FY 2000 Annual Report of Accomplishments
Cooperative Agricultural Research Program – 1890 Research
Tennessee State University

Point of Contact: All questions and comments regarding this Plan of Work should be directed to the Research Director at Tennessee State University.

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PLANNED PROGRAMS

Thirteen research programs were planned to address the needs of our stakeholders. These programs are as follow:

GOAL 1. AN AGRICULTURAL PRODUCTION SYSTEM THAT IS HIGHLY COMPETITIVE IN THE GLOBAL ECONOMY

Program 1. Alternative Livestock and Poultry
Program 2. Nursery Crop/Green Industry Enhancement
Program 3. Small Farms Viability
Program 4. Forest Management for Minority Landowners

GOAL 2. A SAFE AND SECURE FOOD AND FIBER SYSTEM

Program 5. Salmonella in Poultry
Program 6. Bacteria in Fruits and Vegetables

GOAL 3. A HEALTHIER, MORE WELL-NOURISHED POPULATION

Program 7. Nutrition Education for Disadvantaged Populations
Program 8. Healthier Eating

GOAL 4. GREATER HARMONY BETWEEN AGRICULTURE AND THE ENVIRONMENT

Program 9. Integrated Pest Management
Program 10. Sustainable Agriculture
Program 11. Water Quality
Program 12. Improving Environmental Quality

GOAL 5. ENHANCED ECONOMIC OPPORTUNITIES AND QUALITY OF LIFE FOR AMERICANS

Program 13. Economic Opportunity Enhancement

A. Planned Programs

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

Overview

The animal industry in Tennessee and the nation is diverse, with farmers and ranchers raising traditional livestock and considering non-traditional livestock alternatives. Research at Tennessee State University is addressing issues concerning the basic physiology, general performance, and marketing of selected alternative livestock for Tennessee and other States. However, we are maintaining research activities in the traditional areas relevant to Tennessee's economy. Research efforts in non-traditional alternative livestock that include guinea fowl and goats have been initiated. Beef cattle, fryer, and egg production represent our research activities in the traditional areas. Key aims of this research are: (1) developing and introducing a competitive goat production system for limited resource farmers in Tennessee as an alternative to beef, dairy, tobacco farming, and other farming activities where farmers are losing, or are likely to lose, market shares; (2) developing alternatives to traditional poultry production by introducing management practices for improving production efficiency in guinea fowl breeders; (3) assessing metabolic indices in cattle treated with ergotamine or consuming endophytic tall fescue to identify mechanisms through which ergopeptine alkaloids linked to fescue toxicosis reduce productivity in beef cattle production systems; (4) determining the effects of vitamin E supplementation on the reproductive efficiency of beef cows.

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. We are also developing a system for the introduction of selected improved plants for small farmers in Tennessee as alternatives to tobacco farming and other farming activities for which they are losing, or are likely to lose, market share. Finally, our researchers are analyzing the current structure of the green industry in Tennessee. Related activities include the development of hands-on teaching and demonstration areas. The 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.

Operators of small farms in America own about 71 percent of all farmland and contribute 41 percent to the agricultural sector's assets. Many of these farmers are facing 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 toward 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.

Forestland ownership among minorities in the southern states is significant. However, these lands are not contributing significantly to the income of the owners. Among the reasons that have been attributed to this condition is the lack of sustainable forest management knowledge among the 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. Future annual reports will include information on outcomes of our efforts on this subject.

Total Expenditures (Section 1445 Funds under NARETPA of 1977) - **$1,069,706**

Full-time Equivalents - **20.3**

Key Theme - Alternative Livestock and Poultry

a. Research objectives centered around the above key theme are aimed at developing competitive animal production systems for limited resource farmers in Tennessee and in surrounding states. One objective is to assess hormonal profiles for possible metabolic disruptions in cattle exposed to ergot alkaloids linked to tall fescue endophyte toxicosis. Plasma collected from cows and steers treated with ergotamine and steers fed endophyte-infected tall fescue has been assayed for concentrations of various metabolic hormones. The second objective is to determine the effects of vitamin E supplementation on reproductive performance in beef cows by injecting cows with four levels of vitamin E during the breeding season. Cows in the vitamin E study were artificially inseminated in June 2000 and are due to calve in March 2001, at which time data collection will begin. The third objective is to characterize nutritional requirements for optimal reproductive performance, growth, and carcass yield of guinea fowl. Guinea fowl representing different breeds are being fed diets that vary in energy and protein content. The fourth objective is to develop a meat goat management program that would be profitable for limited resource producers. A meat goat research herd is being established at TSU to study various components (*e.g.*, reproduction, nutrition, herd health) of a comprehensive goat production system with the intent of generating management recommendations for participants in Tennessee's growing goat meat industry.

b. Impacts:

- Acute exposure of cows to ergotamine, an ergot alkaloid associated with tall fescue endophyte, alters the plasma concentrations of cortisol, thyroid hormone, insulin, and glucagon. Early work in steers exposed to endophyte-infected tall fescue indicates shifts in plasma thyroid hormone and insulin that correspond with cow responses to ergotamine. These shifts in metabolic function may help to explain losses in performance of cattle grazing on infected fescue.

- The French variety of guinea fowl, when compared to other genotypes, was found to be most suitable for meat production. Dietary protein levels from 19 to 23% and energy levels from 3000 to 3200 kcal/kg of feed appear to be optimal for guinea fowl growth and feed efficiency. When the Pearl Gray breed of guinea fowl was fed dietary protein from 15 to 23%, there was a significant effect on laying performance and egg quality. Egg size and albumen weight were significantly greater for diets containing 21% crude protein. These findings can be used by producers to enhance guinea fowl management.

- Plans for a new goat herd are being implemented. Land has been allocated for the goat program and bids are being solicited for facility design and construction. The animal research personnel have consulted with goat researchers and made site visits to goat research programs at other 1890 and 1862 land-grant institutions. During the initial stages of program development, relationships have been formed with several goat producers in Tennessee. The producers have all expressed enthusiasm for this research initiative.

a. **Source of Federal Funds** - Evans Allen

b. **Scope of Impact** - State Specific

Key Theme - Nursery Crop/Green Industry Enhancement

a. CARP scientists have developed a plan to improve selected plant genera to broaden their consumer appeal and contribute to the enhancement of Tennessee's standing as a national leader in the nursery industry. Among the genera targeted by the team for improvement are *Helleborus, Pulmonaria, Hemerocallis, Castanea* and *Ulmus.* Improvement of these crops will be in development of new cultivars and improvement in propagation practices. Accomplishments in this area include progress toward a better-defined formula for *Helleborus* seed germination, completion of the first step in micropropagation of *Pulmonaria,* initial stages of defining DNA markers for efficient breeding of *Helleborus* and *Pulmonaria,* completion of a *Castanea* collection, and successful insertion of a gene into *Ulmus* callus tissue. Production studies with container-grown *Pulmonaria* revealed that decreasing container height increased media soluble salt levels and tissue nutrient

concentrations. Through careful management of nutrient dynamics in the root zone, producers can facilitate more efficient use of nutrients in containerized crops, reducing fertilizer waste and protecting groundwater quality.

b. Impacts:

- Select team accomplishments were conveyed to more than 500 attendees of the Tennessee Green Industry field day. The attendees gained first hand knowledge of the research goals and accomplishments to date. Program findings were also communicated to the attendees of the TSU Small Farms Symposium and the Cooperative Agricultural Research Program Research Showcase. Those events gave producers and extension personnel direct knowledge of the program.

- This research program, still in its infancy, will ultimately provide unique marketing niches for small farm producers in the state's $250 million nursery industry.

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

d. **Scope of Impact** - State Specific

Key Theme - Small Farm Viability

a. Several strategies to improve the viability of small farms were analyzed. These strategies included efficient production and marketing systems, introducing alternative crops, and use of e-commerce. Exploring, developing, and introducing alternative agronomic crops for small farm operators is considered an approach to keeping small farms viable. During the period under review, CARP 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. Once perfected, we will make these production methods available to farmers.

A survey aimed at obtaining information on production, management, and marketing systems used by small farms was conducted. A second survey was also conducted to identify the issues and constraints faced by farmers in adopting e-commerce.

b. Impacts:

- Two commercial cultivars of a purple coneflower (*Echinacea purpurea*) have been initiated from leaves of mature plants. Eight additional species and cultivars of coneflowers obtained from commercial nurseries and from seed are being maintained. These plants are being evaluated for their pharmaceutical value. Crude extracts from coneflower roots were tested for their anti-carcinogenic activity on cancer cell lines in tissue culture. Preliminary results show that the extracts inhibited growth of cancer cells. A tissue culture protocol was developed for St. John's Wort (*Hypericum* spp.). The protocol is being improved and evaluated for commercial production of clones. A collection of 14 cultivars and species of St. John's Wort is being maintained in a greenhouse. These plants are being evaluated for hypericin, one of the pharmaceutically active compounds in St. John's Wort. When these studies are completed, farmers will have options to diversify opportunities for income generation through the adoption or addition of medicinal crops to their operations.

- Preliminary results of a survey on production and marketing systems utilized by small farms showed that direct marketing was the predominant method of marketing. In contrast, use of cooperatives was limited, and contracts and futures market lagged behind all marketing channels. Further analysis will establish the effects of specific variables pertaining to the operators, their operations, and characteristics of counties where they are located. Results from the e-commerce survey indicate that e-commerce utilization among farmers in Tennessee is rare, and that there is a high degree of interest among the farmers to receive training on the adoption of e-commerce in their operations. The results from these surveys can aid policy making aimed at enhancing the viability of small farms through marketing.

c. **Source of Federal Funds** - 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 Food Safety, Human Nutrition and Family Well-being research team's major objective is to improve the health and well-being of Tennesseans through a safer food supply, adequate food distribution, and greater knowledge of nutrition and dietary assessment methodology. Researchers have developed collaborative projects with the Food Surveys Research Group/Agricultural Research Service/USDA, Economic Research Service/USDA, Richard Russell Research Center/USDA, National Center for Health Statistics/Centers for Disease Control and Prevention/Department of Health and Human Services, America's Second Harvest of Nashville, and the Sensory Analysis Center of Kansas State University. These projects address concerns about food safety messages for disadvantaged populations, increasing food security of economically disadvantaged populations, safer fruit and vegetable consumption, and reducing salmonella in poultry. Research is also being conducted to improve the methods of collecting dietary data during 24-hour recalls.

Total Expenditures (Section 1445 Funds under NARETPA of 1977) - **$103,721**

Full-time Equivalents - **2.4**

Key Theme - Salmonella in Poultry

a. A major goal of federal and state agencies, including USDA, is to reduce infections caused by food borne pathogens, one of which is salmonella. Many mechanisms for control of these organisms have been developed and studied. However, it has been recently noted that bacteria are becoming more resistant to treatments and may be producing their own protective mechanisms. The objectives of this research are to (1) identify proteins that are being expressed in salmonella because of exposure to stressful conditions, (2) define the mechanism for enhanced resistance of salmonella after exposure to various stressors, and (3) identify outer membrane(s) of five species of salmonella enhanced through poultry colonization.

b. Impacts:

- Seven cultures of salmonella were streaked on plates to check for purity. Strains were grown in LB broth. The Coomaise Plus Assay was used to quantify proteins. 1-D and 2-D gel analyses were performed on all salmonella strains. Images have been scanned and will be used for further analysis. Achieving these three objectives will lead to a decrease in salmonella infections due to contaminated poultry food products, which has direct implication on a safe food supply.

a. **Source of Federal Funds -** USDA Evans-Allen

b. Scope of Impact - State Specific

Key Theme - Bacteria in Fruits and Vegetables

a. Many groups, including USDA, DHHS, and consumer-based organizations, are promoting increased fruit and vegetable consumption, especially raw fruits and vegetables, as a way to reduce the occurrence of food-related diseases. If consumers follow this advice and consume more fresh produce, it will be important to be sure that they have practiced safe food handling. Researchers are assessing fruit and vegetable consumption patterns and examining ways to improve how consumers handle fruits and vegetables before eating to ensure a safer food supply.

b. Impacts:

- About 200 consumers completed questionnaires aimed at determining the kinds of fruits and vegetables that were consumed within a previous month period, and to gain an understanding of the handling of those fruits and vegetables before they were eaten. Results from the questionnaire revealed that the fruits most frequently eaten by the respondents were oranges, peaches, grapes, and watermelon. The vegetables most frequently eaten raw by the respondents were lettuce, tomatoes, greens, cabbage, broccoli, and carrots. Almost all of the respondents said that they wash fruits and vegetables in water before eating. However, the percentage of the respondents who washed fruits such as oranges and lemons was lower than for those fruits that that did not require peeling such as apples and grapes. Only about 10 percent of respondents rubbed fruits or vegetables while washing. Additional study is needed to get more specific information on washing technique and washing length. The effectiveness of the practices for bacteria reduction on fruits and vegetables is to be assessed further.

a. Source of Federal Funds - USDA Evans-Allen

b. Scope of Impact - State Specific

Goal 3: A healthy, well-nourished population.

Overview

Research to evaluate the nutritional knowledge of individuals receiving food assistance, the designing of appropriate educational materials that meet their scientific needs, and the evaluation of the effectiveness of those materials is progressing as scheduled. Researchers are also evaluating methods of reporting portion size for selected fruits and vegetables with the overall goal of improving existing methods, or developing new and more effective ones.

Total Expenditures (Section 1445 Funds under NARETPA of 1977) - **$46,063**
Full-time Equivalents - **2.3**

Key Theme - Nutrition Education for Disadvantaged Populations

a. Limited resource individuals and families more commonly consume diets of inadequate quality than more affluent persons. The goal of this project is to learn the food consumption practices and dietary status of economically disadvantaged populations in middle Tennessee. Through follow-up nutrition education and improved food purchasing practices we hope to reduce food insecurity in these individuals.

b. Impacts:

- Food bank recipients and elderly respondents completed 125 questionnaires. The areas covered on the questionnaire were food management practices, nutrition knowledge, dietary practices, and dietary intake. Respondents also completed a 24-hour dietary recall. Food bank recipients also responded to questions about reading food labels and food security. Results show that there may not be any relationship between level of knowledge and dietary intake. Intake of fruits, vegetables, and dairy products were very low when compared with standards. Diets were high in sodium and fat, but low in calcium, vitamin A, vitamin E, and folic acid (females only). This project demonstrates that creative ways of teaching nutrition education are needed so that the knowledge gained will be put into practice. Low-income persons need to be taught wise shopping practices, and other money management skills so the food selections they make will be healthier. Better nutrition could reduce the incidence of several diet-related diseases such as arteriosclerosis, diabetes, and cancer, thus saving millions of dollars in health care costs and lost wages. Since many of these recipients had children, it is hoped that the children will also benefit from the improved diets.

a. **Source of Federal Funds** - USDA Evans-Allen

b. Scope of Impact - State Specific

Key Theme - Healthier Eating

a. To know what people are eating and what improvements they need, we must have as accurate an assessment of their food consumption practices as possible. Thus, we must have valid ways of obtaining food intake information. This is a very difficult task for most people. However, no previous research has been done to assess the accuracy with which the elderly can report their intake. The first objective of this research was to assess how elderly respondents cognitively think about portion size and use portion size estimation aids. The second objective included measuring the nature and magnitude of error incurred in portion size estimation by elderly respondents when using various aids or types of aids. Other objectives include providing insight into the specific types of foods that have large estimation errors by elderly respondents so that we can handle data interpretation accordingly, and determining whether greater error occurs when using two-dimensional aids or three-dimensional aids.

b. Impacts:

- The strategies used by 120 elderly Americans to remember how much food they ate 'yesterday' were determined. Following that, 99 elderly persons consumed known amounts of various kinds of food and were interviewed the following day. We used one of two sets of portion-size estimation aids or no aids to determine how accurately they could report the amounts eaten. This research provides information that may improve the accuracy of dietary data collection by helping to develop new dietary aids or improving dietary questioning during interviews. Improved accuracy in dietary assessment tools will enhance efficiency of data collection.

a. **Source of Federal Funds** - USDA 1890 Capacity Building

b. **Scope of Impact** - Multi-State Research, conducted in TN, KS, FL, and MO

Key Theme - Healthier Eating

a. A goal of the Healthy People 2010 Initiative is to increase the proportion of consumers who follow key food safety practices. The purpose of this research is to assess food safety-related knowledge and practices of consumers and to design educational programs that result in healthier, safer practices.

b. Impacts:

- Researchers designed a questionnaire, pretested, revised and administered it to 157 subjects ranging from elderly to young men and women. Knowledge of sound food safety messages and reported practices were generally good, since the responses did not require knowledge of specific numbers and values. However, researchers noted knowledge gaps that will require further investigation. Results will enable us to compare and contrast consumer understanding and practices in middle Tennessee, design appropriate educational materials, and conduct lessons to improve future practices.

a. **Source of Federal Funds** - USDA Evans-Allen

b. **Scope of Impact** - State Specific

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 dictates studies for their persistence and movement in soil and surface waters, and studies of alternative pest and disease control methods. CARP'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) - **$289,920**
Full-time Equivalents - **7.3**

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; (3) the evaluation and development of environmentally friendly alternatives to fungicides for powdery mildew disease management in dogwood production.

b. Impacts:

- All Japanese beetle 2000 summer insecticide trials, with the exception of a chlorpyrifos dip efficacy/phytotoxicity test (which will be evaluated in the spring of 2001) have been completed. Data and reports are being prepared. Japanese beetle grubs have been collected and stored for a winter insecticide dip test, a laboratory bioassay with entomopathogenic fungi, and spring laboratory tests (mortality depending). Fire ant chemical tests are currently being rated at monthly intervals and are scheduled to terminate in June 2001. Trap collections of wood-boring beetles and clearwing moths have been completed for 2000.
- Setup of the new environmental nematology and micro-imaging lab was completed with the final repairs to critical equipment damaged in the relocation. Colonies of the nine existing races of the soybean cyst nematode (*Heterodera glycines*) were established, with the first generation scheduled to be harvested December 20, 2000. *In vivo* cultures of *Steinernema* spp. and *Heterorhabditis* spp. were established and are being maintained. PVC columns for egg transport studies were constructed and tested. A constant pressure drip water supply system for the columns was designed, constructed, and tested at multiple flow rates. Numerous tracers were tested to select the optimum flow indicator through the soil columns. Two soils for the egg transport study were collected, sieved, sterilized, and stored at ultra-low temperatures.

- The effect of biorational products on powdery mildew disease severity has been confirmed under field conditions. Products effective on dogwood, hydrangea, lilac, and rose have been selected. Resistance to powdery mildew in dogwood (*Cornus florida*) has been confirmed and plant characterization of resistant selections has been initiated. A total of 12 plants have been selected as the initial list of plants being considered for release as new cultivars. Epidemiological studies on powdery mildew have confirmed the role of temperature on ascocarp formation and survival and how it relates to initial infection in the spring. DNA analyses of the powdery mildew pathogen have shown that the aggressive pathogen in flowering dogwood (*Cornus florida*) in Tennessee was identical to that reported in *C. kousa* in Japan. This has significant implications on the sudden emergence of the pathogen in the U.S.

b. **Source of Federal Funds:** Evans-Allen; CSREES 1890 Capacity Building Grants

c. **Other Sources of funding:** Tennessee State University/State of Tennessee

d. **Scope of Impact:** State Specific

Key Theme - Sustainable Agriculture

a. Adsorption and desorption of five widely used pesticides will be studied utilizing both batch technique and column of soil materials. Soils from various nursery sites ranging widely in pH, organic matter and soil texture, as well as various soil mixes and soil separates will be included. Soil mixes and commercially obtained soil separates will also be included. In batch studies, the factors affecting pesticide adsorption and desorption will 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 will be conducted at 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:

- The pesticides to be used in experimental procedures have been selected. Soil sampling and preparation are completed. The setup of the experiment was completed, and adsorption/desorption studies of the first pesticide (a herbicide) were initiated. Methodology of the herbicide (oxyfluorfen) was standardized (lowest level = 0.05 ppm). Recovery studies of oxyfluorfen in soil were completed.

a. **Source of Federal Funds** – Evans-Allen

b. **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 a best management practice (BMP) for the production of nursery crops. This study will characterize (physically and chemically) three types of wood fibers and determine their adsorption capacities for two pesticides. The transport of these pesticides in columns of the selected wood fibers will be determined. Breakthrough curves will be used to determine flow parameters. A total mass balance for the applied pesticides will be performed. Additionally the fractions of pesticides sampled from each column will be predicted using a convective-dispersive type equation.

b. **Impacts**:

- Soil sampling for the column study has been completed. The collected soil was ground and passed through a 2-mm sieve, and a subsample was used for soil physico-chemical properties. The properties analyzed were pH, organic matter, particle sizes (hydrometer method), and gravimetric moisture. Sampling the soil for its hydraulic properties has been completed. The properties analyzed were saturated hydraulic conductivity (Ksat), soil moisture retention, bulk density, and soil porosity. Determination of organic carbon by wet oxidation in an acid dichromate solution is in progress. Twelve PVC columns were cut to specifications of 15 cm inside diameter x 40 cm long, with two holes, 15 cm apart, bored into each column for tensiometer insertion. Calibration of rain simulators was completed. Wood fibers (hardwood and softwood) were crushed and passed through a 2-mm sieve to enhance the sorption of the test pesticide. The test pesticide chosen is Princep 4L, a widely used selective herbicide for the control of broadleaf and grass weeds in ornamental and nursery plants. A calibration of the herbicide experiment is in progress to find the appropriate concentrations used in the sorption/leaching.

c. **Source of Federal Funds** – 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, only cotton, 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 the nursery sector, we are 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 is to conduct economic and policy analyses of issues that affect the well being of local, state, regional, national, and global communities. Results from our studies will be useful for policymaking and contribute to the economic enhancement of communities in our state and in other regions.

Total Expenditures (Section 1445 Funds under NARETPA of 1977) - **$314,276**
Full-time Equivalents - **3.6**

Key Theme - Economic Opportunity Enhancement

a. A survey to solicit information from growers/wholesalers was developed and pre-tested. The survey was designed to obtain data that will provide information on production and marketing variables associated with the nursery business. Researchers met with growers and wholesalers to discuss various marketing and industry issues. In addition to obtaining new information from growers, we provided them with results of research on relevant issues affecting growers. Those results included information on advertising methods and participation in trade shows by growers. The growers/wholesalers can use this information to decide what trade shows to attend and what kinds of sale expectations are realistic from trade show attendance. Trade show and industry convention planners could use this information to target planning for attendance at various trade shows. This information can be useful in effective planning by growers and wholesalers.

b. Impacts:

- Growers now have information to help make necessary changes in their production and marketing methods and to compete successfully in a highly competitive industry. Organizations engaged in developing programs to promote more competitive nursery and greenhouse businesses can also benefit from having this information. Nursery and greenhouse businesses, especially producers and wholesalers, have a better understanding of alternative methods of advertising and planning for their participation in trade shows. New entrants have information regarding marketing opportunities and advertising to help them in developing marketing strategies. More information is available for producers and wholesalers for their business planning, and for policy makers to develop relevant programs to help the green industry in Tennessee and neighboring states. Moreover, there is now some preliminary information on variables that should be considered when developing mechanisms that will aid the entry of minorities or limited resources farmers into the nursery industry.

a. **Source of Federal Funds** - Evans-Allen

b. **Scope of Impact**- Multi-State- Business development and enhancement, Research

Key Theme - Economic Opportunity Enhancement

a. Concerns have been raised regarding the economic contributions of agriculture and manufacturing to rural development in recent years. Those concerns have been raised, not only for the U.S. economy as a whole, but also for the economies of individual states. This study assesses the contributions of these two sectors to the economies of rural areas in Alabama, Mississippi, and Tennessee. The study will also estimate the direct and indirect economic impacts of the two sectors through an examination of output, employment, and value-added multipliers for rural and urban areas. Secondary data has been collected for the state of Tennessee and findings have been presented at national and regional meetings. The research team is now designing the questionnaire needed for collection of primary data.

b. Impacts:

- Researchers on the project attended an IMPLAN (impact analysis) Training conducted by the U.S. Forest Service to sharpen their skills on the software to be used for data analysis. Through the collaboration of the USDA Forest Service, the Forest Service Research Station in New Orleans, Louisiana, has enhanced its collaborative efforts with Tennessee State University. Research papers were presented at several professional meetings. This project, when completed, will provide information about the agricultural and manufacturing sectors in southern states. The project will generate more channels for distribution and sharing of information among researchers, extension professionals, and policy makers.

c. **Source of Federal Funds** - 1890 Capacity Building Grants Program

d. **Scope of Impact** - Multistate Research With AL and MS

Key Theme - Economic Opportunity Enhancement

a. Five counties and high schools (two in Middle, two in West and one in East Tennessee) have been identified as the primary education and outreach areas, based on income levels and rural isolation. The objectives of the project are: (1) educational outreach with the focus on primarily K-12 activities involving teacher/student training using the Biotechnology Kit Loan Program; (2) commodity outreach that includes crop identification, critical analysis, demonstration plot establishment, and, later, on-farm demonstrations of agricultural-biotechnology crops and pest management approaches; (3) community outreach through the organization of field days coupled with small farmer and professional worker training, and (4) socioeconomic studies that will assess the educational effectiveness and public perception, acceptance, and adoption of biotechnology by underserved consumers, producers, and agribusiness groups. On campus, contacts are being made with personnel in the Department of Biology, the Cooperative Extension Program, the TRIO Program, and the College of Education. These contacts will facilitate implementation of the outreach, education, and demonstration aspects of the project. We are developing instruments to conduct surveys of producers, consumers, and agribusinesses in selected counties on biotechnology issues in collaboration with other consortium members.

b. Impacts:

- TSU biotech labs are conducting work that will result in products for demonstration to farmers. A presentation at TSU's Campus Wide Research Day is planned to introduce the project to the University community.

c. **Source of Funding** - USDA/CSREES

d. **Scope of Impact** - Multistate Integrated Research and Extension with AL, AR, MS, FL, GA, OK, NC, TX, LA

B. Stakeholder Input Process

The development of this Plan of Work began with the establishment of the "CARP Vision 2000 Plus" Committee. The committee was established to develop a preferred vision and a corresponding research direction for the Cooperative Agricultural Research Program (CARP) at Tennessee State University. The committee consisted of faculty, scientists (those who conduct research), and staff members. There was also representation from Cooperative Extension (those who use research). This was the first stage of our stakeholder-input process. The second stage consisted of forming research teams. The research teams had the responsibility to insure the relevance of our research direction, or thrust, to the state of Tennessee by seeking inputs from external stakeholders (those who conduct and use research results). The external stakeholders consisted of persons associated with the nursery industry in the state and other individuals from many walks of life. Some of these stakeholders are listed in the sections dealing with internal and external linkages.

To insure the relevance of our research programs during the proposed five-year period and beyond, the stakeholder input process will be a continuous one. The process for this will be both formal and informal. The formal process will seek to utilize statewide surveys, meetings, and inputs from committees in CARP. The informal process will take the form of engaging small farmers, commodity and advisory groups, underrepresented groups, students, staff members, and policy makers in dialogues aimed at gathering information or inputs regarding the agricultural issues that concern them the most.

C. Program Review Process

There have been no significant changes to our program since the plan of work was submitted in 1999.

D. Evaluation of the Success of Multi and Joint Activities

Our programs are new and began in October 1999. We have been proceeding as outlined in the plan of work. We plan to conduct an evaluation at the end of 2001.

E. Multistate Extension Activities

Not Applicable

F. Integrated Research and Extension Activities

Not Applicable

CERTIFICATION:

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