest in using goat meat in their diet).

Change in Action

- Approximately 150 Tennessee goat producers participated in a demonstration of enterprise budget techniques. The demonstration helped participants to evaluate their farm business and identify best production and management practices for their goat operations.
- A goat marketing plan was developed and approved by the Tennessee Goat Producers Association (TGPA) board and presented to the TGPA membership.

c. Source of Federal Funds: USDA Evans-Allen

d. Scope of Impact**:** State-specific

Project Title: Promoting non-traditional alternative enterprises for small farmers

a. Small farms represent a significant proportion of the total U.S farms, and current trends in agriculture pose new challenges for their viability and survival. Several studies indicate that there is an increase in demand for specialty products including goat meat, mushrooms and organic food products. The main purpose of this project was to introduce and promote these enterprises to enhance economic and environmental sustainability and well being of small farmers. The project objectives were to evaluate economic and environmental benefits/costs; assess future research/education/outreach activities; and develop a proposal based on findings from this project.
Focus group meetings were conducted in Tennessee and North Carolina to identify priority areas for future research, educational and outreach activities which will be more effective and efficient in order to promote alternative enterprises among small farmers. The results showed that cost-benefits analysis, risk management and market development were priority research areas. The extension/outreach priority areas include innovative information sources, on-farm demonstrations and farm business incubators along with educational activities in developing marketing skills and learning regulations and requirements. Project collaborators

meeting was held in November 2006 and proposal for NRI program will be submitted in the future.

b. Impact

Change in Knowledge

- The costs and benefits associated with engaging in alternative agricultural enterprises were introduced to approximately 200 small farmers during six focus group meetings in Tennessee and North Carolina.

Change in Action

- Ten agricultural producers in Tennessee initiated alternative agricultural enterprises at their farms after receiving information and counseling produced by this program.

c. Source of Federal Funds: USDA-CSREES/NRI

d. Scope of Impact**:** Tennessee and North Carolina

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.

Trials of poinsettias, the highest value floricultural crop in the US, were conducted in 2006 in conjunction with Kansas State University and the University of Illinois. Fifty five named cultivars and nine experimental cultivars from four major US suppliers were evaluated at Tennessee State University, with each of the 64 cultivars also grown at one or both of the collaborating institutions. Cultivars that performed well in 2006 included Metro Red, Novia Red, Festival Rose, Pink Cadillac and Nutcracker White. A one-day poinsettia open house at TSU drew over 200 attendees, including university personnel, the public and green industry personnel. A consumer preference survey conducted as part of the open house revealed that Prestige Red and Cortez Electric Fire were popular red cultivars, and that Sonora White Glitter and Winter Rose Early Red were popular novelty forms. Ecke 15-02 was a promising experimental form, traditional red with upright growth habit and prominent yellow cyathia (true flowers). In a comparison of four cultivars (Premium Red, Premium White, Premium Pink and Premium Miro) at three pot sizes each (4.5-in., 6.5 in. and 8 in.), respondents preferred the red form most and the white least. Based on respondents' willingness to pay, the smallest pot size was most profitable using estimated costs of production on a square foot basis.

Additional basic research involved identification of genes and mechanisms encoding cold and heat tolerance from selected species. Results from this research can be very important for designing protocols to alleviate damage from extreme weather stressors in nursery production. Two ornamental perennials and a tomato cultivar were transformed with antimicrobial peptide genes. The effects of these genes in plants are being evaluated.

Another research goal is the development of genetic linkage maps for Echinacea based on amplified fragment length polymorphism (AFLP) markers amplified from individual pollen grains as well as train minority students in molecular techniques. Linkage analysis on 111 selected AFLP markers from pollen grains produced 409 cM genetics maps of *Echinacea purpurea* 'Magnus'.

In addition to the above project, selections of goldenseal, a high value medicinal plant species, are being collected from various colonies in its range. These plants will be evaluated for their medicinal and ornamental characteristics.

To address some of the problems facing Tennessee small farm operators and provide consumers with sources of vitamin rich vegetables, research was conducted to identify new niche crops for use by limited resource farmers. The specific objectives of this project are: 1) to collect, analyze and identify vegetable crops with high vitamin contents 2) to develop molecular marker based characterization system for the true-to-type identification of vitamin rich breeding lines.

A position to oversee the implementation of the master plan for the transformation of the Agricultural Research Farms at Tennessee State University into a center for Agricultural Research Experiential and Life Long Learning is in the interview stage. When complete the Center will be an agricultural research educational resource, providing a research infrastructure for TSU agricultural scientists and students, and agricultural educational opportunities to the residents of greater Nashville. We are continuing to acquire and install new plant species while maintaining existing plants. Infrastructure to support this endeavor continues to be installed.

b. Impact

Change in Knowledge

- 64 poinsettia cultivars were evaluated and cultivars appropriate for production in the central portion of the US were identified, along with consumer preference trends and economic data for this high-value floricultural crop.
- These projects have trained five of graduate students at TSU, four in molecular biology procedures and one in greenhouse production techniques.
- Candidate cold regulated genes identified in this project are being sequenced and are being used in transformation of tomato.
- Two hundred small farm operators, located in East and West Tennessee received instruction on goldenseal production and were invited to submit goldenseal accessions from their area for inclusion in evaluation studies.
- Over 3,000 scientists now have access to procedures developed for the transformation of tomato, beebalm and garden phlox.

Change in Action

- The *Echinacea* pollen DNA characterization project has demonstrated that the environmental inputs required in maintaining large populations for use in traditional genetic-mapping approaches can be circumvented; this alternate approach to developing improved plant varieties realizes up to a 50% reduction in cost and time inputs.

c. Source of Funds: USDA Evans-Allen, 1890 Capacity Building Grants Program, USDA/ARS, State of Tennessee Vitamin Settlement

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

Key Theme: Small farm viability

Project Title: The role of diversification and cooperatives in small farm operations

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 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. Impact

Change in Knowledge

- Results of a survey project have provided input for extension programs in designing education and outreach activities to 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.
- A brochure titled “Strategies to Promote Success in Small Farm Operations” has been developed for consumer use, and is available at www.tnstate.edu/IAgER/Impacts/accomplishments.htm

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

d. Scope of Impact: State Specific

Key Theme: Forest resources

a. The project's objectives were implemented this period as planned through two activities: two landowners' education and resource management workshops were held, and a landowners' survey was conducted was conducted to identify Tennessee's minority/limited resource forest landowners, and ownership characteristics relative to forest management practices, constraints and opportunities. The workshops provided information and resources to help the landowners better manage woodlands and identify opportunities for alternative sources of income. The survey of 3,000 minority and limited resource landowners is complete and results are being analyzed.

b. Impact

Change in Action

- As a result of the hands-on workshops sponsored by this project, 48 limited resource landowners have sought advice from extension personnel on timber sales agreements with loggers, resulting in increased income from their woodland resource. These results indicate that the workshops were effective in providing limited resource landowners with a better understanding of the value of woodlands and the ability to negotiate equitable prices for standing trees.

c. Source of Federal Funds: USDA Evans-Allen

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): $268,821

Full-time Equivalents: 5.8

Key Theme: Food refrigeration practices of economically disadvantaged consumers in middle Tennessee

a. To help assess the risk level associated with refrigeration of potentially hazardous foods, food safety knowledge and refrigeration practices are being evaluated. In-home interviews and refrigerator audits were completed in 100 homes in low income areas of Nashville. In addition, microbial analyses were completed in 98 of those homes. *Klebsiella pneumoniae* spp *pneumoniae*, which is known to carry antibiotic resistance genes, was the most prominent bacteria. The results show that a contaminated refrigerator can be a potential source of pathogenic bacteria which can be transferred to other parts of the kitchen. Some food borne illnesses occur because consumers have not been informed and taught about sanitation in the kitchen environment. There is a need to deliver sanitation education to consumers. The temperature of each refrigerator was checked with an infrared device, and a thermometer was installed in each refrigerator. Before leaving the home, the participant was told the temperature of the refrigerator, whether it was within desirable range or not, and was given two food safety brochures developed especially for this project.

   The feasibility of using an mATP bioluminescence assay for assessing microbial contamination of home refrigerators was evaluated and compared with the standard culture methods. Samples of refrigerator surfaces were collected from 123 low income households. Our results indicated a potential discrepancy in the population of mesophilic and psychrotrophic bacteria in the refrigerator samples. Nevertheless, mATP appeared to be a reliable indication of the average of APC and PPC (r _ 0.895). The mATP bioluminescence assay would provide a rapid and convenient test for researchers in field studies to assess microbial contamination in refrigerators.

b. Impact

   Change in Action

- 75% of the consumers in this study reported making changes in their refrigeration and/or food safety practices as a result of the information provided in this project. Additionally,

89% of respondents said they read the information provided to them during the initial contact, of those who reported having read the information, 97% said the information was beneficial to them. The most frequent changes included: cleaning the refrigerator more often and storing leftovers for shorted periods of time. Thus, we demonstrated that consumers will make changes in their behavior as a result of learning that the techniques they were using were not recommended.

- The mATP bioluminescence assay was demonstrated as an efficient and reliable method to determine microbial contamination of refrigerators, and comparable to standard culture methods. This assay can be performed on-site and the results are obtained within 5 min, thus avoiding the efforts of transporting samples back to the laboratories. This assay will provide a rapid and convenient test for researchers in field studies to assess microbial contamination in refrigerators.

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 focuses on the development of innovative methods utilizing phage-displayed recombinant antibodies for rapid detection and identification of *Salmonella* in foods. The specific objectives of this project are to (1) construct cDNA antibody libraries from murine lymphocytes immunologically challenged with surface antigens of *Salmonella,* (2) characterize and screen the libraries for antibodies with diverse specificity to surface antigens of *Salmonella,* (3) develop rapid immunochemical techniques utilizing phage-displayed recombinant antibodies for sensitive detection of *Salmonella* in foods, and (4) validate performance of the developed assays for detection and identification of *Salmonella* in various food products.

b. Impact

Change in Action

- The recombinant antibodies produced in this project have been incorporated into the development of a biosensor for rapid detection of *Salmonella*. The detection time for *Salmonella* has been shortened from 5 hours to about 15 minutes. In addition to their consistency, the recombinant antibodies have lowered the production cost to about 25% of conventional antibodies. The use of recombinant antibodies has increased the sensitivity of the immunoassay by 150% as compared to conventional antibodies.

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c. Source of Federal Funds: USDA Evans-Allen

d. Scope of Project: State Specific

Key Theme: Protein markers for verifying inactivation of TSE agents

a. Surrogate agents for the prion protein associated with TSE diseases will be needed to facilitate research assessing the efficacy of inactivating TSE infectious agents during decontamination/deactivation procedures. The overall goals of this project are: (1) To identify heat- and protease-resistant protein markers that can be used as surrogate agents

for prion proteins, and (2) to study denaturation of the protein markers as monitored by monoclonal antibody immunoassays for verifying the efficacy of manufacturing process to inactivate infectious TSE agents. Correlation between denaturation of protein markers and deactivation of prion proteins will be established, and reliability of the immunoassays for predicting deactivation of prion proteins will be evaluated.

b. Impact

Change in Knowledge

- This project has produced a reliable measuring system that is based on the degree of denaturation of the selected protein markers to determine inactivation efficiency of the inactivation processes. The monoclonal antibodies produced in this project have enabled the development of immunoassays for detecting heat-denatured protein markers. Enzyme-linked immunosorbent assays (ELISA) have been demonstrated to be a reliable system for prediction of inactivation of TSE infectivity under high pressure/temperature conditions by measuring the denaturation of protein marker.

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

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 purposes to categorize food safety risk preferences of consumers in rural and under-served areas of Tennessee, examine factors that explain differences in perceptions, and obtain estimates of willingness to pay for safer foods. Conceptual development and refining of the economic models which form that basis for proposed food safety research is on-going. More secondary research was conducted in order to help in fine-tuning the instrument(s) to be used in collecting data for the study. Work on the models to be used for data analysis was concluded. The models are, however, still being tested and evaluated for appropriateness. Work on the sampling frame has been developed and strategies for the administration and implementation of the mail and face-to-face surveys have also been completed.

b. Impact

Change in Knowledge

- Students were trained on the use of the Excel spreadsheet and the Statistical Package for the Social Sciences in analyzing survey data. The project also engaged the students and increased their knowledge of questionnaire survey design and methodologies for selecting survey participants. Data management and data analysis skills of students participating in the project were enhanced.
- A face-to-face strategy applied to data collection allowed data collectors to speak to survey participants about food safety issues while administering the surveys. Information was conveyed to seventy-seven low-income survey participants in Nashville.

c. Source of Federal Funds: USDA Evans-Allen

d. Scope of Project: State Specific

Key Theme: Safer fruits and vegetables for Tennesseans

a. Efforts have been focused on increasing consumer intake of fresh fruits and vegetables. However, as consumption increases, protection from food-borne illness becomes of added importance. A comprehensive approach to developing relevant techniques for communicating food safety information included: determining consumers' fresh fruit and vegetable consumption and cleaning practices, assessing effectiveness of these cleaning methods, and developing an educational brochure. In a laboratory study, the most frequently consumed items, *i.e.* lettuce, broccoli, apples, and tomatoes, were inoculated with a test organism, then were either soaked in water, a commercial vegetable wash, lemon juice, or vinegar. Each was then either rubbed and rinsed, rinsed only, brushed and rinsed, or wiped with a wet and/or dry paper towel. Wiping apples and tomatoes with paper towels showed little bacterial reduction. Generally, water, vinegar, lemon juice, and vegetable wash solutions reduced bacteria population approximately the same amounts. Therefore, it is cost effective for consumers to use cold running tap water instead of other washing solutions to reduce microbial contamination on fresh produce.

b. Impact

Change in Knowledge

- This fruit and vegetable cleanliness research was highlighted in the December 2007 issue of the Harvard Medical Review Newsletter which has a circulation of 150,000. Additionally we have been contacted by industry consultants who found our approach refreshing. Thus, although we have not had much success in increasing the consumption of fruits and vegetables, those that are being eaten are presumably safer, thus reducing the chances of someone getting a food borne illness after consuming fruits and vegetables.

c. Source of Funds: State of Tennessee Vitamin Settlement

d. Scope of Project: State Specific

Key Theme: Assessing risk and communicating food irradiation benefits to high risk consumers

a. Contacts for possible cooperation with Alabama A&M University, the University of Tennessee, North Carolina A&T State University, the University of Arkansas at Pine Bluff, Kansas State University and Triangle Research Institute were finalized. A nutritionist from Tuskegee University was contacted and she agreed to collaborate on any future research with a nutritional component. Some understanding and verbal commitments were reached in principle that, if needed, scientists will collaborate in working together to re-submit a revised project based on the bridge grant awarded to Tennessee State University. Highlights of the bridge grant was discussed at the Morro Bay Food Distribution Research Society (FDRS) meeting reported in the first year of the

project. Further discussion and some highlights of the developed survey were discussed at the FDRS meeting in Washington, DC in October 2005. A fully-developed survey questionnaire was completed and reviewed by project director, co-director and other scientists. The completed questionnaire will be available for use in revised proposal.

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b. Impact

Change in Knowledge

- Students on the project continued to improve their computer skills through training received while working on the project. Training included using statistical software and spreadsheet programs for data entry and analysis.

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

d. Scope of Project: Tennessee

Key Theme: Characterizing consumer handling, storage, and use of product labels and dates to develop risk communication messages for ready-to-eat foods

a. Listeriosis, an infection caused by *Listeria monocytogenes (Lm),* is a potentially fatal disease of major concern. The *Lm* risk assessment conducted by FDA and FSIS showed that keeping refrigerated foods such as smoked seafood and ready-to-eat (RTE) meats at 40°F or lower and using refrigerated RTE foods as soon as possible can reduce consumers' risk of illness from *Lm* by more than 50 %. To characterize consumer storage practices for refrigerated RTE foods, a nationally representative Web-enabled survey of pregnant women (n = 249), seniors (n = 946), and the remaining population (n = 865) was conducted. The survey collected information on refrigerator temperatures and storage time for bagged salads, pre-cut fresh fruit, pre-cut fresh vegetables, frankfurters, and vacuum-packed luncheon meats. Following completion of the web-enhanced survey, each participant was mailed a copy of the USDA/FDA food storage guidelines.

In-person interviews were conducted with 214 food shoppers in Alaska, Kansas, North Carolina, and Tennessee. In depth questions were asked about the Ready-to-eat (RTE) foods purchased including amounts purchased, transportation, and usage and storage information and whether respondents looked for dates and storage information on labels. Information related to possible increased susceptibility to food-borne illness was obtained.

b. Impact

Change in Knowledge

- Data for smoked seafood was analyzed separately and sent to the Food and Drug Administration for use in FDA updated risk assessments.

- Data from the web-enhance study conducted last year is being posted on the Joint Institute for Food Safety and Applied Research food safety risk analysis clearinghouse web site (www.foodrisk.org), so it is readily accessible to risk assessors and other interested individuals.

Change in Action

- Only 11 percent of all respondents had a thermometer in their refrigerator prior to the survey. All participants were provided a thermometer to use for this project, thus over 2500 households now have a thermometer in their refrigerator.

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

d. Scope of Project: Nationwide survey; State institutions collaborating from Tennessee, Kansas, and North Carolina

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): $400,194

Full-time Equivalents: 7.1

Key Theme: Food shopping habits, consumption patterns, and food security status of limited resource households - implications and strategies for change

a. This program focuses 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. The majority of the consumers studied made several unwise choices with the limited funds they had at their disposal, regardless of whether those funds were from government assistance programs or not. Although most of the consumers studied had a good understanding of what constitutes a balanced diet, they did not always purchase the foods to attain that goal, or sometimes felt that they did not have the means to do so. Thus, results indicate that food and money management education is needed for all limited resource individuals.

b. Impact

<u>Change in Knowledge</u>

- During the discussion groups participants were introduced to recipes incorporating foods they were not familiar with, and were provided a sample of the prepared foods. All but one participant liked the foods, and reported that they would use the recipes in the future. Thus it appears that there is a willingness to try new foods that could lead to a more nutritious diet.

c. Source of Federal Funds: USDA Evans-Allen

d. Scope of Project: State Specific

Key Theme: Assessing the food security status of non-profit food assistance recipients in Alabama, North Carolina and Tennessee

a. 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

b. Impact

Change in Knowledge

- This project resulted in the training of one graduate student (M.S.) in the TSU Department of Agricultural Sciences.
- Approximately 120 agricultural economists, policy makers and representatives from non-profit organizations were informed of project results at regional and national conferences

c. Source of Federal Funds: Southern Rural Development Center

d. Scope of Project: Tennessee, North Carolina and Alabama

Key Theme: Assessing the barriers to increasing fruit and vegetable consumption among economically disadvantaged population groups

a. The overall goal of this research 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. To achieve this goal, research 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, preparation methods, and perceived barriers to consuming greater amounts of fruits and vegetables have been investigated. Results indicated that more fresh produce should be offered in stores that are in areas of easy accessibility to low income neighborhoods. It is also recommended that a follow-up study be done to compare the prices of the items available, and whether increasing their presence in the local grocery stores leads to increased consumption.

Discussion groups were held with low income residents in Nashville to assess their perception of the importance of consuming fruits and vegetables, and the content of a complete meal. Findings showed that consumers are not consuming an adequate amount of fruits and vegetables, and had very little variety in what they did consume. Several vitamins could be missing from the diet as a result of these limitations. The fruit and vegetable booklet that was developed and printed for this project was distributed across Tennessee and in several other states.

b. Impact

Change in Knowledge

- A full-color brochure was developed and printed. It was later adapted for presentation as a web page and placed online for public access and download (http://www.tnstate.edu/iager/impacts/eating_fruits.htm). In the first six months of availability there were over 5000 hits on the website and over 3000 copies of the brochure were ordered. The majority were ordered by extension and public health officials, although a small number of orders were placed by consumers.
- Consumers continue to believe that fresh fruits and vegetables are expensive. Thus, it is still a challenge to get them to invest in them for their health. Also consumers have expressed new concern about consuming fresh produce as a consequence of the recent occurrence of *E. coli* in fresh spinach.

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. While studies have been performed to evaluate various programs offered to minority populations, none have been conducted that specifically investigate the reasons these population groups do not participate in health-related studies, thus resulting in low representation in these studies. This project examines reasons for lack of involvement by minorities in health research, and investigates methods for increasing participation. It has three phases. In Phase I, three focus groups were conducted to determine the consumer's knowledge of health, perception of health and well-being, and the practice of prevention. Persons from three different population groups in Middle Tennessee (African Americans, limited resource consumers, and Hispanics were asked to give opinions addressing the following subject areas: health-related program perceptions, preventive practices, perception of where statistics that are seen, read, or heard about in the media come from, knowledge of different types of research, and barriers to consumer health-related research. The information gathered from the focus groups conducted in Phase I was then used in Phase II. A set of five questions concerning health practices and consumer research participation has been developed, tested and added to each of the research projects conducted by the Food Safety and Nutrition Team of IAgER. Phase III is an expansion of Phases I and II where there will be focus groups conducted with economically advantaged groups (for comparison), an expanded questionnaire, and investigating methods for increasing participation. Results will be used to design more effective methods of recruiting and including minority populations in nutrition and health studies.

b. Impact

Change in Knowledge

- Information about our project reached the Hispanic community and we were asked to join the Nashville Latino Health Coalition, and serve on the committees to improve health services to this population.

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. The use of a descriptive size term for portions of meat does appear to be a consistent choice when obtaining dietary records and recall information. Significant differences were not found between the descriptive portion sizes reported by the overweight or healthy weight subjects, nor were there any differences in the distribution of what they said was a normal portion size for them. The few differences that were found actually showed that the overweight individuals thought the amount shown was a larger portion size than did healthy weight persons. This information is important to nutritionists who counsel patients because it suggests that differences in perception of portion size are probably not the problem, thus other factors must be addressed and emphasized. More total foods, more eating occasions, a sedentary lifestyle, or a cognitive "disconnect" between the actual and perceived sizes of portions consumed may be more important issues in the obesity epidemic. In conclusion, consumers liked using the word scales and preferred that style of reporting rather than reporting by more traditional methods *i.e*. cups, ounces, ruler, etc. Thus using scales does appear to be a viable method that can be used with some consistency in reporting dietary intakes. Improved efficiency and accuracy in dietary assessment could reduce the burden of recalling amounts eaten on both the client and the interviewer.

b. Impact

Change in Knowledge

- An article that was published in the Journal of the American Dietetic Association received much attention. Scientists were interviewed by writers from two newspapers and five popular magazines. Radio stations picked up the information and talked about our research in Washington DC. The research was also posted on www.tesh.com. Thus, this research gained much notoriety and was read by potentially millions of people. Manufacturers contacted us and wanted to produce the portion size estimation aid we tested for this study.

Change in Action

- Consumers prefer using the word scales and preferred doing that to reporting amounts consumed by more traditional methods *i.e.* cups, ounces, ruler, etc. Thus using scales does appear to be a viable method that can be used with some consistency in reporting dietary intakes. It is anticipated that the three point scale currently used for reporting amounts eaten will be altered after completion of this project.

c. Source of Federal Funds: USDA Capacity Building

d. Scope of Project: Tennessee and Kansas

Key Theme: Food safety education for the hard-to-reach and underserved communities

a. The goal of this combination of projects was to design a survey to be used in collecting food safety information from the hard-to-reach communities in Alabama and Tennessee. Information collected would also be used in developing educational materials for communicating food safety to this target group in Alabama.

b. Impact

Change in Knowledge

- One work-study student from Tennessee State University was hired and trained on the project. Knowledge and skill of student participant on the use of the Statistical Package for the Social Sciences (SPSS) and Microsoft Excel in storing, managing and analyzing data were enhanced through the project. Student's knowledge of survey design and sample selection was also increased.

c. Source of Federal Funds: USDA/CSREES

d. Scope of Impact: Multi-State Research – TN, NC and AL

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. Additionally, over-reliance on synthetic fertilizers in crop production can result in migration of nutrients into water resources. Finally, animal farming operations can contribute to nutrient and pathogen pollution of water. Potential adverse impacts of pesticides, nutrients and pathogens on human and ecological health call for studies on fate, behavior, and mitigating strategies for undesirable intrusions of chemical and pathogen in soil and water. Researchers on IAgER's Environmental Protection and Enhancement Team are directing their research efforts toward identification and implementation of alternative pest and disease control; strategies for remediation and/or mitigation of adverse impacts of agricultural non-point source pollution, and overall resource management approaches for environmental protection and enhancement.

Total Expenditures (Section 1445 Funds under NARETPA of 1977): $1,525,141

Full-time Equivalents: 28.4

Key Theme: Integrated pest management; improving environmental quality

a. Our research efforts have included the following: (1) the evaluation of Japanese beetle, imported fire ant, 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, (3) development of powdery mildew resistance in dogwood and analysis of the pathogens, and (4) evaluation of environmentally friendly alternatives to fungicides for the management of foliage diseases in nursery production.

b. Impact

Change in Knowledge

- Favorable data were collected to support several insecticides in Japanese beetle (JB) and fire ant (IFA) quarantines, providing alternatives to chlorpyrifos. New insecticide treatments demonstrating potential for inclusion in the Japanese Beetle Harmonization Plan include clothianidin and thiamethoxam. Thiamethoxam data were submitted to the Chair of the Japanese Beetle Regulatory Treatment Review Committee for consideration of addition into the Japanese Beetle Harmonization Plan. However, the Review Committee has not made a formal decision at this time.

Change in Action

- 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 50-66%, and growers who wish to abstain from using traditional fungicides can reduce fungicide use to zero.
- Multiple insecticides (*e.g*, bifenthrin, carbaryl, trichlorfon, imidacloprid, thiamethoxam, chlorpyrifos, acephate) have demonstrated exceptional efficacy against both imported fire ants and Japanese beetle when applied as root ball immersion treatments. We are

working with chemical manufacturers, EPA and APHIS to facilitate the changes in pesticide labeling needed to approve these treatment uses.

Change in Outcome

- A new insecticide product containing imidacloprid and cyfluthrin was conditionally-approved in the 2004 U.S. Domestic Japanese Beetle Harmonization Plan based on a 2003 Japanese beetle field trial from this project, saving producers about $1,482 / treated hectare. Data from 2004 and 2005 field trials have provided additional support for the conditional approval that was granted in 2004, ensuring producers will continue to experience decreased production costs.
- Chlorpyrifos immersion treatments were efficacious at rates as low 8 times the rate currently used in the Domestic Japanese Beetle Harmonization Plan. Based on our cost estimates of the labor and chemical required to treat a typical acre of nursery trees, the new reduced chlorpyrifos rate will cost growers about $942 per acre of treated trees, compared to $2,702 per acre of treated trees using the current rate. This amounts to a savings of $1,760 per acre of treated trees.

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

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

Key Theme: Sustainable agriculture

a. Three broad objectives of this project encompassed 1) standardization of extraction methodology of triclopyr (3, 5, 6-trichloro-2-pyridinyloxyacetic acid) from soils and water samples using benzene as a solvent and alternate solvents, 2) persistence of triclopyr herbicide in soils and fescue grass selectivity, and 3) adsorption of triclopyr on diverse soils.

b. Impact

Change in Knowledge

- Of great concern to homeowners and ranchers in Tennessee and elsewhere is when to overseed fescue grass areas after triclopyr application. They are assured by this research in knowing that, at the recommended herbicide rate and under similar soil-climatic conditions, it is safe to overseed fescue grass-lawns 28 days after triclopyr application.

Change in Action

- An improved method of triclopyr extraction from soils and fortified waters was developed. This method is less time consuming, and eliminates the ‘cleanup’ step before gas chromatographic chemical analyses. Thus, it improves the efficiency and safety of the chemical analysis technique of this herbicide.

c. Source of Federal Funds: USDA Evans-Allen

d. Scope of Impact: State Specific

Key Theme: Salt-loading assessment of plant nursery soils mapped with geographic information systems.

a. An *in situ* field survey of soil electrical conductivity (EC_a) plays a major role in precision agriculture. Growers can tell which block(s) of their nursery field is high or low in soluble salts. The accumulation of soluble salts in nursery fields can adversely impact crop growth by increasing osmotic potential of the soil solution and subsequently may induce specific ion toxicities or nutrient imbalance.
The goal of the research is to monitor nursery soils salinity level as a function of apparent EC_a. Four nursery fields in Middle Tennessee are being used for the study. The sites are geo-referenced and the shape files will be linked to ArcCatalog of an ARCView platform. Soil samples from nursery fields are also being analyzed for predominate solutes responsible for salinity.

b. Impact

Change in Action

- As a result of the research and outreach efforts of this research, about 30% of the approximately 1000 certified nursery producers in Tennessee are able to identify which regions(s) of their production areas are high or low in soluble salts.

c. Source of Federal Funds: USDA Evans-Allen

d. Scope of Impact: State Specific

Key Theme: Remediation/mitigation of chemical contamination in the environment

a. Plant systems can be used to clean up or alleviate adverse impacts chemical pollutants in the environment; however, there are still aspects of the processes that are not well understood, which has limited full deployment of the practice in the field. Between 2004 and 2005, we investigated four grasses namely, Eastern gammagrass (*Tripsacum dactyloides*), switchgrass (*Panicum virgatum*), Indian grass (*Sorghastrum nutans*) and big blue stem (*Andropogon gerardii*), and 2 legumes, alfalfa (*Medicago sativa*) and crown vetch (*Coronilla varia*), to determine their abilities to enhance dissipation of the insecticides Dursban (*chlorpyrifos*), Flagship (*thiamethoxam*), Talstar (*bifenthrin*), and Chlordane. Dursban is widely used as a quarantine insecticide to control the Japanese beetle in nursery production; however, growing concerns about the chemical's human and ecological impacts suggest that its future use could be restricted. Accordingly, alternatives are being sought as replacement. Among the alternatives being tested are thiamethoxam and bifenthrin. Chlordane was banned from use by the EPA in 1988 because of its adverse human health and environmental impacts. However, the pesticide has continued to be cited as a chemical pollutant in Tennessee sediments.

Different behaviors of the insecticides were observed when monitored under the influence of different rhizosphere conditions. Microbiological characteristics of the soils are being investigated to identify plant-microbe interactions that cause accelerated degradation of insecticides in rhizospheres, so they can be improved further. We have used biochemical approaches and are continuing to develop molecular techniques for characterizing soil microbial communities. Laboratory personnel and students were trained in current methods for chemical, microbiological, and molecular analysis of soil.

b. Impact

Change in Knowledge

- One student graduated with a master's degree in environmental engineering (December 2006) by conducting a thesis project on phytoremediation of pesticide contamination in soil.
- One student is conducting a doctoral dissertation project using skills acquired on techniques developed during the conduct of this project.
- One research associate acquired competence in extraction of DNA from soil for use in molecular characterization of microbial communities in soil.
- One undergraduate student is working on a senior project using techniques developed during execution of this project.

c. Source of Federal Funds: USDA Evans-Allen

d. Scope of Impact: State Specific

Key Theme: Water quality-non-point source water pollution

a. Until recently, most concerns about environmental pollution focused on large intrusions of chemicals into the environment from accidental spills or improper disposal or discharge practices (point source pollution). Now, attention has shifted to perhaps a more insidious type of pollution: Non-Point Source Pollution (NPS). In contrast to point source pollution, NPS pollutants do not arise from a single location; rather, they come from diffuse sources, thereby making source identification and control daunting tasks. The two most frequently cited non-point source water pollutants in Tennessee are silt and bacteria. Bacterial pollution of streams, lakes and rivers poses serious health threats to communities through ingestion of contaminated drinking water, or food that has come into contact with contaminated water. One of the urgent research needs for addressing non-point source pollution is identification of the pollutant source which in turn will allow for immediate action. We recently submitted a proposal to investigate non-point source pollution of waters. The major focus of the proposed work is on development and/or improvements of bacterial source tracking methods and development and/or improvement of strategies to prevent pollution in the first place.

b. Impact
No impacts to report at this time.

c. Source of Federal Funds: USDA Evans-Allen

d. Scope of Impact: State Specific

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

Change in Action

- 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 Institute of Agricultural and Environmental Research

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

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 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): $625,176

Full-time Equivalents: 11.2

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.

After input from researchers and scientists, the questionnaire survey to be used for data collection was finalized and will be sent through the University's human subject committee for approval before use. Data collection began in March 2006. The sampling frame has been developed and a strategy for the administration and implementation of the mail surveys has also been completed. Work on the models to be used for data analysis was concluded; however, the models are still being tested and evaluated for appropriateness and robustness.

b. Impact

Change in Knowledge

- 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 nursery producers via the TSU Nursery Research Center 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.
- A bulletin exploring the issue of diversifying the farm population in the south has been published.

c. Source of Federal Funds: USDA Evans-Allen

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

Key Theme: Food safety practices and risk reduction education for rural residents of selected states

a. Overall goal of project is to build Tennessee State University's capacity in the area of food safety research. The project focuses on the rural residents in Alabama, North Carolina and Tennessee. Through this research, student research skills will be enhanced through active participation in all aspects of data collection and analysis. Collaboration between Tennessee State University and two USDA agencies -- the Food Safety Information Service (FSIS) and the Economic Research Service (ERS) – will strengthen the University's research in this area. The project will strengthen campus inter-departmental collaboration between food scientists, nutritionists, extension food safety professionals, and agricultural economists. Information and skill sharing among scientists will enhance research, teaching, and student learning at Tennessee State University. Other 1890 and 1862 institutions participating in the project with TSU are:

Alabama A&M University, North Carolina A&T State University, and the University of Tennessee, Knoxville.
During this report period, a survey questionnaire developed by collaborating institutions for the project during the first year was discussed among team members and modified according to suggestions. Telephone data on food safety knowledge, opinions, and actual practices were collected from 1,000 randomly selected residents of Alabama, North Carolina and Tennessee. Demographic information was also collected. Scientists and students worked together on coding, entry and analysis of data collected up to this point. Updated statistical software for data analysis was acquired.

b. Impact

Change in Knowledge

- Students on the project were introduced to data management and analysis using the Statistical Package for the Social Sciences (SPSS) and Micrsoft Excel. These students acquired some basic skills in data coding, data entry, and data analysis using the above-referenced software packages. Students also received training in poster design and preparation.

c. Source of Federal funds: USDA/SCREES 1890 Capacity Building Grants Program

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

Key Theme: Strengthening teachers' and students' knowledge of agricultural biotechnology through hands-on workshops and outreach.

a. The goal of the project is to build on Tennessee State University's effort in biotechnology education by providing hands on training for middle and high school teachers and college students.

b. Impact

Change in Knowledge

- To date, 86 high school teachers have been trained in applied biotechnology techniques. The training enhances the knowledge and confidence of the teachers to teach the subject in their schools and will have a positive impact of advancing the national and state goal of expanding science education. Teachers were also given material prepared for the training, CDs and a new web based book on Agricultural biotechnology. The sharing of these resources and knowledge acquired with other teachers at their schools and training their students in biotechnology techniques can have a long term impact.
- Eleven area high school students interned in IAgER laboratories and received hands-on training in plant biotechnology. Participants in the training receive laboratory equipment which enables them to train students at their base schools.
- Seven TSU students participated in biotechnology training thereby enhancing their skills through experiential learning, thereby increasing interest in the field of biotechnology among the students and increase the number of future graduates.

Change in Outcome

- Of the teachers receiving training, over 50% stated an increased confidence in their ability to teach biotechnology. A 40% increase in agricultural biotechnology oriented laboratory exercises and lessons was obtained in classes led by teachers who received this training.

c. Funding Source: USDA-CSREES

d. Scope of project: Tennessee

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

Change in Knowledge

- 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 Institute of Agricultural and Environmental Research at Tennessee State University hosted the last consortium meeting that highlighted impact of the project by various stakeholders. Project results are summarized in brochure (http://www.tnstate.edu/IAgER/Impacts/accomplishments.htm) and also published in an applied journal. Final project reports from the collaborating institutions are being compiled by Alabama A & M University which is the lead institution. Project results from all eleven collaborating institutions including Tennessee State University can be found at http://www.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.

Key Theme: Participation of Latino/Hispanic population in the food stamp program in the South.

a. The Hispanic population is growing rapidly in the U.S. generally and in the southern states particularly. This rapidly growing population is characterized by high poverty rates among children and elderly population compared to other races. The majority of the

population is not aware of the Food Stamp Program (FSP) and their eligibility to participate in the program. The goal of this study was to acquire an understanding of the dynamics of the Latino/Hispanic population and their participation in the FSP.

b. Impact

Change in Knowledge

- Project team from Tennessee State University conducted meetings with nearly 400 Hispanics in five locations in Tennessee and Kentucky. The survey results help to identify problems and recommend strategies that will increase their participation in the program.
- Final report of the project was presented at the USDA-ERS Small Grants Conference on December 2-3, 2004 in Washington, DC. The participants of the conference include researchers, private organizations and food stamp policy makers from national and regional levels. The final report and results are available at the SRDC website.

c. Source of Federal Funds**:** Southern Rural Development Center

d. Scope of Impact: Tennessee and Kentucky

B. Stakeholder Input Process

Various actions are 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 representatives from small, medium and large nursery operations 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) seeks stakeholder input through professional meetings, field days, demonstrations, consultations, and informal contacts. This input is 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 are 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.

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.

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 activity.

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.

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.

Specific Issues:

Did the planned programs address the critical issues of strategic importance, including those identified by the stakeholders?

As addressed in 'B. Stakeholder Input Process' above, 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.

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.

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.

Did the planned programs address the needs of under-served and under-represented populations?

The areas of research emphasis in the Institute of Agricultural and Environmental Research are the culmination of a thorough strategic planning process that was used to define the scope and direction of the research programs in the Institute. 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.

Did the planned programs describe the expected outcomes and impacts?

Outcomes and impacts for the planned programs are described within the program summaries. Each planned program includes defined outcome goals that have generated quantifiable impacts.

Did the planned programs result in improved program effectiveness and/or efficiency?

As stated above, the research objectives in the Institute of Agricultural and Environmental Research have been developed after a thorough strategic planning process in which the assets and liabilities of the Institute 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 has 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 research has been 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. 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.