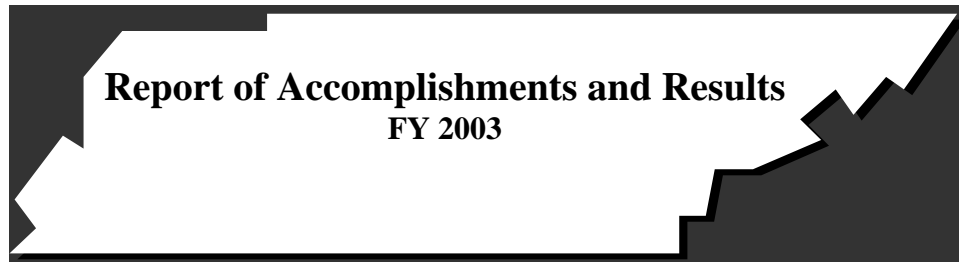


**TENNESSEE AGRICULTURAL RESEARCH
AND EXTENSION SYSTEM**



**The University of Tennessee Institute of Agriculture
Agricultural Extension Service
Agricultural Experiment Station
and
Tennessee State University
Cooperative Extension Program**

**Submitted to:
United States Department of Agriculture
Cooperative State Research, Education, and Extension Service**

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TENNESSEE AGRICULTURE RESEARCH AND EXTENSION SYSTEM

ANNUAL REPORT OF ACCOMPLISHMENTS AND RESULTS
FY 2003

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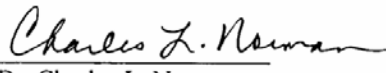
I. Introduction

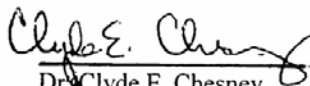
The Tennessee Agricultural Research and Extension System refers to Tennessee’s two land-grant universities which conduct research and extension programs. The Agricultural Extension Service and the Agricultural Experiment Station of the University of Tennessee comprise the 1862 institution and the Cooperative Extension Program and the Institute for Agricultural and Environmental Research of Tennessee State University comprise the 1890 institution. This Annual Report of Accomplishments and Results for FY 2003 represents the combined efforts of the University of Tennessee Agricultural Extension Service, the University of Tennessee Agricultural Experiment Station, and the Tennessee State University Cooperative Extension Program. This report includes results and accomplishments of FY 2003 planned programs, stakeholder input, program review, multistate, and integrated research and extension activities.

II. Certification

This is the USDA-CSREES Annual Report of Accomplishments and Results for FY 2003 for the University of Tennessee Agricultural Extension Service, the University of Tennessee Agricultural Experiment Station, and the Tennessee State University Cooperative Extension Program of the Tennessee Agricultural Research and Extension System.


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III. Planned Programs

FY 2003 results and accomplishments from Tennessee’s Extension and Research planned programs have been organized by the five USDA-CSREES National Goals. Planned programs are organized by key themes. The planned programs represent all 25 performance goals

established in the FY 2000-2004 Plan of Work submitted to USDA-CSREES on April 1, 1999, and/or the educational needs identified through stakeholder input.

TENNESSEE AGRICULTURAL RESEARCH AND EXTENSION SYSTEM
**Goal 1 - An Agricultural System that is
Highly Competitive in the Global Economy**

1.0 Overview

1a. Results

The Tennessee Agricultural Research and Extension System focused FY 2003 efforts to improve the competitiveness in production, processing, and marketing so that Tennessee agriculture remained competitive in the economy. The uncertainty of a tobacco “buy out” and loss of tobacco quota have lowered overall farm income for Tennessee tobacco producers and put more pressure on them to increase income from their beef cattle operations. With limited land resources for herd expansion, beef producers are being forced to increase the quality, value, and profitability of the feeder cattle which they produce. UT Research and Extension and TSU Extension responded to this need by teaching beef producers how to be profitable through greater management, marketing, and value-added products. Studying the minerals in forages was a prime example of the state’s supreme integration of Extension and Research work.

Tennessee’s farming sector continues to be stressed by low profit margins, scarce production resources and changing marketing conditions. From 1996 to 2000, the farmer’s portion of the average consumer dollar spent on food decreased from 23 cents to 19 cents. Prices in commodity markets continue to fluctuate sporadically while production and operating costs continue to increase. Extension’s MANAGE program focused on helping Tennesseans improve farm and financial management with 31,394 educational contacts during 2003. UT researchers developed and tested new soybean and tobacco varieties. Promoting adoption of higher-yielding, disease-resistant varieties was an important part of Extension’s crop production education programs in which 38,236 educational contacts were made.

UT and TSU Extension projects and activities related to USDA-CSREES Goal One reached 459,973 educational contacts. Both UT and TSU Extension made special efforts to serve minority, limited resource and under-served farmers. These farmers were contacted through on-farm visits, direct mail, office visits and group meetings.

1b. Highlights

Through on-farm research trials and on-farm Extension programs in 72 counties, the mineral content of Tennessee’s forages was established. All Tennessee mineral dealers reformulated their mineral lines based on the research results. Over 2,000 horse enthusiasts owning more than 8,000 horses participated in Extension’s Horse Management group meetings. Objectives

included better horse nutrition and curtailing the spread of West Nile Virus in the state which claimed both human and horse fatalities in 2001 and 2002. Through Extension’s mobilized response, the state’s horse death rate from West Nile dropped 60% in 2003.

1c. Benefits

The Tennessee Agricultural Experiment Station spent approximately \$10.7 million for research at 10 Branch Experiment Stations located throughout the state resulting in an estimated total economic impact of \$18.2 million, with \$1.1 million indirect and another \$6.4 million induced impacts. An estimated \$12.7 million in value-added or two-thirds of the total impact to the Tennessee economy occurred as a result of UT agricultural research. UT Experiment Station researchers developed a new, higher-yielding soybean variety, 5002T which will increase both yields and disease resistance for millions soybean acres in the Southeast.

Profits improved for many beef producers through Extension’s efforts to teach cooperative marketing. The Giles County Beef Marketing Alliance’s 71 members improved net income by \$74,000 through group marketing alone. Regarding forages, UT and TSU Extension impacts to farmers, including money saved and knowledge gained, were documented in 76 of the state’s 95 counties. In the six-counties of Northwest Tennessee, producer adoption of superior performing grain varieties reached 96%. These varieties were identified from the UT Extension Standardized Hybrid and Variety Test. The adoption rate resulted in some \$15.71 million additional income, without increasing cost. The \$15.71 million increase resulted from an increase of 8.49 bushels (\$22.41) per acre for corn, 3.04 bushels (\$17.33) per acre for soybeans and 4.61 bushels (\$13.46) per acre for wheat.

1d. Assessment of Accomplishments

UT and TSU Extension and UT Experiment Station personnel forged exceptional working relationships between and among agribusinesses, farm organizations, local farmer groups, and most importantly individual farmers to leverage Federal resources to increase agricultural competitiveness. To the extent possible, Goal One accomplishments on the county and multi-county level have been aggregated to show statewide Extension impact. Exceptional county impacts are also reported since programs and delivery methods are targeted to the needs of the local audience.

1e. Allocations for Goal 1

<p>UT 1862 Research - \$12,666,786</p> <ul style="list-style-type: none"> •Hatch - \$1,834,516 •Multistate - \$377,674 •McIntire-Stennis - \$125,676 •State - \$10,328,920 	<p>FTEs for Goal 1</p> <ul style="list-style-type: none"> •UT 1862 Research - 33.80 scientist and 185.10 non-scientist •UT 1862 Extension - 66.6 •TSU 1890 Extension - 4.5 professional and 1.0 paraprofessional
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UT 1862 Extension - \$5,478,807 •Smith-Lever b and c - \$1,074,103 •Smith-Lever d - \$24,500 •State/County - \$4,380,204	TSU 1890 Extension - \$344,572 •NARETPA Section 1444 and 1445 - \$214,748 •Grants and Contracts - \$64,836 •State/County - \$64,998
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**1.1 Key Theme: Agricultural Competitiveness
(Management, Marketing and Value-Added)**

Title: MANAGE Program

Issue: For farmers to survive the current farm financial crisis, they must become better managers. One example is that producers must have and use records for decision making purposes. Records are an important part of management and marketing. A listening session of 26 business leaders and agricultural lenders identified management, including record keeping, as a weakness of most Tennessee farmers.

What has been done: The MANAGE program was available in all of Tennessee’s 95 counties. Helping farmers, agribusinesses, and others to manage and improve their resources is the goal of the MANAGE program. The program served 31,394 Tennesseans through farm visits, office visits, phone calls, group meetings and personal letters. Example educational topics included: farm financial education, records, farm planning, hay economics, marketing alliances and computer applications.

Of the myriad MANAGE programs and delivery methods, three examples follow: partial budgeting/leases, farm plans, and computer applications. 91 West Tennessee farmers were assisted in partial budgeting and leases while 50 received assistance in making an informed decision on signing up for the new farm bill. A UT Area Farm Management Specialist assisted 39 South Central farm families in developing intensive farm plans (26 long-run plans, eight cash flow plans and two year-end analyses). In Southeast Tennessee, two multi-county computer-based accounting workshops for nursery producers were held with 16 people attending the three-day sessions.

Impact: A survey of farm families using intensive planning indicated an average of \$11,000 per farm in increased income and/or reduced expenses resulting from intensive farm planning. By applying this value to the 39 South Central Tennessee farmers who completed this planning, farm families realized \$297,000 in increased income. These farm plans represented approximately 6,600 acres of crop production and a potential gross income of \$8.9 million.

A pre and post-test was conducted with 17 producers who participated in a program on keeping and using records for decision making purposes. The survey showed the following results:

- 100% increased their knowledge, interest, and understanding of financial management.

- 100% increased their skills in using goals in management, in record keeping, in preparing balance sheets, income statements, cash flow statements, and enterprise budgeting.
- 100% plan to implement some of the skills learned.

In Grundy County, 590 farmers, producers, landowners, and citizens attended educational meetings and were taught recommended production, management, and marketing practices for the enterprises in which they are engaged. Follow-up evaluations and pre-tests/post test results from educational meetings indicate a:

- 17% increase in knowledge of developing a market plan to suite their farm.
- 50% increase in knowledge on record keeping and financial management.
- 47% knowledge gain for the seven management topics (n=590).

A survey of 16 nursery producers who participated in two computer software workshops showed:

- Record keeping and financial management skills increased by 50%.
- Overall knowledge of the software package increased by 115%.
- Knowledge of how to use the software in your business increased by 123%.

For 48 Upper Cumberland farmers, the addition to net farm income from alternative farm enterprises ranged from \$71,290 to \$155,853. The change in cash flow from alternatives suggested by the producers and the farm management specialist ranged from \$63,121 to \$158,328. Of the Upper Cumberland farmers in the MANAGE program, 65% made a positive change in their operations as a result of farm financial analysis.

In West Tennessee, 50 farmers analyzed their individual farms for the new farm bill sign up and made decisions that will not only benefit them in 2003, but for many years to come. The difference in farm bill sign up options meant an additional \$562,898 in direct payments for these farmers.

The success stories of individual farm families and others who participate in farm MANAGE programs in 2003 are legion. The following is merely a sample of these successes:

- One participant has prepared a balance sheet annually for the last three years. Last year his equity increased by \$40,000.
- Another participant bought 25 acres of land for \$2,000 per acre. He made a down payment on the land of \$30,000. He negotiated a price reduction for the land from \$2,500 to \$2,000 per acre. His MANAGE experience taught him that this price was in line with the land's net income and cash flow potential.
- A dairy producer who attended risk management educational programs increased income by \$8,000 by using appropriate risk management tools.
- Yet another producer increased his net worth by \$16,279, an increase in equity of 3%, and a dairy producer who attended risk management educational programs increased income by \$8,000 by using appropriate risk management tools.
- In the Smoky Mountain Region, a farm family opened a vegetable retail sales operation in a restored, on-farm store building. With the modernization of their retail sales, the

family wanted improved financial records. UT Extension assisted the family to select a computer software program that uses a bar code scanner, cash box, and receipt printer. The family estimates that their sales have nearly doubled this year from past years, and a portion of the increase is credited to more accurate records.

- A landscaper and nursery producer on the verge of bankruptcy has improved his record keeping skills during 2003. Extension helped him to obtain a better grasp on his business expenditures and cut unnecessary expenses. By organizing his debt load and tracking his payments, he is now managing his debt more successfully.

Funding: Smith-Lever

Scope of Impact: State Specific

Title: Value-Added Beef Marketing

Issue: Opportunities for income improvement often exist through better management, marketing, or value-added products. Value is often added to agricultural commodities and farm resources by various processing, packaging and marketing activities. However, to appropriately consider, evaluate and take advantage of value-added opportunities, Tennessee agriculture leaders and farmers must be aware of opportunities and be informed about economic feasibility, planning and market development. Local and state needs assessment showed that Tennessee beef producers could greatly benefit from value-added strategies. Tennessee beef producers receive low prices due to production and marketing calves without a health /management program, in small numbers and without known genetic performance traits.

What has been done: UT and TSU Extension Agents in 25 counties mobilized resources for teaching and researching value-added beef production. In each of these counties, evaluation plans were used to document measured outcomes from the programs. Also in each county, special efforts, such as direct mail and advisory groups, were used to target limited-resource, minority and under-served farmers.

Extension Agents conducted on-farm demonstrations, held hundreds of group meetings, field days, farm tours, hosted an out-of-state beef industry tour, taught two multi-session Beef Schools, and used numerous farm visits, newsletters and news articles to share the value-added message with Tennessee beef producers (one Decatur County Extension Agent made over 1478 contacts in beef marketing alone). Beef producers have been informed through meetings and demonstrations and print media of the changing market for feeder cattle in which buyers are demanding cattle which have some known feedlot and carcass performance characteristics. They were also shown research results which document that feeder cattle marketed in truckloads of 50,000 pounds bring premium prices. Demonstrations were conducted which showed producers that they could successfully and profitably afford to wean calves prior to marketing.

In Cheatham County, the Extension Agent collaborated with local livestock auction markets to conduct pre-conditioned feeder cattle sales and conducted 14 on-farm trials to collect and

analyze feeder calf weaning weights for making better management and marketing decisions. Extension raised awareness of marketing alliances such as Jackson County, where three producers agreed to market cooperatively after the county's Extension Beef meeting. In other counties, Extension provided the education and training for producers to start or maintain their own cooperative marketing alliance. Extension assisted Giles County beef producers to organize their own Beef Marketing Alliance in 1999. The original group of 32 farmers grew to 71 producers in two states and 11 counties in 2003 with 5,760 brood cows and 213 bulls. The Alliance has emphasized Beef Quality Assurance (BQA) with the Extension Agent training 341 individuals in formal BQA classes since 1999. In rural White and Van Buren Counties, three Tennessee Livestock Producer video sales were connected to the local extension office for local producers to see the advantage of this alternative market and how the video sale functions. In Franklin County, a TSU Extension Agent worked with an advisory group that identified and delivered information on beef marketing strategies to area producers.

Impact:

- 13 producers from six North Central Tennessee counties met requirements for 143 heifers in the 2003 UT Ultimate Bred Heifer Sale. (2003 marked the third annual sale.) The average sale price of the heifers was \$1015. This was an increase in value of \$191 per head. Eight producers from three counties met requirement for 103 heifers in the first Annual U T Ultimate Open Yearling Heifer Sale (2003). The average sale price of the heifers was \$616. This was an increase in value of \$86 per head. The combined value to producers from these two sales in 2003 was \$36,290.
- 40 Giles County Beef Marketing Alliance members marketed cattle together and improved net income \$216,465 in the past three years. Alliance members improved their income \$1.56/cwt. on steers and \$1.09/cwt. on heifers. In 2003, 71 Alliance members improved their net income by over \$36,000 by adopting BQA Certification practices. 40 different Alliance members sold 1,342 steers and heifers together at three video-alliance sales improving net farm income \$74,199 over regular auction markets or \$55.29 per head. The average length in days for calving season from the first calf born to the last calf born has decreased from 154 days in 1999 to 81 days in 2003. Castrating bull calves with surgical methods, such as a knife, increased from 30% in 1999 to 93% in 2003. Not only do steers receive a premium price in the marketplace, but castration with surgical methods reduces the possibility of tetanus and infection. The average number beef producers treating for brown stomach worms has increased from 56% in 1999 to 78% in 2003. The average days at castration has improved from 109 days in 1999 to 52 days of age in 2003. Regarding adoption of rotational grazing, a 25% increase has been realized, and a 40% increase in use of UT recommended forage varieties when beef producers were either establishing or renovating pastures. Adoption of these two practices has increased economic returns by \$123,177. Beef producers also increased the establishment of bermudagrass pasture from 20% to 40% which has provided more forage for beef cattle during the summer when fescue is short.
- Survey data obtained annually from 71 Giles County Beef Marketing Alliance members has shown the following financial impact for those practices adopted per year: castration of bull calves (\$15,814); vaccination of cows and calves (\$132,219); use of EPD+ herd

sires (\$141,120); BQA certification (\$36,592); record keeping (\$ 32,227); stockpiling fescue (\$91,040); 90 day calving season (\$106,122); implanting (\$40,648); forage testing (\$1,814); group marketing (\$72,000). The total impact has been over \$600,000 or \$9,400 per farmer.

- In Perry County, four producers increased weight an average of 230 pounds per calf, increasing income approximately \$48,000. Producers submitted 23 soil samples for forage crops and renovated or re-established 250 acres this year. Research shows adding clover increases weaning weight 146 pounds. This represents a \$32,800 increase in income to Perry County beef producers.
- Nine Cheatham County producers sold over \$200,000 of feeder cattle through Pre-conditioned feeder cattle sales or through other “added value” marketing opportunities. In an end-of program survey, 32 Cheatham County farmers estimated a total impact of over \$ 46,000 on their farms by following Extension recommended forage and beef management practices.
- Of the 347 producers attending the 2003 Cumberland Beef Day, 284 (82%) indicated they had previously attended the event, of which 119 producers (42%) stated they had adopted practices to improve production and marketability of their feeder cattle as a result of this event.
- In White and Van Buren Counties, 18 additional producers (up to 52 over the past five years) utilized alternative marketing strategies, including video board sales, truckload lots from multiple producers, as well as single source loads and the area preconditioning sale. Research conducted by UT agricultural economists has shown that producers utilizing these alternative markets increased total income by \$34.75 per head as compared to weekly auctions on the same day. The total increase in revenue for these producers marketing 2,244 head of feeders was in excess of \$78 million.
- In Middle Tennessee five producers from different counties participated in a cooperative marketing effort to group cattle in load lots. Over 250 head were included resulting in three trailer-load lots. Premiums when compared to traditional marketing methods (Tennessee weekly average price) were \$49 per head or \$7.18 / cwt. In addition, the participating producers saved on commission fees and sold with more favorable weighing conditions when compared to traditional marketing methods. Two producers marketed their calf crops totaling 190 head by private treaty for the first time in 2003. By soliciting bids they estimated the calves brought \$40/head more than they would have brought if they were marketed by their previous method. Estimated increase in revenue for the those who participated in the alternative marketing methods was over \$20,000.
- Pre and post-evaluations of a TSU Alternative Beef Marketing workshop in Franklin County showed: 58% knowledge increase in obtaining livestock marketing information; 79% knowledge increase in livestock marketing alternatives; 34% knowledge increase in importance of genetics in marketing; and 46% knowledge increase in overall livestock marketing.
- In 2003, 58 producers were grouping their calves to market and 6 were selling in load-lots, saving \$12 per head on commission on 1400 calves for a total of \$16,800. These calves sold for more money due to grouping by a total of \$60,000. 180 producers are rotating fly tags to control parasites. This has increased weaning weights by 22 pounds in

2003 on demonstrations. Bull lease and PT bulls have increased calf weaning weights by over 50 pounds per calf which amounted to \$50 more on 1300 calves (each)!

- In Chester County, 45 producers received Extension education regarding marketing alternatives with these impacts: 73% increased weaning weights by at least 40 pounds; 60% explored new marketing avenues in 2003; and 50% tried a new marketing approach.
- 35 Blount County producers increased income by an estimated \$22,000 by participating in graded feeder calf sales; 3 producers increased income by over \$5,000 by adding value through weaning, health programs and grouped marketing; 2 producers have used data gathered through weaning information to utilize new genetic potential by adding sires that have high EPD's for weaning.
- In Anderson County, 25 beef producers attended a Beef Advantage meeting, and three producers sold cattle in the Beef Advantage Sale. These producers increased the value of their feeder cattle by an average of 6 cents per pound or a \$30.00 increase per head for a 500 pound feeder calf.
- In Jefferson County, six producers participated in feeder calf marketing demonstration which increase their income by \$30,000. One producer increased his income by \$20,000 from topics covered in the County's Beef University.
- When marketing in truckload or near truckload lots feeder cattle have brought prices \$4 to \$8 per hundred above weekly auction prices. Depending on weight this means added gross returns of \$20 to \$50 per head. In addition the producers get the advantage of marketing on in weights (a 2-4% advantage) rather than out weights which are used at most weekly auctions. Some of these successful programs include the Smoky Mountain Feeder Calf Association's Southeast Pride Plus Sale, The Giles County Beef Alliance, Tennessee Farmers Cooperative's Beef Advantage Program, the Knox Area Feeder Calf Association, The Hawkins County Cattle Association, the Upper Cumberland Cluster sale and The Lower Middle Tennessee Cattle Association which markets about 15,000 head per year using the video sale technique. It has been shown that these cattle sell for about \$35 per head above weekly auction sale prices

Funding: Smith-Lever; NARETPA

Scope of Impact: State-specific; multistate component is the Giles County Beef Marketing Alliance (TN and AL)

Title: Assessing and Correcting Mineral Imbalances and Deficiencies in Beef Cattle on Tennessee Farms (Extension Title: Feeding is Fundamental)

Issue: Beef producers in Tennessee have recognized that their animals have not performed at the desired levels. In addition, they have recognized that these animals did not shed their rough hair coats during the warmer months. The fescue endophyte has been blamed for these problems. Research has documented that mineral imbalances, excesses and/or deficiencies particularly copper, sulfur, zinc, and selenium can produce these same negative effects. A lack of information on the mineral content of Tennessee forages has made it difficult to select the mineral mixture that would correct any imbalances or deficiencies. This study, to characterize

the mineral content of forages, was critically important to Tennessee beef producers and their mineral suppliers.

Beef cattle research continues to be conducted to increase the efficiency of feed utilization through supplementing feed with specific nutrients. The cost of feed represents approximately 60% of the cost associated with maintaining a cow/calf pair through one production cycle (approximately \$355 per year). For each 1% research decreases the cost of feeding beef cattle, a savings of over \$2.4 million per year in feed cost will be available to Tennessee beef cattle producers.

What has been done: This has been a joint Research and Extension effort with Extension's county agricultural agents collecting data and educating farmers. Extension agricultural agents in 72 counties submitted fescue samples for analysis. A total of 834 tall fescue samples have been analyzed. Chemical analyses of fescue samples revealed that copper was deficient or marginally deficient in 98% of samples. If sulfur is too high, it makes other minerals (Copper and selenium) less available. Sulfur was at problem levels in 78-95% of samples tested. Statewide selenium levels were deficient. Zinc was deficient or marginally deficient in more than 90% of samples. The spring magnesium level, 0.22%, is consistent with the large number of cases of grass tetany in spring calving beef herds. Potassium was above the level considered antagonistic to magnesium in almost one-third of spring samples.

Extension agents submitting samples have been provided detailed information about adjusting mineral supplementation based on forage mineral analysis. All companies that sell minerals in Tennessee were provided results of the analyses. Every company has made some adjustments in specific minerals or mineral lines. Information from the mineral survey has been widely distributed. Articles have appeared in *Progressive Farmer*, *Drover's Journal*, *Tennessee Beef Cooperator*, *Farm Bureau News*, *Southeast Farmer* and other publications. These data have been presented in at least 72 county meetings or field days and 30 cattlemen's meetings.

Impact: Producers are responding to the information provided by the mineral survey. Over 100 White County producers indicated that they are now aware of mineral deficiencies in their beef herd and 42 have upgraded their mineral supplement program. The state survey indicates producers lost \$910 per farm due to mineral deficiencies. In 2003, for White County alone, this research and extension effort has increased income for 42 beef producers by a combined \$38,000 in just one production cycle.

All mineral dealers in Tennessee reformulated mineral lines. A mineral dealer in Lincoln County revealed that 57 producers in 2002 changed to the reformulated mineral. The producers purchased 893 bags (50 lb bags) of the new mineral. In 2003 this increased to 84 producers purchasing 1796 bags of the reformulated minerals. This was a 47% increase in the number of producers adopting the practice of providing improved minerals for their beef animals. All other dealers in the state have indicated that sales of the newly formulated minerals have increased. Reports from producers using the newly formulated minerals indicate that animals are shedding their rough hair coats and are showing a much glossier hair coat.

Providing additional nutrition in the form of soybean hulls, to calves grazing cool season pasture in the fall resulted in calves gaining 2.4 times faster than calves consuming only pasture while maintaining pasture as their primary nutrient source. Pasture consumption estimations were only reduced 14%. It is estimated that each calf marketed after grazing with this supplementation for 60 days, after a weaning period, is worth an additional \$36 over calves' only grazing pasture during the same period. If 10% of the 750,000 calves marketed each year in Tennessee followed this program, calf sale receipts would be increased \$2.7 million.

A viable supplementation program has been developed to consistently produce grass-finished beef from calves grazing common Tennessee perennial pastures. Production of finished beef creates an opportunity for producers to market their beef products directly to niche market retailers or consumers thereby retaining a larger portion of the consumer dollar on the farm.

Pivotal research used for obtaining FDA clearance of an organic selenium source for cattle has been conducted to verify efficacy. This selenium source does not increase edible tissue residues to levels greater than those previously reported as safe for human consumption. Highly available selenium sources, such as this one, are in demand to provide proper selenium nutrition in dairy and beef cattle diets.

Funding: Smith-Lever; Hatch; Additional funding for this project was provided in part by Initiatives for Future Agriculture and Food Systems (IFAFS) grant #00-52101-96219 from USDA; Tennessee Forage and Grasslands Council; Lower Middle Tennessee Cattlemen's Association; Tennessee Farmers Cooperative; Southern States Cooperative and various individuals; companies and county livestock associations supplied additional financial support.

Scope of Impact: State Specific; Integrated Research and Extension

Title: Evaluating and Developing Value-Added Enterprises in Tennessee

Issue: Tennessee agriculture could be more competitive by adding value to its raw commodities. Tennessee agriculture leaders and farmers must be aware of opportunities and be informed about economic feasibility, planning and market development. Tennessee's agriculture industry can also benefit from value-added income opportunities not directly related to production agriculture, such as tourism, natural resource utilization and waste/by-product utilization.

What has been done: The educational programs and services provided across the state by the Center for Profitable Agriculture in value-added agriculture were numerous. The primary target audience groups who benefitted from value-added program efforts in 2003 were agriculture leaders and farmers (entrepreneurs) with value-added projects and enterprises. Extension faculty with the Center for Profitable Agriculture completed 24 on-farm visits, five project analysis, and 21 other farmer consultations. Extension faculty made 31 group presentations, used 13 venues to distribute educational information from exhibits, and conducted 11 workshops. New stakeholder groups were organized. The Tennessee "Value-Added Council" and the "CPA Executive

Council” were created and convened to provide direction for value-added Extension and Research.

Impact: Outreach and training programs conducted in 2003 enabled some 600 participants to improve the planning and development of their value-added ideas and more than 120 agriculture leaders improved their knowledge, understanding and comfort level of value-added agriculture. As a result of the 2003 program efforts, approximately 18 Tennessee farmers were directly impacted by the one-on-one, project-specific, value-added evaluations and analyses. As a result, it is estimated that 8 value-added farm enterprises were added and are positioned to increase net farm income. In addition, previous survey results by the Center indicate that each new value-added enterprise will create 1.2 new jobs in the short-term.

The “Statewide Journey” combined the documented success stories from actual enterprises with on-site tours, seminars, web-based resources and mass media. Seventeen authors contributed to 16 articles in the training manual and 21 other publications were featured. Training was provided by 26 presenters and farm hosts through on-site visits, tours and presentations. Twelve hosts provided specific orientation and local media coverage at nine locations. Fifty-seven tour delegates and 18 guests received various levels of training through individual, one-session and one-day participation. In the program evaluation survey, delegates were asked to estimate the increased level of knowledge, understanding, resource base, comfort zone and likelihood of addressing value-added and sustainable agriculture with others. On a one to 10 scale, where 10 equals the highest level of agreement:

- 77% of the delegates rated “my general understanding of sustainable and value-added agriculture has improved” as an 8 or greater.
- 88% of the delegates rated “my knowledge of sustainable and value-added agriculture has expanded” as an 8 or greater.
- 88% of the delegates rated “my resource base of sustainable and value-added agriculture has expanded” as an 8 or greater.
- 79% of the delegates rated “my comfort zone with sustainable and value-added agriculture has increased” as an 8 or greater.
- 98% of the delegates rated “the statewide journey was worth my effort and time” as an 8 or greater.

Funding: Smith-Lever; state funds; Tennessee Farm Bureau Federation; Special market development and initiative projects were funded by the USDA FSMIP program, the USDA SARE program and Tennessee “Ag Tag” speciality license plate program.

Scope of Impact: State Specific

Title: Removing Distribution Barriers Confronting Small Fruit and Vegetable Growers

Issue: Four national trends are having negative impacts on American agriculture. One is the trend toward a bimodal distribution of producers. Another is the reduction in the number of farms, particularly smaller enterprises. Third is the consolidation in the food marketing system.

A fourth trend, primarily located in the Southeast, pertains to tobacco production, and is a complicating factor in the viability of small scale producers. Tobacco quotas are being reduced, and there is increased social pressure for less federal support for tobacco programs. Small farmers are very dependent on this as a cash crop. Therefore, as these operators consider alternative enterprises, fresh produce is often suggested, due to increased consumption. However, viability depends to a large extent on the presence of markets.

Changing food consumption patterns favor fresh produce and the emergence of convenience (precut) packaging have created opportunities for fruit and vegetable production, which has prompted many to suggest small farmers should switch to these alternative crops. But consolidation and increased concentration within the fresh produce distribution channels are also occurring. Changes in information technology, processing, wholesaling, and transportation continue to favor larger market participants who also benefit from specialized managerial and coordination activities.

The situation is particularly acute for fresh produce. Market access favors larger growers who have the ability to deliver products at specified sizes and grades, appropriately packaged and labeled, in sufficient volumes, and for enough time to permit the creation of a suitable market infrastructure to service large scale buyers. Small-volume growers have difficulty meeting the purchasing requirements for many types of outlets that favor larger scale growers. Such barriers include the requirements of providing bar codes, full car/truck loads, sorting and grading, etc. These trends will continue as larger retailers expand their lines of fresh produce (e.g., supermarket chains and discounters such as Wal-Mart).

What has been done: Five surveys have been completed in each of four states (Georgia, Kentucky, North Carolina, and Tennessee). These were surveys of 1) growers, 2) Extension agents, 3) public market managers, 4) marketing agents, and 5) state Departments of Agriculture. Analyses of all five surveys, completed in previous years, were completed for each of the four states involved with the project. Research results were shared through eight poster presentations, one publication, and numerous oral presentations at annual meetings such as the Tennessee Fruit and Vegetable Growers' Association.

Impact: Differences are being identified regarding the breadth and variety of produce programs in the four states. Notable differences in the produce distribution channels between the successful states (Georgia and North Carolina) versus the less successful states (Kentucky and Tennessee) have been identified. The results point to the need for critical masses in all components of the distribution channel to be present for market development to occur. Public produce markets need to provide the complete range of marketing activities in order to attract sufficient numbers of stakeholders to build adequate supply and demand for the sector to expand. A sufficient number of larger-sized growers is needed to attract buyers. State Departments of Agriculture need to have personnel and programs in place to assist in produce marketing decisions and in bringing buyers and sellers at wholesale and retail levels together.

Funding: Hatch

Scope of Impact: Multistate (TN, GA, KY and NC); Integrated Research and Extension

1.2 Key Theme: Agricultural Profitability (Forage, Livestock and Crops)

Title: Making Forages Work

Issue: Two major problems for Tennessee forage producers have been poor storage and poor quality. By adding clovers to the hay fields, farmers improve the nutritional quality of hay and pastures. With beef cattle alone, poor quality forages yield reduced weaning weights, low conception rates and poor cow condition. Proper storage results in saving up to 30% of the annual hay crop. Tall fescue is the predominant and most important cool-season grass in the eastern U.S. Most of it is infected with the endophytic fungus *Neotyphodium coenophialum* that causes tall fescue toxicosis. Annual losses to the Tennessee beef cattle industry due to tall fescue toxicosis are over \$100 million.

What has been done: Extension's goal is to teach forage producers how to increase the capacity of their land in forage production. Adding clovers, rotational grazing, forage testing and using warm season grasses to improve feeding practices are a few areas that Extension is emphasizing. UT and TSU Extension impacts to farmers, including money saved and knowledge gained, were documented in 76 of Tennessee's 95 counties.

One example of the inputs and outputs from "Making Forages Work" comes from Decatur County where over 34 agent days and 2031 different contacts were made in forage production practices with 300 producers in the past year. The Extension Agent made 168 farm visits, created and sent four newsletters and two news articles related to forage production. Eight producers over-seeded pastures with legumes, 14 sprigged or seeded hybrid Bermuda grass for summer production, five over-seeded winter annuals for winter grazing and 10 producers stockpiled tall fescue for early winter grazing. In addition, 12 forage producers built hay pads to store hay on and four built water systems to keep livestock out of ponds and creeks. Farmers learned how to "make forages work" at winter meetings, field days, demonstrations and on-farm visits from their County Extension Agent.

In West Tennessee, the 2003 Hay Day (field day demonstration) drew over 100 producers from nine counties to gain a better understanding of water control structures, pasture weed control, improving forage quality, and beef handling facilities. The Knoxville Beef and Forage Field Day was attended by 295 East Tennessee cattle producers.

Research was conducted on serum arginine levels in steers, heifers and bulls that had grazed endophyte-infected and endophyte-free tall fescue.

Impact:

- Eight Decatur County producers added clover to their pastures and their calves were 52 pounds heavier at weaning this fall. This was \$52 more per calf at selling time on 240

calves equaling \$12,480 more! Ten producers each gained 70 days more grazing time by stockpiling fescue saving hay cost of \$14,000. Twelve producers saved \$600 each by storing their hay on pads & reducing hay spoilage. Fourteen producers are now using warm season grasses to graze cattle in July & August, thus, have increased weaning weights of calves by 36 pounds this summer (420 calves amounting to an increase of over \$15,000). Five producers saved hay costs of over \$3600 by drilling winter annuals into Bermudagrass for winter grazing. 22 Bermudagrass producers are utilizing correct herbicides to control broadleaf weeds in their hay and reducing "drying days" to harvest their hay.

- 48 farmers in South Central Tennessee are now making forages work thanks to an Extension Short Course. In 2003, these farmers stockpiled an average of 71 acres. Stockpiling fescue has a net benefit of \$24.85 per acre which is a benefit of \$1764 per farm or a total for all producers of \$84,688. 45 producers indicated that they have used rotational or controlled grazing on an average of 120 acres. Use of rotational grazing has been determined to increase calf weight by 91/lbs per acre. 44 producers indicated they had renovated fescue with clovers on an average of 41 acres per farm. Adding clovers reduces fertilizer costs by an average of \$11.19. That is a savings of \$458 per farm or a total fertilizer costs savings for all producers of \$20,186.
- 60 producers in five South Central counties had indicated that they had fertilized by using a soil test on an average of 107 acres. Research has determined that the savings in fertilizer and/or the value of added yield by fertilizing and liming to the farmer is \$22/acre. The benefit per farm is calculated at \$2354. The total impact for these 60 producers was over \$140,000. Beef producers indicated that they had forage tested on average 28 times. Forage testing has been determined to improve cattle performance and/or reduce costs by approximately \$363 per farm. That is a benefit of almost \$10,000 to these 26 producers.
- 44 producers who attended the Cumberland District Extension Beef Field Day indicated that they soil tested more often and fertilized according to soil test recommendations because of Extension education. This represents a \$524 increase per producer, or a \$5,760 increase to the producer group.
- Following recommendations in the UT Extension publication *Weed Control in Pasture and Hay Fields*, eight Carter County producers applied chemicals on 100 acres to improve forage stands of orchardgrass and fescue. This resulted a \$1,000 increase on the 100 acres. The eight producers improved 20 new acres of alfalfa for a financial impact of \$6,000 as this hay is sold to horse owners. Two producers improved their hay storage techniques. The storage areas should hold 200 bales weighing approximately 750 pounds. With bale savings of 30% from less spoilage and the cost of \$15 per bale, the savings are \$900 annually.
- Extension efforts with 16 Loudon County farmers have resulted in an additional 5,315 bales of hay under cover. At \$50/ton, saving 20% from spoilage, that is \$26,575 in savings.
- In Clay County, 16 individuals attended a six-day Grazing School, and pre and post-test results show their knowledge of forages increased 43%.

- Marion County farmers in the forage management program increased their knowledge level an average of 25%, from 58% to 83% as a result the program. Six producers have covered an additional 2,000 bales of hay in storage for an estimated savings of \$4,000. Field day participants indicated a gain in knowledge and awareness of proper hay making methods and equipment and hay storage and sampling by an average increase of 17%, from 65% to 82%. Four producers have implemented forage sampling into their management program to assist with monitoring of forage quality and marketing aspects for cash hay sales. Two producers have introduced Bermudagrass into their program for additional 40 acres of grazing valued at \$1,000. Two producers have implemented rotational grazing of both cool and warm-season grass.
- 33 Wayne County farmers tested their forages in 2003. Figuring for the viable period of three years for the samples, which were for 1,372 acres, these 33 producers will experience an impact of \$90,552 to their forage program due to added yields of forages, and reduced wastage of soil amendments. For example, one producer was planning to apply two tons of lime per acre to his 75 acres of forages. The soil lab did not recommend that any lime be applied, so the producer saved \$2850 on the lime, plus he can save another \$2000 per year for the next three years on fertilizer for a total savings of \$8850.
- Forage education for 48 McNairy County beef producers yielded important dividends. In an end-of-program survey, when asked to compare last year's calf crop to this year's calf crop, 73% reported an increase in weaning weight. No producers reported a decrease in weaning weight and 27% said their weaning weights remained about the same. Those beef cattle producers who reported an increase in weaning weight also reported an average increase of 40 pounds per calf weaned. 40% of the beef cattle producers surveyed reported that they have established new forages during the past year.
- Research results showed that exposure to toxins associated with *Neotyphodium* infected tall fescue decreases serum arginine levels. The results of the study indicate that cattle could possibly benefit from supplementing the diet with arginine. Research continues in testing the efficacy of supplementing arginine to reduce the adverse effects of fescue toxicosis.

Funding: Smith-Lever; Hatch

Scope of Impact: State Specific; Integrated Research and Extension

Title: Heat Stress Reduces Fertility of Dairy Cows by Altering Oocyte Quality

Issue: Infertility caused by environmental heat stress is one of the most important economic problems facing the dairy industry. Costs incurred by the dairy producer may be as high as \$4.00/day/cow for every day that a cow is not pregnant beyond 90 days after giving birth. Problems associated with heat stress are not exclusive to the southern part of the United States as exposure of lactating dairy cattle to an ambient temperature as low as 27°C may be sufficient to elevate body temperature.

What has been done: Studies were conducted to evaluate the susceptibility of oocytes that would be contained within growing follicles during the summer months. In addition, efforts also focused on investigating whether antioxidants such as retinol improves developmental competence of oocytes compromised by heat stress.

Impact: Results showed that oocytes contained within growing follicles are susceptible the direct effects of elevated temperatures further defining the time period that heat stress can negatively impact the fertility of dairy cows. Retinol administration during maturation improved development of oocytes compromised by heat stress.

Funding Sources: Hatch; USDA-IFAFS

Scope of Impact: State Specific

Title: Improving Embryonic Survival in Livestock

Issue: The majority of pregnancy loss in beef and dairy cattle occurs during the first eight days of pregnancy. The economic losses associated with failure of or delay in pregnancy in beef cattle alone can approach \$2.5 billion dollars annually. A large portion of these losses is associated with different types of stressors including environmental (heat), management (nutrition) and disease (mastitis).

What has been done: Our laboratory has identified that a hormone (prostaglandin $F_{2\alpha}$), produced by all cells of the body especially the uterus where the embryo is found, directly impacts embryo development and survival. The release of this hormone is directly related to onset of the above-mentioned stressors.

Impact: Determination of events associated with this hormone and embryo development resulted in the application of an anti-prostaglandin protocol that increased pregnancy rates by more than 10% following transfer of good embryos. Furthermore, development of novel anti-prostaglandin substances added directly to media (flushing, transfer, and/or freezing) will significantly improve pregnancy rates (efficiency of production) and economic (improved genetics) impact of embryo transfer technology in the beef and dairy industries as well as assisted reproductive technology currently used for the human population.

Funding: Hatch; Schering-Plough Animal Health

Scope of Impact: State Specific

Title: The Role of Retinol in Oocyte Maturation and Early Embryonic Development

Issue: Poor reproductive efficiency is a major cause of economic loss to the livestock industry.

What has been done: Research has been performed to determine the effects of acute vitamin A (retinol) administration on early embryonic survival and pregnancy maintenance in sheep. The effects of vitamin A on in vitro derived bovine embryos has also been evaluated.

Impact: Findings show that vitamin A administration improved the viability of sheep embryos to survive cryopreservation, embryo transfer, maintain pregnancies and produce viable offspring.

Vitamin A treatment during in vitro maturation, followed by fertilization, improves subsequent early embryonic development.

Funding: Hatch; USDA Competitive Grants Program

Scope of Impact: State Specific

Title: Horse Management/Curtailing West Nile Virus

Issue: The profile of a tremendous number of new or novice horse owners is not that of a person with a farm animal or rural background, but rather an urban dweller with a specific interest in horses. However, the new horse owners do not have the knowledge to properly care for and manage a horse(s). Therefore, most are seeking reliable information on management, care and health of their horses.

West Nile Virus (WNV) infected 150 Tennessee horses in 2002 and 28% of these horses died. In Tennessee, human deaths resulted from WNV as well.

What Has Been Done: In West and Middle Tennessee, 20 educational meetings were held for new and novice horse owners. The objective was to increase the nutritional know-how of horse owners to improve management of their horse(s): Digestive Anatomy of Physiology; Nutrient Requirements; Feeds and Feeding Management. In East Tennessee, eight multi-session horse education programs were conducted reaching 370 persons.

The Extension WNV program began in 2001 and continued through 2003 to make and keep horse owners and the general public mindful of factual data on the seriousness and distribution of WNV. A state map, noting number of positive equine and birds per county, was kept current. WNV presentations were made in various settings. Vaccination was recommended based on applicable field data and a vaccination protocol. Extension released a number of news releases and radio programs.

Impact: Over 2,000 horse enthusiasts owning more than 8,000 horses participated in educational meetings with 10% of the attendees submitting hay for analysis and subsequent feeding recommendations. As a result of this effort, most horse owners indicated a decrease in feed costs of \$12 per head per month and this represents a \$1.1 million savings in feed costs due to improved management skills and knowledge. Pre and post-test at the Horse Management and Horse Ownership Courses showed a 40% average increase in knowledge.

The number of positive WNV horse cases dropped from 150 in 2002 to 103 in 2003, a 31% reduction. Deaths from WNV declined by 60% from 42 in 2002 to 17 in 2003. The death rate dropped from 28% of infected horses in 2002 to only 16% in 2003.

Funding: Smith-Lever

Scope of Impact: State Specific

Title: Soils and Nutrient Management in Coffee County

Issue: Coffee County has 968 farmers, with 345 having farming as their principal occupation and the market value of all agricultural products sold was \$30,846,000. According to the latest Census of Agriculture figures, 660 farms harvested crops including soybeans, corn and wheat. The agricultural focus group identified environmental concern from herbicides as a priority. In addition, the focus group agreed that keeping farmers informed on current UT recommended crop production practices was a priority for Coffee County.

What Has Been Done: 274 producers attended Extension meetings and tours targeting farmers in crop production situations. New crop varieties and herbicides were discussed. Extension conducted 4 Round-up Ready soybean variety trials using 78 different varieties. The purpose of this trial was to evaluate Round-up Ready soybeans so that farmers can have more choice in selecting varieties that require the fewer herbicides to be sprayed into the environment for control of weeds. A trial of the new Round-Up Ready varieties of corn was also conducted so farmers could learn the difference in production of these varieties. All trials were conducted so that when farmers select varieties in 2004, they will have a better idea of which varieties will work best in their situation.

Impact:

- 47% of farmers attending the winter crops meeting said they definitely would utilize information learned at the meeting for selecting their corn and soybean varieties.
- Regarding herbicides, knowledge increased 16% about how to select and use new, recommended herbicides.
- 12% of farmers said they gained knowledge about how to select new crop varieties for their 2003 production year.
- Three farmers who have never used the PSNT (Pre-sidedress nitrogen test) tested their corn fields for nitrogen levels present in the field before adding more nitrogen.
- There was a 12% increase in knowledge as to the how and why UT recommended specific chemicals on specific crops.
- 53.3 % of farmers present at the winter meeting learned something about soil fertility that would cause them to change their crop fertility practices in 2003.
- 291 soil test were taken in the county during the past year to determine fertility needs. 151 (52%) of these test were for corn, wheat and silage.

Funding: Smith-Lever.

Scope of Impact: State Specific

Title: Extension and Research Improve Tennessee Cotton Productivity

Issue: Tennessee cotton producers are trying to survive recent years of low prices and challenging weather patterns which have limited yields. Due to high inputs, low prices and low yields, cotton acreage has dropped in the past two years. Price and weather are factors that producers have limited control over but they are not the only factors that limit profitability. Soil fertility, insects, disease and weeds present tremendous harm to Tennessee cotton profits. When these economic limiting factors or pests reach an economic damaging level, they must be controlled in an efficient manner for cotton producers to maintain the highest economic return for their crop. In addition, cotton farmers are uncertain about the costs and returns for investment in precision farming technology.

In 2003 cotton acreage decreased due to unfavorable planting conditions, the need for a lower cost crop and rotation. Many producers are not able to grow crops other than cotton due to equipment or landowner restrictions. These producers were forced to plant cotton outside of the reasonable planting window.

What has been done: The Extension Cotton Specialist trains farmers at the Farmers Gin in Humboldt and Yorkville Gin in Yorkville to emphasize research-based variety yield and fiber information. The UT Cotton Focus was held for cotton growers to learn new production knowledge and skills. In Dyer, Obion, Lake, Lauderdale, Weakley and Gibson Counties, in-field training sessions, phone calls and farm visits were used to educate producers, scouts and other private enterprise concerning the objectives of IPM programs so that yields could be maintained and/or increased. Additionally, 68 newsletters were written and distributed to the six county area which benefitted cotton producers and others involved in the agricultural community regarding the benefits of IPM. Extension assisted agribusinesses, professional scouts and growers with IPM decision-making using distance diagnostic equipment.

The cotton IPM program offers producers an educational monitoring and management service which deals with the primary yield limiting factors. Producers on the program receive a weekly comprehensive report regarding these pests and a weekly letter related to pest problems which are occurring and correct recommendations to use to control these problems. UT and private monitoring programs which promote IPM principles pointed out to producers where boll weevil eradication was doing an adequate or inadequate job.

An interactive computerized decision aid was developed and tested to help cotton farmers determine the yield gains and input cost savings required to pay for investment in a cotton yield monitor. The Cotton Yield Monitor Investment Decision Aid (CYMIDA) utilizes a combination of partial budgeting, breakeven analysis, and sensitivity analysis techniques to evaluate the potential costs and benefits of a cotton yield monitoring information system.

Impact: In Gibson County, the Extension agent made 200 contacts in cotton production, and the total dollar impact of adopting variety selection, IPM and other UT recommended practices was \$1.9 million.

In Crockett County, through the use of egg ELISA tests on eggs collected by the agent, scouts or agri-business, approximately 7,000 acres of Bt cotton were treated for bollworm before economic damage could occur. Twenty-seven producers and agri-business people attended the defoliation tour to observe field results of numerous combinations of materials. Many others visited the plot or contacted the agent or agri-business in order to determine defoliation combinations to use.

In Dyer and Lauderdale counties, six new producers enrolled 1,718 acres in the UT Extension cotton IPM programs. Data obtained from the private sector pointed out that the number of acres being monitored for pest had increased by 21% (62,300 acres) when comparing 2003 to 2002. In Dyer County, 95% of producers indicated they would make production practice changes based on information about variety selection.

In Haywood County, which annually produces one-fifth of Tennessee's cotton, 90% of respondents indicated that the Extension Cotton Variety Field Day definitely met their needs for information about cotton varieties and recommended production practices. 60% said they would definitely utilize this program's information or adopt these practices in their operation. Through direct contact with the agent, 12 producers saved on average \$5.00 per acre on 25,600 acres on defoliation treatments for a total savings of \$128,000. Over 1000 acres were enrolled in the IPM program that allowed producers to eliminate a blanket pinhead application for plant bugs and only spray insects after the populations exceeded economic threshold. The projected savings on these 1000 acres was \$7500. Agent directly assisted producers in determining "last harvestable boll" and terminated 1-2 late-season insecticide applications on approximately 18,000 acres for a savings of over \$94,500 in chemical costs alone.

More than 250 farmers, agribusinesses, and extension personnel have used the Cotton Yield Monitor Investment Decision Aid (CYMIDA) to determine the yield gains and input cost savings required to pay for investment in a cotton yield monitoring information System.

Funding: Smith-Lever; Hatch; Restricted IPM Funds

Scope of the Impact: State-Specific; Integrated Research and Extension

Title: Cotton Agronomy and Physiology Research

Issue: Cotton remains a major field crop of Tennessee, producing annual farm revenues exceeding \$200 million, and adding over \$1 billion to Tennessee's economy each year. Profitable crop management remains challenging, as yields and fiber quality fluctuate from year to year, while costly new technologies are offered to producers. Improved cultivars, management practices, and cropping systems can improve Tennessee cotton production

efficiency. Agronomic research is needed to develop more profitable, sustainable, and technically sound production systems.

What Has Been Done: In 2003, the Cotton Agronomy and Physiology Project:

- evaluated the growth and development traits of 35 new experimental and transgenic cotton varieties in a grower-supported study;
- led a core-funded regional study to determine the last effective boll population in cotton grown in two cropping systems, for use in a computer-based decision-aid system;
- initiated a grower-sponsored study of solid and skip row spacings of cotton in contrasting field environments;
- collaborated with agricultural economists to determine the influence of seeding rate and plant population density on net revenues in ultra-narrow row cotton production systems, and to define the agronomic minimum seeding rate for this system;
- collaborated in a regional core-funded project to evaluate and adapt existing methods to statistically evaluate the stability of yield and fiber properties of cotton germplasm tested in the North Delta region.

Impact: Results of the Project's evaluation of new cotton varieties influenced decisions of seed companies to release and market new cultivars in Tennessee in 2003. This research documented the specific growth and development traits of varieties and strains that contributed to yield and earliness of maturity.

- Results of the Project's 3-year regional study to determine the last effective boll population in cotton allowed crop managers and consultants to correctly identify bolls to manage for harvest in two contrasting cropping systems. This advancement also improved calibration of a computer-based decision-aid system for different crop conditions.
- Results of the Project's plant density study allowed cotton producers to calibrate their precision planters to realize significant savings (42%) in seed costs by planting in ultra-narrow rows at moderate density, while maximizing net revenues.

Funding: Cotton Incorporated; Hatch

Scope of Impact: Multistate (TN, MS)

Title: Tennessee Soybean Production Improves

Issue: Soybean is a major agricultural crop which produces high quality vegetable protein for human and animal nutrition. Soy protein and oil are versatile and are also widely utilized in industrial products. Overlooking weather effects, variety selection has been cited as the most critical step in soybean production. This need was indicated from the advisory committee and from numerous personal contacts made throughout the program year. A second item requested was the evaluation of conventional (non-GMO) varieties vs varieties with the Roundup Ready

technology. Introduction and adoption of Roundup Ready soybeans has impacted production tremendously. However, some associated problems have emerged because seed companies have released varieties with out fully knowing disease tolerance or resistance and farmers have not necessarily kept up with how to use fungicides and insecticides to keep from losing yield. Protection from plant diseases continues to be a major problem for Tennessee soybean producers. One of the major diseases is Sudden Death Syndrome (SDS), a devastating disease which can destroy entire fields of soybean. The availability of a new SDS-resistant, higher yielding soybean variety will positively impact farmers, processors, and consumers.

What has been done: Extension agents made one-on-one visits with producers, local and area demonstrations, producer meetings, demonstration yield data (local and area wide standardized variety results), and direct mail.

In regional tests in 2003, the Tennessee Agricultural Experiment Station's new soybean variety, 5002T, exhibited excellent resistance to SDS and produced excellent seed yields.

Impact:

In Gibson County, the Extension Agent collected 132 nematode samples representing 3,300 acres from 9 producers. Eleven samples were shown to test at or above economic threshold level. Producers adopted either crop rotation or resistant variety selection which made them an additional \$20,625. Forty samples were shown to have a nematode infestation that warrants continued monitoring and management practices which will have a yearly savings of 10 bushels per acre average. The 40 samples represent 1,000 acres. At a price of \$7.50 /bushel this is an average improvement in income of \$75,000 yearly from this Extension program.

In McNairy County, farmers are getting the message about higher yielding varieties. The 2003 estimated county yield average for soybeans was 37 bu/acre, and the historical average in that county was 23 bu/acre. Approximately 90% of McNairy County producers use standardized variety yield data to aid in selecting varieties planted.

In 2003, over 60 Hardin County soybean producers (75%) used treated soybean seed to improve yields. Follow-up survey indicates one soybean farmer applying lime in 2002 increased yields 15 bushels per acre in 2003. Lime was applied to 5,000 acres on Hardin County soils in 2003. 12 farmers said they improved their marketing skills after attending area-wide marketing seminar, and 35 producers surveyed indicated a \$12 savings in weed control cost by using Roundup-ready soybeans.

In Haywood County, based on surveys distributed at the Variety Trial Field Day, over 90% of respondents indicated this program definitely met their needs for information about soybean varieties' performance and recommended production practices. 100% indicated it increased their knowledge of crop varieties and recommended production practices while 60% said they would definitely utilize this program's information in their operation. By the agent scouting and utilizing economic threshold levels, 6 producers eliminated a stink bug treatment on 4000+ acres. That was a savings of over \$12,000.

UT Research developed a new, high-yielding maturity group 5.0 conventional variety, 5002T. This new soybean variety has broad adaptation to millions of acres of soybean producing areas in Tennessee as well as the Mid-South and Southeastern United States, and it will increase farm income from soybean production. In addition to its high yield, research conducted in 2003 showed that this new variety is resistant to stem canker, resistant to frogeye leaf spot, and resistant to SDS. It is an excellent parent for soybean breeders to utilize in crossing programs to complement with additional traits for further genetic improvement.

Funding: Smith-Lever; Hatch

Scope of Impact: State Specific; Integrated Research and Extension

Title: Extension Improves Northwest Tennessee Grain Production

Issue: Grain producers in Northwest Tennessee produce some 901,500 acres of corn, soybeans and wheat in the 6 county area including; Dyer, Gibson, Henry, Lake, Obion and Weakley worth over \$189.5 million in 2002. Over 240 hybrids/varieties were available for planting this year with 138 or 57% new to the area. Roundup Ready soybean technology accounted for 52% of the new entries. Private companies rush new genetics into the marketing arena, without localized testing for yield and disease resistance, placing producers at risk. Soybean yield losses from disease remain high at 28% (estimated for 2003) according to Extension Pathologists. In addition to hybrid/variety selection, producers are struggling to keep up with emerging cultural management decisions, including seed treatments, fungicide efficacy, seed technologies and seeding rates. Improving yields while limiting cost inputs will keep our producers in a competitive position. Producers and agribusinesses continue to identify hybrid/variety testing and disease resistance as the strongest priority for Extension grain efforts through numerous needs assessment techniques.

What has been done: Extension Agents, Specialist, Producers, Agribusiness and Seed and Chemical sales representatives, utilizing Extension's surveys of producers and agribusinesses, meet to develop hybrid/variety protocols and agronomic focus for on-farm demonstrations to meet the needs of local producers. Extension developed Standardized Hybrid/Variety and agronomic testing program protocols to enable producers to identify locally available superior hybrids/varieties with superior disease characteristics for use on their farms. Contacts were made and seed/inputs procured for dissemination to agents throughout the area: 19 West Tennessee counties, eight Middle Tennessee counties, three Western Kentucky counties and two Experiment Stations planted over 182 demonstrations. These demonstrations included: 1663 corn, 2303 soybean and 162 wheat variety plots in cooperation with area producers. These plots involved 114 corn/milo hybrids, 103 soybean varieties and 18 wheat varieties. Twelve counties conducted 22 comparisons of corn seed insecticide treatment demonstrations. Additional county agronomic demonstration(s) included extensive planting of 200 soybean varieties for disease screening, four on-farm soybean fungicide demonstrations comparing various fungicides for foliar disease control and an extensive corn insecticide test to determine most effective in furrow/seed treatment for early season insect control and yield preservation. A soybean disease

Field Day tour of demonstration plots was conducted to educate 100 producers/agribusiness personnel/seed reps of soybean variety disease characteristics. Conducted fee based testing for seed companies that participate in the Standardized Testing program to assist in supporting work conducted by Extension Agents. The results of all of these on-farm demonstrations were gathered and analyzed to determine differences. Results were summarized in Excel spreadsheets for the specific hybrid, variety and agronomic protocols along with agronomic disease data generated from replicated variety disease trials. These data were disseminated to producers through 18 production field days or meetings involving 1668 producers including 268 agribusiness personnel, in-service training for agents, various county newsletter mailings, posting of variety and agronomic data on the Extension and Experiment Station website, agribusiness visits, and individual contacts (office, phone and farm visits) in an effort to encourage adoption of practices. Individual county surveys, multiple county area surveys, agribusiness surveys, and end of year follow-up were surveys conducted and analyzed to determine programming impact and focus for future extension programming.

Impact: In the six-counties of Northwest Tennessee, 96% of producers selected the superior performing varieties identified from the *Extension Standardized Variety Test* resulting in some \$15.71 million additional income, without increasing cost. The \$15.71 million increase resulted from an increase of 8.49 bushels per acre or \$22.41 per acre for corn, 3.04 bushels per acre or \$17.33 per acre for soybeans and 4.61 bushels per acre or \$13.46 per acre for wheat.

21% of corn producers increased corn yields by 4.19 bushels per acre and gained insect protection by adopting better seed treatments. These producers had previously used none or poor performing treatments.

91% of soybean producers use the Extension generated soybean disease charts in selecting 79% of their soybean varieties. These producers selected the top twelve disease resistant varieties to plant on 68% of their acreage. 63% of soybean producers sprayed 18.2% of this year's soybean crop with a fungicide/insecticide for an average 4.94 bushels per acre yield increase, resulting in over \$3.15 million in additional income. Additionally, 62% of producers did not spray 23% of total soybean acreage because of disease resistant plantings, saving \$17 per acre; \$1.83 million total additional income. 49% of soybean producers have increased planting of conventional bred soybean varieties to include 16.7% of their acreage, with on-farm estimates of yield increases of three bushels per acre for an additional \$1.76 million. Reduced seeding rates of premium priced soybean varieties can reduce production cost without sacrificing yield. 33% of producers indicated they decreased seeding rates in 2003 to 167,727 seed per acre compared to the 67% of producers that did not lower seeding rates at 181,364 seeds per acre. The difference of 13,637 seeds per acre at 3000 seed/pound resulted in a savings of 4.55 pounds per acre, saving producers as estimated \$351,000.

About 35% of wheat producers utilized a better seed insecticide treatment on 35.5% of total wheat acreage in 2003. UT Experiment Station data and County Standardized Tests indicate a 5.5 bushel per acre yield advantage. The use of seed insecticide resulted in an additional \$857,202 income for Northwest Tennessee farmers in 2003.

Funding: Smith-Lever; TN Soybean Promotion Board supported this program with over \$10,000 in grants to purchase weigh wagon and other materials for on-farm testing; private seed companies invested over \$113,000 in seed and other cost in support of the standardized testing (Corn: \$49,827; Soybeans: \$56,665; Wheat: \$7,200)

Scope of Impact: Multistate (TN, KY); Integrated Research and Extension

Title: Integrated Research and Extension Improve Tennessee Tobacco Income

Issue: In 26 Tennessee counties, tobacco is a major source of income. Tobacco quotas have been cut for both Burley and Dark tobaccos. To help offset income lost from quota cuts, educational programs were conducted to teach disease-resistant varieties, to increase pounds per acre from dark tobacco, to decrease input costs and to manage disease better.

A number of research projects were completed, all of which were integrated into Extension work with many of the trials conducted on Tennessee farms and others conducted at UT Experiment Stations. Pythium root rot is a commonly encountered fungal disease of the roots of tobacco transplants produced in float systems. The fungus spreads in the water on which the plants float, infecting the roots and causing many of the plants to grow poorly both prior to and after transplanting into the field. For several years, there were no registered treatments for control of Pythium root rot.

What has been done: Extension tobacco production education programs were conducted in Tennessee's 35 major tobacco-producing counties in 2003. UT Extension shares an Extension Tobacco Specialist with Kentucky Cooperative Extension. Tennessee Extension Agents made 20,321 educational contacts in tobacco production during 2003:

- Almost 6,000 contacts were made on-farms and 636 contacts were made in Extension Office visits to diagnose tobacco diseases and correct tobacco production problems.
- Over 6600 contacts were made through group meetings, such as the KY-TN Tobacco Expo, Tobacco Grower Tour to the leaf processing facility in North Carolina, Cumberland Tobacco Expo and numerous tobacco field days.
- Over 6,500 educational contacts were made through direct mail and telephone calls to emphasize recommended production practices.
- 522 contacts were made with tobacco demonstrations on farms and at Experiment Stations, and 19% of these contacts represented a racial or ethnic minority group. Examples of demonstrations included nitrogen fertilizer, black shank resistant varieties, chemical control methods, evaluating growth enhancement products, tobacco aphid control, fungicides for Blue Mold control and Fumigation for disease control in field.

Integrated with extension work, the following tobacco production research was conducted:

- Research on black shank resistant varieties
- Research on foliar disease fungicide
- Research trials have been conducted to determine the efficacy of Terramaster fungicide and how to use it to best advantage. Formulations, rates, time of application, and how to

incorporate into a typical farm plant-production system have been evaluated. Efficacy in root rot control and safety to plants have been measured in these trials, conducted at the Plant and Pest Diagnostic Center and at the UT Highland Rim Experiment Station. Data obtained from these efforts was used by the manufacturer to obtain EPA registration for Terramaster. Extension educational programs have focused on training growers in the safe and effective use of Terramaster.

Impact: The registration and use of Terramaster saves the Tennessee tobacco growers \$1.163 million in unusable plants and in infected plants that are transplanted to the field but perform poorly. Almost all float beds experience Pythium infection, with loss of plants averaging 50% in unprotected beds.

From the Black Shank Resistance Variety Research, two experimental varieties, SN 2105 and SN 2108 averaged 2,391 more pounds of tobacco per acre than three commonly used varieties. One of the commonly used varieties was found to have no black shank resistance.

Results would indicate that one or both of the experimental varieties should be released. According to surveys, 10% of the 2003 crop was lost to black shank. Release of SN 2108 would add over \$3,000,000 to farm income in Montgomery County alone.

In the Foliar Disease Fungicide Trial, 11 treatments plus an untreated check were used with four replications. Disease ratings indicate that the product Quadris was the most effective product in controlling foliar diseases. This product is not yet labeled for public use, but hopefully will be released in 2004. Results of this trial will be used to secure a use label for Quadris.

East Tennessee tobacco growers increased productivity. Through soil testing, Johnson County tobacco producers were able to decrease their production cost an average of 25%. This resulted in a savings of approximately \$80.00 per acre. In Sevier County, 22 producers indicated that they planned to use a split application of Ridomil for the control of black shank which should increase their production by 200+ pounds per acre on 110 acres of tobacco that would amount to an additional \$55,000 of increased income. In Washington County, 14 greenhouse producers decreased Pythium root rot in floatbeds by utilizing effective control measures, resulting in an increase of usable transplants, valued at \$31,000. 18 producers reduced black shank losses by using recommended practices and improved varieties, with a loss reduction value of \$62,000. 26 producers utilized multiple toppings, which increases production by 300 pounds/acre, resulting in \$270,000 of additional income. 2 producers comprising 62,000 pounds of tobacco stripped tobacco into four grades, resulting in an increased profit of an additional \$6,800. In Grainger County, 10 producers added lime to stop Mn toxicity in crop which added 40% yield increases; 14 producers side-dressed by recommendation which added 50% yield increases; and 11 producers sprayed to stop Blue Mold adding 25% yield increases.

A program evaluation involving 66 Middle Tennessee tobacco producers found that the producers felt the total net return from adopting the practices Extension emphasized in 2003 was \$3616 per farm. In Montgomery County 24 producers were surveyed about their participation in

the KY-TN Extension Tobacco Expo: 98% of these producers felt that their needs were being met with Tobacco production information. 96% felt they had increased their knowledge about recommended practices. 96% planned to use information from the Expo in the future. 90% felt that UT Extension had helped to increase their net return. In Stewart County, program evaluation indicates that as a direct result of Extension tobacco educational programs, the value of dark tobacco produced increased \$618.00 per acre. Average pounds per acre increased to 3250. Average input costs decreased \$150.00 per acre. 85% of producers reported adopting production practices based on Tobacco Educational programs. Practice adoption included: nine growers used the UT Tobacco Systems Software for budgeting their 2003 crop and 20 growers reduced losses to Black Shank and other diseases by using recommended practices and improved tobacco varieties, with a loss reduction value of approximately \$90,000. Fifteen growers reduced losses by other insect and disease problems by over \$40,000 through “in field” diagnosis and by using the UT Digital Diagnostics System.

Funding: Smith-Lever; Hatch; Crompton Uniroyal Chemical Co.; General Tobacco Co.; U.S. Smokeless Tobacco; Tennessee Farmers Co-op

Scope of Impact: Multistate (TN, KY, NC); Integrated Research and Extension

Title: Tobacco Quota Buyout Simulations

Issue: As uncertainty continues to surround the future of tobacco production – especially related to a prospective tobacco quota buyout and significant modifications to or elimination of the federal tobacco program – tobacco stakeholders and decision makers have a high level of demand for information about the impacts of potential changes in the tobacco program and marketing system. Pending tobacco quota buyout legislation has continued to be an issue of great interest to Tennessee’s numerous tobacco growers and quota owners. Legislation being considered in the United States Congress would (1) terminate the current federal tobacco program, (2) compensate tobacco quota owners for the elimination of their government-created quota asset, (3) make transition payments to tobacco quota growers to facilitate adjustment to a new environment for tobacco production and marketing, and (4) establish a new national agricultural tobacco policy consistent with other policies affecting tobacco and tobacco products. A wide variety of tobacco stakeholders including agricultural leaders, tobacco producers, Extension personnel, news media, and others have requested information about various aspects of the proposed legislation and also questioned the potential impacts of the legislation at the farm level.

What has been done: Frequent updates and comparisons of tobacco quota buyout legislation were provided to numerous stakeholders in 2003 through presentations, website and printed publications for tobacco growers. The representative tobacco farms were used to simulate the impacts of the potential tobacco quota buyout and transition legislation on four Tennessee tobacco farms. In addition to the farm-level simulations, a study was conducted to estimate the regional and state-wide economic impacts of a potential tobacco quota buyout. A commonly-used input-output model, IMPLAN, was used to estimate the net changes in total economic

activity and employment—i.e., multipliers—that would result in major tobacco states from the proposed tobacco quota buyout according to H.R.3160 and S.1490. Results indicated that in the six major tobacco states, the total economic impact of the buyout in the first year would be \$2.48 billion and would support more than 24,000 additional jobs. Over all 11 states included in the model, the estimated impacts would be more than \$2.58 billion and over 25,000 new jobs. The cumulative economic impact in all states through 2010 would be more than \$18 billion.

Impact: This project has provided a considerable amount of information about proposed tobacco quota buyout and transition legislation. Side-by-side comparisons of the House and Senate buyout consensus bills have been used widely by farm groups, tobacco growers, news media, and congressional staffers. Results of the TnFARMS analyses of proposed tobacco quota buyout and transition legislation have been widely requested by tobacco growers, legislative staffers, tobacco researchers and educators, journalists and reporters. Results from this project are also critical in providing policy makers with estimates of the farm-level impacts of various legislative alternatives. More than 30 Representatives and Senators and their staff have arranged formal meetings with the UT researchers to discuss the economic and policy impacts of the tobacco quota buyout. The information provided through this project is critical in helping farmers make business decisions based on reliable policy analysis. Estimates of the economic (total industry output) and employment impacts of tobacco quota buyout legislation that were estimated under this project were presented in graphic form by Representative Fletcher and his 41 House co-sponsors when they introduced H.R. 3160, the Tobacco Reduction, Accountability and Community Enhancement Act of 2003, in the U.S. House of Representatives on September 24, 2003.

Funding: Hatch

Scope of Impact: Multistate (11 tobacco states)

Title: Rethinking U.S. Agricultural Policy

Issue: U.S. domestic agricultural policy has been widely criticized in recent years, especially by trade negotiators and interests outside the U.S. pushing toward a trade liberalization agenda in agriculture. Despite the highly-criticized large government subsidies and accusations of trade-distorting policies, U.S. farmers—especially family farmers—have generally not benefitted from prosperity in the agriculture sector as net farm incomes have declined significantly despite record-level direct government payments.

What has been done: The UT Agricultural Policy Analysis Center developed a report, “Rethinking U.S. Agricultural Policy: Changing Course to Secure Farmer Livelihoods Worldwide.” The report presents a convincing argument about the impacts of current domestic farm policies on U.S. farmers as well as farmers around the globe. The report identifies alternative policy directions for U.S. public policies that have potential to improve the performance of the domestic farm sector at a considerably lower cost to taxpayers. These same policy directions also have potential to improve farmer livelihoods outside the U.S., especially in

some of the most impoverished nations.

Impact: Following the formal release of the report findings at the National Press Club in Washington, D.C., UT Agricultural Policy Analyses Center has had numerous opportunities to discuss the report and other policy issues with policy makers, congressional staff, farm organizations, professional peers, and organizations representing numerous interests. The authors have accepted more than 50 invitations to present the findings to audiences we would otherwise have been unable to reach, including audiences in Canada, Guatemala, Senegal, Mexico, France, Belgium, Germany, Spain, the United Kingdom, and Switzerland, which is an indication of the recognition of the broad impacts of U.S. agricultural policy around the world and the UT research in this area. More than 3,000 print copies of the report have been distributed. A special project website for the report was developed. The first three months the website was posted in 2003, there were over 30,000 hits on the main report website. The full report has been downloaded more than 6,400 times. The report presentation has been downloaded over 14,600 times. The Spanish versions of the report have been downloaded 363 times (complete summary) and 255 times (summary), while the Spanish version of the presentation has been downloaded 1,700 times.

Funding: Hatch; Oxfam America; American Corn Growers Association; Oxfam Belgium; numerous other NGOs have contributed travel funding for presentation of research findings.

Scope of Impact: National and International

1.3 Key Theme: Innovative Farming Techniques

Title: TSU Assists Organic Farmers

Issue: According to the National Organic Farmers Survey, in the United States, organic farming systems research remain largely uncharted territory, with institutional support lagging far behind individual farmers innovation and the curve of the industry. Tennessee State University conducted an organic survey during its organic production meeting in February. The growers in Tennessee identified weed management as the number one issue facing Tennessee growers. The survey showed that growers needed help to market their products, increase favorable state polices, increase research efforts and educate the public on organic agriculture.

What has been done: Tennessee State University conducted an organic production workshop.

Impact: 72 organic farmers gained knowledge of certificate standards and participation in organic programs. As a result of workshops, 13 growers expressed interest in establishing an organic association. Tennessee State University helped them to organize the Tennessee Organic

Grower Association (TOGA). Regarding research, TSU selected an area on its Research Farm for organic research, responding to the needs for research in this area.

Funding: Smith-Lever; Hatch; NARETPA

Scope of Impact: State Specific

Title: Conservation Tillage Yields Big Returns for Agriculture and Environment

Issue: Until recent years, Tennessee was known for its heavy soil losses. The damage to the environment and agriculture was devastating as the state's most productive soils were lost to the Mississippi River. Conventional tillage was the major contributor to this erosion.

What has been done: Over the past 20 years, UT Extension and Research have focused on solving Tennessee's erosion problem. Numerous field days, including the Milan No-Till Field Day, have helped thousands of Tennesseans to learn and to use conservation practices, namely no-till crop production. This effort continued in 2003.

A UT research project attempted to estimate the economic impacts of conservation efforts in four rural regions considered – South Georgia and Alabama, Mississippi, Iowa and Nebraska, and Tennessee. The impacts of federal conservation expenditures, changes in production practices, shifts in acreage of traditional crops, changes in crop price, and impacts of erosion on downstream costs were estimated using an input-output model (IMPLAN) and the Micro-Oriented Sediment Simulator (MOSS II).

Impact: Use of conservation tillage systems on Tennessee farms continued at a high level in 2003. Approximately 80% of the acres of corn, soybean and cotton in the state were produced using some form of conservation tillage, mostly no-till. This use of conservation tillage is resulting in an annual reduction in soil erosion of approximately 20 million tons per acre per year compared to the practices of 15 years ago. The reduction in offsite damages as a result of the use of conservation tillage is estimated to be in the range of \$40-\$50 million per year. In addition, the use of conservation tillage is improving soil quality through the addition of organic matter, estimated at 0.1 % each year. This increase in organic matter sequesters thousands of tons of carbon each year, reducing the carbon dioxide in the atmosphere and helping reduce the effects of global warming.

Impacts on the four regions were mixed with several showing a decrease in input purchases as a result of acreage and tillage shifts. In Tennessee, an estimated \$7 million is saved as a result of reduced erosion levels. The impact of Federal conservation expenditures is estimated to be \$23 million in the four-county Tennessee region. However, as a result of decreased tillage and increased land in the Conservation Program and, hence, reduced inputs purchased, a \$2.1 million decline in economic activity is estimated.

Funding: Hatch; Smith-Lever

Scope of Impact: Multistate (TN, GA, AL, MS and NE); Integrated Research and Extension

Title: Beef Producers Adopt Recommended Practices

Issue: Tennessee beef producers could benefit from the adoption of recommended practices.

What has been done: Extension invested over 4,000 agent days to make 101,859 statewide educational contacts in beef programming in 2003. Extension -

- Increased awareness of quality mineral program.
- Assisted farmers in placing or selecting herd sires and replacement heifers.
- Conducted genetic improvement herd demonstrations complete with AI breeding, selection, culling and pregnancy checks.
- Educational meetings for youth and adults with research-based information on various management practices related to herd health, breeding seasons, intensive grazing, forage utilization and more.

Impact: Over 80 Hamilton County producers benefitted from Extension beef programs. Using a pre and post-test to measure knowledge improvement, gains were seen in all areas of beef production, including culling decisions, in which producer scores improved 50%.

In Bledsoe County, 60 beef producers were part of an Extension program to improve overall herd health. After the program, the producers were surveyed and follow-up surveys were complete by the Extension Agent during on-farm visits. Practices adoption improved dramatically with a 58% improvement in adoption of deworming practices and an 86% improvement in the number of farmers who now vaccinate for blackleg. This resulted in a combined savings of over \$17,000 to the 60 farmers or about \$300 per farmer.

Extension programs to teach innovative farming practices to Washington County beef producers achieved these impacts:

- 11 producers stockpiled fescue for the first time in 2003 to produce better nutrients for fall calving cows.
- 19 producers now store their round bails of hay under permanent shelter.
- 21 producers bought registered bulls with known EPD's.
- 5 producers changed to a controlled breeding season.
- 8 producers changed their method of working cattle to prevent the spreading of disease.
- 31 producers now lime and fertilize on a more regular basis.
- 13 producers changed their mineral feeding program and product to better fit their need
- 10 producers changed their fly control program.
- 3 producers got A.I. certification.
- 2 producers are using embryo transferring.

Producers attending the UT Area Beef School have indicated by survey (42 producers with 4,104 head of cattle), that they have adopted practices that resulted in a total economic impact of \$556,502 to their operations. Producers were surveyed on the implementation of twelve

recommended practices taught by Extension. Surveys returned from producers from Hickman County indicated a total economic impact on their herds of \$115,305.

An East Tennessee Beef and Forage Field Day was attended by 295 people. A random sample of 111 was conducted. Survey respondents indicated an increase in knowledge and understanding of beef management and forage practices: 47% increase in commercial hay production knowledge, weed control and temporary fencing systems 47%. The majority (78%) increased knowledge of Tennessee fencing laws and liability. About 40% indicated that they learned how to add value to their herd through proper weaning. Two-thirds (67%) gained knowledge of the Tennessee forage copper survey and its implications on their farms. In skill improvement, 41% of beef producers gained new skills in fence installation. Was the Beef and Forage Field Day valuable? The survey respondents were asked to place a total economic value of the knowledge gained at the field day. Their collective total, \$94,159, indicates that they were impacted by the new knowledge gained and skills acquired.

In Henderson County, 35 producers using improved genetics to increase weaning weight and grow replacement heifers. Bull Lease Program participants continue to save \$10 to \$40 per cow bred by using lease bulls.

Funding: Smith-Lever

Scope of Impact: State Specific

Title: Improving Animal Well-being in Tennessee

Issue: Environmental and management stressors cost livestock production enterprises billions of dollars annually in lost potential profitability by adversely affecting the animals health and well-being. Research evaluating the biological responses of livestock to stress and establishing criteria for effectively assessing the well-being of farm animals requires a multi-disciplinary, collaborative team approach.

What Has Been Done: UT Research examines circulating levels of specific blood constituents recognized as key players in an animal's biological response to stress. In addition, the measurement of behavioral responses has been incorporated to supplement the physiological measures and to more fully understand cause and affect relationships involved in animal well-being. The goal of these studies is to further the fundamental understanding of the biological responses to stressors, and to develop strategies for preparing animals physiologically to impending stressful events.

Impact: Our laboratory has developed an assay for measuring a specific protein in the circulation of swine that assists the animal in coping with chronic stress. Also, its measure can be

used in estimating the effective amount of another key participant in the animal's physiological response to stress. A similar assay is being developed for assessing chronic stress in the horse.

Funding: Hatch

Scope of Impact: State Specific

Title: Nutrition and Environmental Temperature Interaction in Poultry

Issue: Economic losses associated with the detrimental effects of heat stress on poultry production are substantial. This research seeks to identify nutritional modulations and management strategies that are important in dealing with this problem. Findings generated from this research are important to producer, industry groups and research scientists.

What has been done: Evaluated the performance of broilers fed diets containing enzyme supplemented defatted rice bran and reared under high temperature conditions.

Impact: Use of a by-product feed, defatted rice bran, at up to 25 % of the diet is not detrimental to broiler production and is cost effective. Enzyme addition increased bone phosphorus retention and decreased excreta phosphorus excretion.

Funding: Hatch; In-kind industry gifts

Scope of Impact: State Specific

1.4 Key Theme: Fruit/Vegetable Production, Home Horticulture and Urban Gardening

Title: Commercial Fruit and Vegetable Production

Issue: Because of shrinking tobacco quotas and high lease prices; many traditional row crop and tobacco growers in Tennessee and neighboring Southeastern states have been turning to vegetable and small fruit production. Although there is considerable production information available for these crops in print, many of these producers have little practical experience with these enterprises, and desire more education and training. These are potentially high-value crops that can provide an economic alternative to tobacco and other traditional sources of farm income if production and marketing recommendations are followed. Prompt diagnosis of plant growth problems is key to profitability in the commercial fruit and vegetable crops. Speed is of paramount importance sometimes in avoiding unacceptable losses in production.

What has been done: In Smith County, Extension assisted growers to organize the Fruit and Vegetable Growers Association to develop and promote the establishment of a small fruit and vegetable industry in the county. Agent used the Association as a means to distribute educational

materials to growers and keep them informed of field days and new production and marketing opportunities.

A Winter Vegetable School has been held in Upper East Tennessee. In 2003, eight nightly sessions were held at three different locations. Topics included field and greenhouse tomato production, annual plasticulture strawberry production, cucurbit crop production, blueberry and bramble production, sweet corn and bean production, pepper, sweet potato, eggplant, cole crop, and Irish potato production, as well as irrigation design and utilization. Each session was designed to cover all facets of production, often including some marketing and economic data.

The University of Tennessee operates the state's largest plant diagnostic lab. It is staffed by a diagnostician, a technician, and three faculty members. Plant specimens are submitted by mail, hand delivery, and, in recent years, digital images. The latter method has revolutionized plant problem diagnostics, allowing for quicker response to production problems.

Impact:

- One Smith County farmer stopped tobacco production to invest \$20,000 in a hydroponic tomato greenhouse, using some existing equipment and family labor. With a capacity of over 500 tomato plants and estimated average yield of 15 pounds per plant each season, selling for \$1.50 per pound, the potential gross returns will average over \$22,000 per year. With an automated watering and fertilizing system, the grower and his wife can handle all the labor requirements without hiring outside labor.
- In Sumner County, one greenhouse tomato producer began growing heirloom tomatoes as opposed to traditional varieties and was able to double the price of his tomato sale. (\$1.50/lb. to \$3.00/lb for heirloom varieties).
- In East Tennessee, about 144 growers attended the Winter Vegetable School, and growers came from eight counties in Tennessee; Madison County in North Carolina; and Lee and Scott Counties in Virginia. One attendee commented that what they had learned in the previous year's Vegetable School had increased sales of vegetables and small fruits by at least \$250,000 in Scott County, Virginia alone.
- In Hancock County, Extension assisted three 4-H members to net \$1500 off of one and one-half acres of pumpkins which were all sold locally.
- In Bledsoe and Rhea County, 24 tomato growers were targeted for practice adoption. In 2003, there was a 31% increase over the previous year in the number of farmers using the UT Distance Diagnostics (a free service) to diagnosis diseases and treat diseases quickly. There was a 53% increase in adoption of new pesticides and fungicides, and a 9% increase the use of Fusarium Wilt-resistant varieties.
- Approximately 500 fruit and vegetable samples were processed by the UT Plant Diagnostic Lab in 2003. Using a conservative estimate of \$100 per sample in average savings to the clientele, this effort amounted to a \$50,000 saving to the growers of these crops. If the educational aspect of diagnoses is considered, the value is much greater. Under this scenario, the grower is able to recognize the problem in the future and can immediately take remedial action without the need for diagnosis.

Funding: Smith-Lever

Scope of Impact: Multistate (TN, NC and VA)

Title: **Strategies for Enhanced Tomato Production**

Issue: Indeterminate tomatoes are less adapted to shipping to distant markets due to softness of the fruit as it matures. For this reason, Tennessee growers of indeterminate tomatoes generally sell their product through direct marketing outlets, such as roadside stands, on-farm sales, or farmer's markets.

What was done: 24 indeterminate tomato cultivars and hybrids were tested in West Tennessee for adaptation, yield, and fruit quality. Entries were identified which had high fruit yields, small or large fruit, and early- or late-season maturity.

Impact: When given the choice, shoppers purchase locally grown tomatoes more than 60% of the time. Results of this study enabled commercial tomato growers to grow the tomato types that the market demands. This resulted in improved marketing procedures and improved profit for the growers. Consumers were better able to purchase the size and type of tomatoes they desired, since they had wider choices of fruit in the marketplace.

Funding: Hatch

Scope of Impact: State Specific

Title: **Memphis Urban Gardening Grows Success**

Issue: The National Cancer Institute reports that approximately 35% of cancers are caused by the things we eat, and the others are treatable if caught early during routine physical exams and routine screening. Black Americans are especially at risk: they are diagnosed with cancer and die from it more often than any other group. But many more could survive cancer through better diet and health habits. In the general population, black men have the lowest consumption of fruits and vegetables and they have highest rate of cancer death for any of the measured groups.

Studies have estimated that a family of four can save \$350-400 from growing their own garden and preserving vegetables. Extension created a Memphis Urban Gardening Project targeting limited resource audiences. Workshops were held in predominately African American communities due to their health risk factors and need for this program.

What has been done: The Extension Agent partnered with the City of Memphis Housing and Community Development Office to implement the Memphis Urban Gardening Program. The City of Memphis invested \$41,000 in this program for plants, seeds and tiller equipment. The Extension Agent worked with volunteers to enroll 850 (85% African American) in the Memphis Urban Garden Program. Garden plots were tilled for 300 participants. School gardening projects

were initiated. Extension made regular home visits to backyard gardens to teach recommended practices. Extension held three educational workshops at Mt. Pisgah Church, Hollywood Community Center and Gaisman Senior Center. Extension developed and distributed the first Memphis Urban Gardening Cookbook and conducted a food preservation workshop and awards program.

Impact: In 2003, Extensions' Memphis Urban Garden Program was recognized by the Mayor of Memphis as one of only five non-profit programs in the city that had "rebuilt communities and lives." Impacts included:

- Each family saved over \$350 in food cost.
- Participants reported their overall health improved from eating fresh fruits and vegetables and working in the garden.
- 100% of participants gained knowledge in fruit and vegetable production.
- 90% increased their knowledge in food preservation.
- 98% increased knowledge in proper cooking of fruits and vegetables.
- 80% improved production practices in their backyard and community gardens.
- 100% reported being helped by educational programs presented by Extension Agent.
- 100% rated the overall program as very good.

Funding: Smith-Lever; City of Memphis Housing and Community Development

Scope of Impact: State Specific

Title: Extension Master Gardeners Make Tennessee Greener

Issue: Gardening and horticultural projects around the home are regarded as the second most popular Tennessee past-time, behind spectator sports. Communities have a need for trained individuals to deliver horticultural information and add value to the community through horticulture.

What has been done: After receiving extensive training from UT and TSU Extension, Master Gardeners volunteer to complete local service projects to earn their Master Gardener certification. Local Master Gardener projects are conducted across the state, including maintaining demonstration gardens, scheduling and delivering presentations at local Lawn & Garden Shows, providing speakers to civic and community groups, publishing monthly newsletters, maintaining an up-to-date Internet site, training Junior Master Gardeners, and community landscaping projects. In home gardening, UT and TSU Extension had 10,836 educational contacts in 2003.

Impact: More than 1,800 citizens in over 30 Tennessee counties became Master Gardeners in 2003 and contributed over 55,000 volunteer hours to community horticulture. About 1,200 of those Master Gardeners were in 17 Tennessee counties. Using the Public Sector hourly rate of \$16.54, this equals nearly \$1 million in free horticulture service to Tennessee communities in

just the 17 counties with the most active Master Gardener Program. Examples of this service include:

- In Bradley County, Extension professionals and a staff of 220 Master Gardeners directly helped at least 8,000 adults derive more success with horticulture-related activities, while saving very significant amount of money by avoiding mistakes and saving landscape and garden plants, and by controlling problems themselves instead of having to pay professionals, each one potentially saving from a few cents to thousands of dollars. These volunteers increased their knowledge and skills and were enriched by that and by their service to the community. Graduates of the Bradley County Master Gardener program complete a pre-test/post-test survey to determine the knowledge and skills gained about recommended horticulture practices. Test scores concerning recommended soil testing procedures increased 33%.
- Haywood County Extension Master Gardeners worked with the Parks and Recreation staff, soil testing was utilized and saved that department and Schools System \$3,956 in fertilizer and chemical cost. It was discovered that in the past they just simply over fertilized and had several herbicide mishaps. Evaluation data from the Master Gardener class survey indicated that 97% of the graduates felt that they could now do various home landscaping and gardening tasks themselves, alleviating the need to use professional service saving \$8,100.
- In Rhea County, 22 Extension Master Gardeners trainees collected soil samples from their homes which resulted in 64% of the samples needing no lime, thus saving participants an estimated \$260.
- In Nashville-Davidson County, a survey provided an opportunity for participants to reflect on gardening / horticultural knowledge and skill levels before and after receiving training. The greatest increases in knowledge were in the areas of fruit tree pruning (100%), small engines, fuels, and lubricants (89%), urban IPM (81%), diseases of garden and landscape plants (72%). A 42% increase in knowledge of vegetable gardening further validated responses in other areas. Overall knowledge increase in seventeen areas was 61%. Respondents reported a sixty percent overall increase in six skill areas: Taking a soil sample (90%), utilizing pesticides in the landscape (62%), controlling insects and diseases (60%), selection and care of trees and shrubs (54%), designing your landscape (48%) and controlling weeds in the landscape (43%).
- A Rutherford County survey by TSU showed the following: 95% of programs participants understood how to attract beneficial insects; 92% learned that beneficial insects can control aphids; 100% understood that mulches are used to control weeds and conserve moisture; 66% understood that cultural practices make up the majority of weed control; 88% understood that fungicides can control disease problems; 97% learned that disease only occur when host, pathogen and favorable environmental are present; 62% understood that insects can transmit diseases.
- Maury County participants expressed their feelings this way after their Extension Master Gardener program:
 - “[I] will never look at plants again without saying WOW!”
 - “Inspirational.”
 - “[I now have a] better sense of soil importance, a new respect for plants ... [This

was] useful for home and career.....learned what I should have been doing, and learned where to get answers.

Funding: Smith-Lever; Local donations; Participant fees

Scope of Impact: State Specific

1.5 Key Theme: Greenhouse, Turf, Nursery Stock and Greens Industry

Title: Risk Management Education for East Tennessee Nursery and Landscape Businesses

Issue: Feedback obtained through numerous site visits, association meetings, and focus groups identified production, financial, and marketing risks as a priority educational need for nursery and greenhouse growers and landscapers in East Tennessee.

What has been done: To develop an educational program to address these risks for green industry firms, UT Extension and Research faculty planned an intensive educational field tour focusing on risk management strategies. This tour highlighted innovative nursery operations in East and Middle Tennessee. The individuals targeted in this project included nursery and greenhouse growers, landscape contractors, garden centers, and county agents in the 24 counties of the Smoky Mountain District of East Tennessee.

Following the tour, a debriefing website was developed that incorporated digital photographs of each tour stop (taken by the team leaders), as well as a summary of educational “take-home points” generated by the team leaders. In addition a followup survey was administered to determine whether the *ex post* benefits derived surpassed *ex ante* expectations. Their overall evaluations indicate that they gained useful information, enjoyed the interactions and discussions with their peers, and appreciated the opportunity to see how other operations handle risk. Site visits were the most effective teaching tool, according to the respondents.

Impact: Evaluations completed by participants in the educational field study tours indicated that their general understanding of the Green Industry and best management practices utilized by successful firms had increased by 20%. In addition, participants indicated that their resource base of Green Industry contacts and their comfort zone with risk management concepts and strategies had also increased. Some of the comments of participants included: “The most valuable part of this trip was to realize that there are better and other ways to solve problems in a business, even those that seem to be unsolvable”; “I learned new ways to educate my workers better; grow the products we raise; keep better records on growing and on our cost of raising certain products”; and “The information gained from this tour reinforces the fact that my quality goals are attainable and that with a little more production experience and attention to marketing my operation can be more profitable.”

Funding: Smith-Lever

Scope of Impact: State-specific

Title: Sudden Oak Death Survey of Tennessee Nurseries

Issue: The Southeastern United States is home to a nursery industry valued at over \$1,000,000,000. The nursery industry in Tennessee is valued at over \$200,000,000. *Phytophthora ramorum* (*Pr*), the causal agent of SOD (Sudden Oak Death) and other foliar diseases of ornamental plants has been detected in landscapes and nurseries in CA, OR and WA. The presence of this pathogen has resulted in quarantines and stop sales of ornamental plants in West Coast Nurseries, causing lost sales. It has been determined by USDA scientists that the climate of Middle and East Tennessee is favorable for the survival and spread of *Pr*.

What has been done: The Tennessee survey was part of a survey of nurseries in five Appalachian region states (GA, NC, SC, TN, VA) conducted to determine if *Phytophthora ramorum* was present in the Southeastern United States. In Tennessee, nurseries in Middle and East Tennessee that grow woody ornamentals susceptible to *Pr* were surveyed for symptomatic plants. Suspect leaves and shoots were collected and tested using a polymerase chain reaction (PCR) assay developed by USDA scientists in Beltsville.

Impact: Three nurseries were surveyed in Middle Tennessee and eight nurseries were surveyed in East Tennessee. Of the 11 nurseries surveyed:

- 100% of the 66 blocks of pieris, rhododendron, mountain laurel and viburnum representing tens of thousands of plants were surveyed, assayed and found to be free of *Phytophthora ramorum*.
- In approximately, 10% of the plants with symptomatic tissue, it is suspected that other *Phytophthora* species common to the nursery industry were responsible for the foliar dieback.
- At this time, the Tennessee Nursery industry (valued > \$200,000,000) should be considered to be free of *Pr* and not subject to quarantine and shipping restrictions placed on West Coast Nurseries.

Funding: USDA APHIS Grant; Smith-Lever

Scope of Impact: Multistate (GA, NC, SC, TN and VA)

1.6 Key Theme: Small Farm Viability

Title: TSU Revitalizes Small Farms through Integrated Research and Extension

Issue: To provide cost effective and environmentally friendly production and management technologies to small and limited resource farmers. In addition to production, information on market development, alternative crops, and niche enterprises to include value added were provided.

What has been done: The TSU Small Farm Specialist provided training and re-certification classes for over 500 applicators in the area of forestry, non-crop land, fruits and vegetables , tobacco, turfgrass, ornamentals, highways and power lines.

Organic, Home Garden, and Commercial Vegetable Production demonstration were established. TSU agents and specialist provided and assisted with materials and set up of drip irrigation system. In Franklin County demonstrations were established on three different farms. TSU specialists provided materials to include drip irrigation system, chemicals for weed, insect and disease control and the application of the materials. A field day was also conducted. A Tipton County Community Garden was established. TSU established drip irrigation demonstration, assisted in land preparation, provided garden seeds for demonstration, and provided leadership for community projects.

Five *Third Tuesday* field days and workshops were held along with Kentucky State University. Farmers and others from across the state were educated on specific subjects, such as food safety, pest control and other topics. The *Third Tuesday* program has successfully developed, maintained, and strengthened a multi-disciplinary team of farmers, 1890 and 1862 Extension professionals. The Third Tuesday program grew 73% in one year, with 120 participants in 2002 and 450 participants in 2003. Third Tuesday attracted organic producers and non-traditional farmers. TSU also hosted a statewide *Third Tuesday* Small Farm Expo Field Day focusing on alternative enterprises, farm safety, disability farmers and sustainable agriculture system with 95 farmers and families attending from counties across Tennessee.

TSU specialists working with Dow Agro Sciences discovered the use of the herbicide *Turflon Ester* for the control of dallisgrass in fescue lawns.

Impact: The Hardeman County demonstration farmer increased income by 75% by utilizing the drip system under drought conditions. 71 farmers attended the field day activities, and observed the results of an Extension program that helped a hobby farmer move to a commercial farming operation. This operation produced over \$27,000 on two an on-half acres. These were the results of new superior varieties of tomatoes that contributed to increased production, quality, and income. The Tipton County Community Garden provided food for the needy and limited income resource families, hands on experience in gardening for youth & adults in public housing, and rehabilitation for offenders. TSU Agricultural Research and Extension were able to showcase and share with the public programs and information that will help small farmers become more profitable. It also provided information on niche enterprises such as goats, pigeon peas, and guinea fowl. One of the highlights of the program was a beef cattle feeding program, showing the results of orchard grass feeding. This method increased animal weight by 79% higher than fescue feeding.

This is first time a chemical has been discovered for removing dallisgrass from established fescue lawns. In Tennessee, Kentucky, and surrounding states dallisgrass is a major pest that will totally take over a fescue lawn within 2 to 3 years establishment. Because of this discovery the

esthetic beauty can now be extended for 3 to 20 years or more without replanting. This \$100 treatment per acre will save a \$20,000 replacement cost per acre if resod or \$1000 per acre if re-seeded.

Funding: NARETPA

Scope of Impact: Multistate (KY and TN); Integrated Research and Extension

Title: North Central Tennessee Small Farm Viability

Issue: Small farmers in the state have extraordinary educational needs and often do not know about opportunities available for agricultural production.

What has been done: TSU Cooperative Extension educational programs and workshops that increased overall production & marketing of crops were offered to producers and the general public. Demonstration plots were established on a variety of crops with data being collected for a one-year period and culminating in a field day. Awareness of small farms and demand for fresh, local produce has also been increased through programs and dissemination of timely newsletters and publications.

Some of the programs offered were: Small Forest Landowner Assistance Workshops (2), Sweet Potato Production & Marketing, Tennessee Christmas Tree Growers Association Workshops (2), Marketing Alternative Timber Crops, and the Montgomery County Ag Showcase. Specific topics included: successful marketing and management techniques, beginning an agri-tourism enterprise, proper crop production, weed, pest, and insect management, value-added products, calibration of equipment, and direct sales methods.

Impact: According to survey results: 88% of participants increased their knowledge in marketing and best management practices through timber workshops, while 61% felt these workshops would help them earn a collective \$37,000 through better management and marketing of timber crops. 94% planned to utilize professional foresters and 80% would implement a management plan. 76% had a better understanding of alternative forest crops.

Due to the Sweet Potato Extension Workshop in Montgomery County, there was a 31% increase in local producers, average production increased from 65 bu/acre to 200 bu/acre with total sales increasing by \$70,780. Marketing techniques were also changed with an increase of 70% of producers selling in bulk/contract as a cooperative vs. direct sales only.

Christmas Tree & Pine Straw Workshops: 93% felt that these workshops would help them earn more money through better management, production, and marketing techniques, for a total of \$43,500. 86% were willing to incorporate value added products and 74% to diversify/add another crop. After the workshops, 88% could more effectively control insects, diseases, weeds, and utilize IPM. Participants gained and enhanced production skills; 72% could more accurately calibrate sprayers, decrease chemical waste, thus saving money and increasing profitability.

With educational assistance from Extension, three new agri-tourism enterprises were begun in North Central Tennessee. 86% of producers had improved their agri-tourism and marketing skills. 80% felt the programs were very beneficial, 20% somewhat helpful. 76% of participants increased their understanding of agri-tourism, 88% increased their awareness of the importance of local farms and farm products. As the majority were under-served farmers with small acreage, the TSU Area Farm Management Agent introduced the farmers to agencies serving farm families. After the training, 76% had a better understanding of the expertise and service of UT and TSU Extension and Research Programs and the Center for Profitable Agriculture. In addition, 84% better understood the programs and services available to them through USDA-FSA and NRCS.

Funding: NARETPA

Scope of Impact: State Specific

Title: South Central Tennessee Small Farm Viability

Issue: A TSU Extension Agent surveyed 59 small farmers (including 31 under-served, limited-resource farmers) in South Central Tennessee regarding their farming practices. The survey showed that record keeping for beef cattle operations was not a general practice for the farmers. An advisory committee of small farmers (4 black males, 2 black females, 2 white males) was assembled to identify issues, set priorities and plan educational programs targeting small farmers.

What has been done: A hay marketing workshop was conducted to give hay producers access to pertinent information in relation to managing weeds, increasing forage stands for good quality hay, nutrition factors of hay types, forage testing to increase crude protein, soil testing to regulate liming and fertilizing, hay storage, and hay marketing clientele for round and square bales. This program emphasized hay testing.

Impact: 41 producers in small farm operations increased profits by selling beef cattle with accurate records and received an increase cattle sales by one-third of what they were receiving. A total of \$84,600 was profited from the participants using good record keeping practices. Sixteen hay producers said they increased their knowledge of weed management and pesticide use. Of these producers, six in ten (64%) reported that the TSU Extension program caused them to test their hay. According to a hay producer, by following the recommendation from a forage test he was able to save \$520 on lime and fertilizer.

Funding: NARETPA

Scope of Impact: State Specific

Title: Tennessee Extension Goat Program Targets Small Farmers

Issue: Tennessee is the second largest goat producing state in the nation. Due to the loss of the wool and mohair incentive, the introduction of new types of meat goats and the higher transportation costs, goat production has proved to be an attractive enterprise for producers. Much of the land unsuitable for crops or housing is ideal land for goat production. Little educational opportunities have been provided to goat producers. Area producers, federal loan officers, local stockyard owners, feed and supply dealers and local advisory board identified the need to develop a program to help goat producers provide a quality product to the consumer. The need for greater goat production expertise for the small farmers had been identified Extension advisory groups, such as the Extension Small Farmer Advisory Group in Franklin County.

What has been done: UT Extension conducted meetings in nine different Tennessee counties to assist goat producers. A total of 238 people (4% minority and 12% female) attended. This was an average of 23 people per meeting. Two 4-H Meat Goat Shows were held in 2003. In Franklin County, small and limited resource farmers were targeted for the Goat Parasite Workshop and 120 attended.

Impact: Of the 238 producers attending the UT Extension meetings:

- 100% said that they learned something new about goat production.
- 72% learned that they needed to administer additional vaccinations to kid goats.
- 54% learned that they could market bucks for as much money as wether with more poundage.
- 52% learned to creep feed and the proper nutritional levels for different classes of goats.
- 82% learned of the 4-H Goat Project in Tennessee.
- 42% learned that they were different marketing times due to the religious holidays.
- 92% stated that they would now keep some records and try to use them in selection of replacements.

Participants' comments included:

- "While feeding wether kids, I have a larger death loss than bucks or does. Urinary Calculi will no longer be a problem on my farm."
- "Dewormers are not as effective as I thought they were and additional management practices may be better."

In the 4-H Goat Project,

- 78 youth from twelve different counties exhibited 244 goats at the 2003 Tennessee 4-H Meat Goat Show. While over \$3,500 of premium money was presented to the participants in these two shows, no entry fees were charged.

Pre/post evaluations of the Franklin County Goat Parasite Workshop indicate the following knowledge gains: 81% now have knowledge of fecal egg counts; 26% now have knowledge of stocking rates; 29% now have knowledge of minerals for goats; and 37% now have knowledge of dewormer resistance.

Funding: Smith-Lever; NARETPA

Scope of Impact: State Specific

Goal 2 - A Safe and Secure Food and Fiber System

2.0 Overview

2a. Results

Tennessee's FY 2000-2004 Plan of Work for Research and Extension outlined steps for a safer and more secure food and fiber system. In FY 2003, UT and TSU Extension and UT Experiment Station contributed to food safety and security in production, processing, and consumption. Research and Extension initiatives included: safe food handling, food quality, foodborne pathogen protection and food security. UT Experiment Station research continued on milk quality. One intensive line of research explored non-antibiotic approaches to prevent and control mastitis.

2b. Highlights

In TNCEP (Tennessee Nutrition and Consumer Education Program) more than 64,000 Tennesseans who are food stamp recipients were taught the importance and technique of washing hands before and after food handling. Over 18,000 Tennesseans who are food stamp recipients were taught how to cook food to a safe temperature. More than 24,000 youth and 4,000 adults were taught food safety practices through their participation in EFNEP.

UT's recent discovery of *Streptococcus uberis* Adhesion Molecule (SUAM), a novel bacterial protein, is a critical step in pin-pointing non-antibiotic prevention and control of mastitis. The SUAM discovery may lead to better diagnostic tests and treatment of mastitis. The UT Experiment Station developed a new antimicrobial delivery system in the lab that improves safety of fresh and processed foods by adding efficient antimicrobial capsules made from phospholipids. Additional research found that films enriched with essential oils, containing all natural components, can successfully control bacteria on fresh fruit.

Approximately 500 Tennessee Beef Quality Assurance (BQA) certifications in 2003 not only lead to healthier cattle, but it also enabled over 13,000 cattle to be marketed through a pre-conditioned feeder calf marketing program that requires such certification. Extension certified 72 producers in Tennessee at level III (highest level) of the Pork Quality Assurance (PQA) program. These 72 producers produce over 96% of the hogs produced in Tennessee.

TSU Extension expanded its successful landownership program from West to Middle Tennessee to stem the tide of declining landownership of Tennessee's African American population. Over 250 black landowners in 18 counties were contacted through three Extension programs that taught how to manage estates and wills, manage forest resources, and improve sweet potato productivity. Landownership contributes to greater food security for the local community and the entire state of Tennessee.

2c. Benefits

Tennessee food stamp recipients adopted safer food handling practices based on a purposeful sample of participants from three months to one year after the learning experience. Among Tennessee food stamp recipients:

- 37,873 now wash their hands before and after food handling.
- 9,541 now cook foods to a safe temperature.
- 7,433 now separate raw, cooked, and ready-to-eat foods while storing and preparing.
- 11,386 now preserve food safely.

Among EFNEP youth participants, more than 22,000 (92% of those taught) reported improved practices in food preparation and food safety. Nine food preservation clinics brought the latest research to more than 500 Tennesseans while ensuring the safety of over 200 pressure canners and saucepans.

In addition to the SUAM discovery, UT scientists determined its theoretical DNA sequence. Which lead to patent applications. UT Research successfully developed a new antimicrobial delivery system in the laboratory that improves the safety of fresh and processed food products. The addition of efficient antimicrobial capsules made from phospholipids to foods counteracts post-processing contamination of foods. Cattle with the BQA certification are selling for \$3 to \$5 more per hundred pounds than cattle sold at comparable weekly auctions. During 2003, no drug residue finding has been reported from the producers in Tennessee participating in the PQA program.

2d. Assessment of Accomplishments

In Tennessee, Extension and Experiment Station work contributed to food safety and security in production, processing, and consumption. Measured outcomes were noted for programs. One exceptional accomplishment was the high adoption rate of food safety practices by Tennesseans receiving or eligible for food stamps, targeted in the state’s TNCEP program. Both the TNCEP and EFNEP programs achieved documented successes through formal program evaluation efforts which involved client follow-up.

2e. Allocations for Goal 2

<p>UT 1862 Research - \$4,195,101</p> <ul style="list-style-type: none"> •Hatch - \$608,968 •Multistate - \$32,264 •Animal Health - \$32,800 •State - \$3,521,069 	<p>FTEs for Goal 2</p> <ul style="list-style-type: none"> •UT 1862 Research - 9.20 scientist and 79.90 non-scientist •UT 1862 Extension - 6.8 •TSU 1890 Extension - 3.5 (3.0 professional; 0.5 paraprofessional)
<p>UT 1862 Extension - \$575,558</p> <ul style="list-style-type: none"> •Smith-Lever b and c - \$109,602 •Smith-Lever d (EFNEP) - \$18,997 •State/County -\$446,959 	<p>TSU 1890 Extension - \$141,885</p> <ul style="list-style-type: none"> •NARETPA Section 1444 and 1445 - \$71,376 •Grants and Contracts - \$52,992 •State/County - \$17,517

2.1 Key Theme - Safe Food Handling

Title: Safe Food for Families...Keep Food Safe to Eat

Issue: Foodborne infections affect about one in every four Americans. It is estimated that there are at least 76 million cases of foodborne illness each year, 325,000 hospitalizations and 5,000 deaths. In 2002, 19.61 in 100,000 Tennesseans reported infection from *Salmonella* bacteria, which was higher than the overall average for other states participating in FoodNet. Through proper handling, consumers can lower the risk of infection from *Salmonella* and other pathogens in food.

What has been done: During 2003, consumer food safety education was delivered through Extension programs such as the Expanded Food and Nutrition Education Program (EFNEP) and the Tennessee Nutrition and Consumer Education Program (TNCEP). Education occurred in homes, community centers, churches, schools, detention centers, shelters for displaced homemakers, drug rehabilitation programs and other locations. Extension agents and paraprofessionals provided education in single and multiple, face-to-face sessions and through mass media outlets such as newspapers, television and radio.

Impact: Improvements were reported in food safety as a result of participation in TNCEP. Participants planning to adopt were contacted at three months to one year to ascertain the adoption rate. For all five of the program’s food safety outcomes, the majority of those participants who planned to adopt actually adopted the practice. The following results are based on a purposeful sample of the county’s best practices. Clients were surveyed at three months to one year after the program. The TNCEP food safety outcomes and adoption rate follow:

Outcome Indicators	Number of Food Stamp Recipients Taught	Number Who Plan to Adopt Practice	% Who Plan to Adopt	% Who Adopted Practice**
Wash hands before and after food handling	64,299	58,267	90%	65%
Cook foods to a safe temperature	18,225	15,146	83%	63%
Separate raw, cooked, and ready-to-eat foods while storing and preparing	16,817	13,516	80%	55%
Refrigerate perishable foods promptly	18,773	15,298	81%	50%
Preserve food safely	14,558	11,739	80%	97%

**Based on a purposeful sample provided by county Best Practices at 3 - 12 months

As a result of food safety education with EFNEP funds, 65% (2,825) of adults reported improvements in one or more food safety practices, which included thawing perishable foods in

the refrigerator or other recommended ways and refrigerating perishable foods within two hours. Of EFNEP youth, 92% (22,495) reported improved practices in food preparation and safety. Individual participant success stories are numerous, but two were common. In the Upper Cumberland EFNEP program, one participant stated, “you have convinced me that thawing meat on the counter is not the right way to thaw meat.” Another Upper Cumberland participant described how she learned how to cold pack green beans in a jar and the difference between pressure canners and water bath canners and how to use a pressure canner.

Funding: Smith-Lever; Tennessee Department of Human Services Food Stamp education funds

Scope of Impact: State Specific

Title: Marshall County 4-H Improves Food Safety Practices

Issue: The Marshall County 4-H Advisory Committee determined that 4-H participation could solve a number of youth problems in the county, among these was better hand washing practices.

What has been done: An educational program on proper hand washing techniques was created. The program involved 601 4th and 5th graders (100%) identifying germs on hands by utilizing a Glo-Germ Kit, practicing proper hand washing techniques, learning about different types of germs and where they come from. Newsletters and printed materials were produced for each participant.

Impact: The 601 members who participated in the hand washing activity were given a pre-test prior to the program and a post-test at the program’s conclusion. The multiple choice test consisted of four questions that dealt with hand washing times, techniques, germs, antibacterial products, and cleaning. The following outcomes were identified:

- 96% learned to wash hands before and after food handling,
- 100% improved proper hand washing techniques,
- 60% recognized that antibacterial products causes bacteria in your home to become resistant to being killed, and
- 72% identified the need to use bleach or chlorine-based cleaners to kill bacteria.

Funding: Smith-Lever

Scope of Impact: State Specific

Title: Safe Food Preservation Clinics

Issue: To maintain safety in preserving foods, many Tennesseans need their pressure canner gauges checked each summer during the food preservation season. Others need to practice basic food preservation skills in drying, freezing or canning foods.

What Has Been Done. A total of nine Summer Safe Food Preservation Clinics were held in six Tennessee Counties (Knox, Sullivan, Lincoln, Houston, Anderson and Weakley). Letters announcing the clinics were mailed to past attendees, FCE (Family and Community Education) Club members and announcements were posted in the communities. All media outlets in the six counties were notified.

Impact: 224 pressure canners and saucepans were inspected. The gauges were checked for accuracy. The air vents and gaskets were inspected and replaced when needed. If the gaskets or air vents were faulty, they were removed so as not to be re-used in the faulty condition. Suggestions for canner use were given and over 500 people received the latest research-based recommendations in food preservation. In Anderson County, 23 homemakers reported adopting at least one new food preservation practice. A Weakley County survey showed that 17 participants (100%) are now more confident using the water bath canner and 14 (82%) are now more confident using the pressure canner.

Funding: Smith-Lever

Scope of Impact: State Specific

2.2 Key Theme - Food Quality

Title: *Streptococcus uberis* Adhesion Molecule: An Important Factor Involved in *Streptococcus uberis* Mastitis

Issue: Mastitis is a complex multi-factor disease that affects dairy cows worldwide. Control of mastitis is extremely difficult due to diverse types and sources of mastitis pathogens coupled with a poor understanding of bacterial and host factors associated with the disease process. Current mastitis control programs are based primarily on hygiene including teat disinfection, antibiotic therapy and culling of chronically infected cows. Acceptance and application of these measures has led to considerable progress in controlling contagious mastitis pathogens. However, current mastitis control procedures are less effective against environmental pathogens such as *Streptococcus uberis*. Strategies for controlling mastitis caused by environmental pathogens are poorly defined and currently inadequate. Factors that favor adherence of mastitis pathogens to milk secreting cells of the udder likely play a crucial role in the establishment, spread and persistence of infection.

What has been done: Scientists in the Mastitis Research Laboratory at The University of Tennessee recently discovered a novel bacterial protein designated *Streptococcus uberis* Adhesion Molecule (SUAM), which is believed to be involved in the pathogenesis of *Strep. uberis* mastitis. Numerous studies on this newly discovered novel bacterial protein have been conducted.

Collectively, experiments from our laboratory have provided evidence that: (1) *Strep. uberis* produces SUAM, (2) SUAM binds to lactoferrin (LF), a protein normally found in milk, (3) binding of LF through SUAM enhanced adherence of *Strep. uberis* to milk secreting cells of the udder, (4) SUAM was isolated, purified and sequenced, (6) a SUAM-like protein was also identified in *Streptococcus dysgalactiae* subsp. *dysgalactiae* and *Streptococcus agalactiae*, two important mastitis pathogens, (7) SUAM-like proteins produced by *Strep. dysgalactiae* subsp. *dysgalactiae* bound to bovine LF similar to what we observed with *Strep. uberis*, (8) antibodies against SUAM and to a synthetic peptide (pepSUAM) cross-reacted with homologous proteins present in other strains of *Strep. uberis* demonstrating the ubiquity of SUAM across all strains of *Strep. uberis* evaluated, (9) pepSUAM and SUAM antibodies cross-reacted with *Strep. agalactiae*, *Strep. dysgalactiae* subsp. *dysgalactiae*, and *Streptococcus pyogenes* (a human pathogen), (10) antibodies directed against pepSUAM inhibited adherence to and internalization of *Strep. uberis* into bovine mammary epithelial cells suggesting that pepSUAM is biologically active. In addition, the theoretical DNA sequence of SUAM was determined and confirmed by PCR and restriction digests. Further confirmation of the theoretical SUAM sequence was obtained when the SUAM gene from the mastitis pathogen *Strep. uberis* UT888 was amplified, cloned and sequenced. Research on SUAM resulted in the submission of U. S. Non-Provisional Patent and PCT International Patent applications entitled “*Streptococcus uberis* Adhesion Molecule (SUAM)”. There are several applications of SUAM --- as an antigen/vaccine for prevention of *Strep. uberis* mastitis in dairy cows, commercial use as a therapeutic in the treatment of cows with mastitis, and as a diagnostic test for detection of *Strep. uberis*.

Impact: Discovery of non-antibiotic approaches for the prevention and control of environmental mastitis pathogens that are refractory to current methods of mastitis control will have huge payoffs in the near future as use of antibiotics in the dairy industry come under greater scrutiny by federal regulatory agencies.

Funding: USDA Animal Health; Hatch; The University of Tennessee College of Veterinary Medicine Center of Excellence Research Program in Livestock Diseases and Human Health; and The University of Tennessee Food Safety Center of Excellence

Scope of Impact: State Specific

Title: A Simple, Effective, Economical Method for the Prevention of Mastitis in Heifers

Issue: Intramammary infections (IMI) in unbred and pregnant heifers were once thought to be very low. However, during the last two decades, several studies have clearly shown that IMI in heifers occur frequently during the prepartum and peripartum periods. Many of these infections can persist for long periods of time, are associated with elevated somatic cell counts (SCC), and may impair mammary development and affect milk production after calving.

What Has Been Done: UT Research on mastitis in heifers is an excellent example of identifying a problem, developing strategies to reduce the impact of the problem, and evaluating if those strategies were effective. Prepartum intramammary antibiotic infusion of heifer mammary glands a few weeks before calving with antibiotic formulations approved for use in lactating cows is an

effective procedure for eliminating many infections in heifers during late gestation and for reducing the prevalence of mastitis in heifers both during early lactation and throughout lactation. Prepartum antibiotic-treated heifers produced significantly more milk and had significantly lower somatic cell count scores than untreated control heifers. These observations are likely associated with or due to the lower prevalence of mastitis pathogen isolation in prepartum antibiotic-treated heifers throughout lactation.

Impact: Prepartum antibiotic treatment to reduce the rate of mastitis in heifers during early lactation was economically beneficial. Prepartum antibiotic-treated heifers produced 531 kg more milk than the untreated control group. Multiplying this increase by a milk price of \$0.348/kg yielded a \$184.54 per-heifer increase in gross revenue. Subtracting the cost of treatment from gross revenue (including the cost of testing for antibiotic residues), the net revenue from the actual production increase amounted to \$174.92 per heifer. Results of this research have already impacted dairy producers that have adopted this new technique by increasing heifer productivity, efficiency of milk production, and production of a better quality more wholesome milk. The procedure is simple, cost-effective and would fit easily into most dairy management schemes.

Funding: Hatch; Animal Health; Tennessee Agricultural Experiment Station; The University of Tennessee College of Veterinary Medicine Center of Excellence Research Program in Livestock Diseases and Human Health

Scope of Impact: State Specific

Title: Improving Milk Quality by Identifying Dairy Cows Susceptible to Mastitis

Issue: Mastitis, an inflammation of the mammary gland most commonly caused by bacteria, negatively impacts milk quality and costs the dairy industry \$2 billion each year. Moreover, the use of antibiotics to prevent or treat mastitis has the potential to contribute to the development of antibiotic resistant bacteria. Identifying additional means to boost overall animal health is critical as the use of antibiotics comes under attack for contributing to the development of antibiotic-resistant bacteria.

What Has Been Done: UT Research focuses upon reducing the incidence of mastitis by improving the immune system of the dairy cow to fight off infection. As a first step, scientists identified a series of polymorphisms or variations in a gene critical for getting immune cells to the site of infection. Additionally, one of these polymorphisms has been associated with increased incidence of mastitis. Cattle with CC genotype have 15% more mastitis cases compared to cows with a GG genotype.

Impact: Sires that are more susceptible to mastitis can be potentially identified through a genetic screen and dropped from service. Over time this will serve to increase the number of mastitis resistant animals in the population, thereby increasing productivity and milk quality. Additionally, we can use this information to aid in identifying what makes a cow more susceptible to disease, so that it can be targeted in future preventive and therapeutic strategies.

Funding: Hatch; The University of Tennessee Food Safety Center of Excellence

Scope of Impact: State Specific

Title: Milk Quality Management in Tennessee

Issue: Tennessee dairy producers have struggled to produce a high-quality product for American consumers. Stress placed on the lactating cow declines cow health and makes them more susceptible to mastitis and other diseases. There are numerous tasks that a producer can perform in a milk parlor to help reduce bacterial contamination of milk and the spread of mastitis. While the practices of hired workers could improve milk quality, these workers are often uninformed and unskilled in ml quality practices.

What has been done: More than 20 individual meetings were held with producers and their employees to train the employees in proper milk parlor procedures and how certain tasks can affect milk quality and udder health. Additionally, a multi-county Milker School was organized and conducted. This school was directed towards dairy employees who work in milk parlors. It contained in-depth presentations on factors that affect milk yield and quality, the anatomy and physiology of the udder, the milk let down reflex, the diagnosis of mastitis and the control of mastitis. Additionally, producers submitted milk samples from their bulk tank and we analyzed them for different strains of bacteria to help them determine hidden problems in milk quality.

Impact: Over 40 people, representing 18 farms in a five county region, attended the UT Extension Milker School. Participants completed a survey at the end of the school. Participants reported that they learned new knowledge of factors that affect milk yield and quality and the control of mastitis. 73% of attendees plan to make changes (apply new information or practices) to their operation. Example of changes they adopted: teat dipping, pre-dipping, drying teats, culturing milk, wearing gloves, more concentration on cleanliness, shorten time period after pre-dipping, types of bedding, bulk tank sampling and milk testing. When asked the most valuable part of the training, participants responded: training for milkers, milk let down explanation and mastitis control.

Funding: Smith-Lever

Scope of Impact: State Specific

2.3 Key Theme - Foodborne Pathogen Protection

Title: Investigation of Physicochemical Properties of Food Colloids and Biopolymers and Their Relationship to Food Processing and Microbiology

Issue: The safety of the U.S. food supply has with the rise of international and domestic terrorism become a national security concern. Deliberate and involuntary contamination of foods

during processing, distribution and storage may result in a spread of deadly diseases via the food supply chain. New technologies that can protect food products *in-situ*, i.e. after they have left tightly controlled manufacturing environments, urgently need to be developed. Food antimicrobials are compounds that can inhibit or kill foodborne pathogens but their activity in food systems is low because of interactions with other food components.

What has been done: UT Research demonstrated previously that encapsulation can improve integrity and increase efficiency of antimicrobials. Encapsulation technologies that were tested included (1) emulsifier micelles (2) liposomes (3) emulsions and (4) biopolymeric nanoparticles. In 2003, we focused specifically on the development and evaluation of liposomes; phospholipid-based spherical bilayer structures that have been used in the pharmaceutical industry to deliver enzymes and proteins to treat and combat cancer. Liposomal-encapsulated antimicrobials were able to inhibit bacterial growth much better than free antimicrobials. Stability of liposomes containing antimicrobials was high and no leakage or breakdown was found after more than one month of storage. Carriers were also stable at pH values typically found in foods and were capable of withstanding temperature abuse conditions encountered in food process operations such as pasteurization or blanching.

Impact: UT Research successfully developed a new antimicrobial delivery system in the laboratory that positively affects Tennessee and U.S. stakeholders by improving the safety of fresh and processed food products. The addition of efficient antimicrobial capsules made from phospholipids to foods offers not only a mean to counteract post-processing contamination of foods, but also will help develop an entirely new range of shelf-stable, but minimally processed food products. Addition of liposomal capsules is easy, the capsules can be applied as a spray or directly incorporated in the food. The method is therefore of particular interest to smaller food manufacturers that cannot afford large scale, expensive preservation processing equipment and increase entrepreneurial opportunities in rural areas.

Funding: Hatch

Scope of Impact: State Specific

Title: Functional and Bioactive Carbohydrates

Issue: Cases of foodborne illness caused by microbial pathogens continue to be a serious problem in the United States. Recent outbreaks and potential biocontamination have raised attention and requests for nonspecific and highly effective antimicrobial agents that can be used in a broad variety of food products to ensure food safety. Antimicrobial, biodegradable and completely natural films and coatings are an excellent solution that can provide safety of fresh and processed foods.

What has been done: 2003 research resulted in development and optimization of preparation of pure chitosan films and chitosan films enriched with essential oils. Films, antibacterial properties against food borne pathogens were tested on fresh fruits and on meat products. When applied on

meat pure chitosan film reduced number of *L. monocytogenes* for 2 logs. Addition of oregano essential oil into the film increased its antimicrobial properties and strongly reduced number of pathogens indicating not only the inhibitory effects but bactericidal activity of this system. Fresh strawberries treated with chitosan-anise essential oil coatings showed complete microbial reduction with no mold growth up to 18 days. Although the mold growth appeared after 21 days it was still considerably lower in coated fruits than in nontreated control.

Impact: Chitosan films enriched with essential oils are prepared of all natural components and present excellent system for controlled release of active antimicrobial compounds. The novel packaging material can be successfully applied for prevention and control of food pathogens on fresh and processed foods. This research will benefit both food industry and consumers by providing better and safer foods. Higher food quality will enhance value and competitiveness of U.S. agricultural products on local and global market.

Funding: Hatch

Scope of Impact: State Specific

Title: Use of Antimicrobials, Germicides and Biological Systems to Control Growth of Foodborne Pathogens

Issue: The market for botanical ingredients for foods was over \$27 billion last year and is growing annually at over 20%. Scientific evidence on the efficacy and mechanism of action of herbal oils and other botanicals is essential to support this growing market and ensure the safety of food products produced with botanical ingredients.

What has been done: Researchers added common essential herbal oils to meat products to kill harmful microorganisms.

Impact: This project has shown that the essential oils of selected botanicals are highly effective for inhibiting growth of spoilage and pathogenic bacteria in foods.

Funding: Hatch; National Research Initiative

Scope of Impact: State Specific

Title: Memphis-Shelby County Food Safety

Issue: Recent outbreaks of illnesses associated with improper food handling, storage and serving techniques have increased the public's awareness of foodborne illness and food contamination by pathogenic organisms. According to Shelby County Health Department, foodborne illness has increased 10% in recent years, and 10% of the county's restaurants fail regularly scheduled health inspections due to food sanitation process violations. Every year calls to the Extension office regarding food safety increase 10-20%. Focus groups have listed food sanitation as a priority need in the city and county.

What has been done: Extension provided food safety information to consumers including limited resource audiences, food service workers and day care workers. Food preservation information was provided consumers who wanted to preserve food safely at home. Over 600 participants were taught basic food safety practices, and over 20,000 general audience consumers received food safety education.

Impact: Of the 600 participants completing Extension food safety courses:

- 90% learned to identify the temperature danger zone for food-contaminate growth.
- 85% learned the food source for major food-bourne illnesses.
- 90% of participants could identify proper food storage techniques for all food groups.
- 100% intend to preserve food safely, according to USDA guidelines.
- 100% report that they now separate raw meat, cooked and ready-to-eat foods when storing and preparing foods.

Funding: Smith-Lever, Tennessee Department of Human Services nutrition education funds

Scope of Impact: State Specific

2.4 Key Theme: Food Security

Title: Black Landowners' Information Project

Issue: Landownership among Tennessee's black farmers can be traced to the beginning of the early years following emancipation. It is estimated that by 1910, the peak of black landownership in the United States, blacks owned approximately 15.6 million acres of land. By 1920, the total number of farms operated by blacks was 926,000. At that time blacks comprised one-seventh of all farmers in the United States. Today, roughly 18,451 black farmers account for 1,499 acres of farmland. Tennessee's black farmers have faced many obstacles in their efforts to retain ownership of their land. The steady decline in black owned rural land continues to be a major concern to the African-American community.

What has been done: TSU Extension delivered an intensive education program that addressed estate planning, making wills, filing the deed, property ownership rights and responsibilities, taxes, the value of land and legal assistance. A list of 250 black farm owners was identified in 18 Tennessee counties. The farmers were contacted through direct mail. Extension targeted this audience with a Record Keeping Workshop, a Management and Marketing Workshop and Tour, and three Small Forest & Landowners Workshops. In 2003, this program expanded from West Tennessee to include Middle Tennessee.

Impacts: In Middle Tennessee, 39 persons (24 were farmers) improved their understanding of wills and estate issues. The Farm Management and Marketing Workshop and Tour attracted 50 farmers while 168 attended the Small Forest & Landowners Workshops in West Tennessee. Of

these 168 participants, 80% increased their knowledge of estate issues, written wills, and clear titles.

Funding: Smith-Lever

Scope of Impact: State Specific

Title: Tennessee Beef Quality Assurance

Issue: Consumers across the world are becoming even more concerned with the safety and quality of the food that they eat. All segments of the beef production chain must work diligently to continue to produce the safest and most wholesome beef products possible.

In the initial Injection Site Audit conducted by the National Cattlemen's Beef Association in 1991, the incidence rate of injection site lesions and scars in top sirloins was 22%. The data collected in the 2000 audit revealed that there was a marked reduction in injection site lesions and scars in top sirloins with the incidence rate dropping to 3%, an actual reduction of 19%. Other quality issues have contributed to a reduction in value of carcasses produced. Tennessee beef producers are producing feeder calves that are a part of the overall beef production chain. Tennessee producers must be aware of beef quality issues and follow beef quality assurance guidelines so improvement can continue to be made.

What has been done: Extension agricultural agents, Tennessee Cattlemen's Association members, veterinarians and agribusiness representatives have been trained as trainers for the Tennessee Beef Quality Assurance Program. In FY 2003, Extension agents in 23 counties conducted certification training. Marketing opportunities for cattle owned by Beef Quality Assurance trained Beef producers have been developed.

Impact: 1,900 beef producers have received their certification since the February, 2000, inception of the Tennessee Beef Quality Assurance Certification Program, including approximately 500 certifications in FY 2003. The Tennessee Farmers Cooperative has initiated a preconditioned feeder calf marketing program with a requirement that producers must be Beef Quality Assurance Certified. In FY 2003, there were a total of 13,116 head of feeder calves market through this program. In addition, the Wilson Livestock Network video sales, the Lower Tennessee Cattlemen's Association Board Sales, Superior Livestock Satellite Sales have marketed cattle produced by BQA Certified Producers. Cattle with BQA certification and a defined health program have sold for an average of \$3 to \$5 more per hundred pounds than comparable cattle sold at weekly auction.

Funding: Smith-Lever; Tennessee Cattlemen's Association in cooperation with the Tennessee Beef Industry Council and agribusinesses operating in Tennessee.

Scope of Impact: State Specific

Title: Tennessee Pork Quality Assurance Program

Issue: Pre-harvest food safety is a concern throughout the food industry. The Pork Quality Assurance (PQA) Program assists producers in developing a comprehensive management system to address the health and welfare of animals and the proper use of animal health products to prevent drug residues in the carcass of slaughter hogs. More recently, producers have had to re-qualify at a higher level of PQA.

What has been done: Extension informed producers of PQA at hog buying stations. Two State Extension Specialists were certified as instructors to teach producers and to initiate the Tennessee Youth Pork Quality Assurance Program.

Impact: Extension has certified 72 producers in Tennessee at level III (highest level) of the PQA program. These 72 producers produce over 96% of the hogs produced in the State. During 2003, no drug residue finding has been reported from the producers in Tennessee participating in the PQA program.

Funding: Smith Lever; National Pork Board; Tennessee Pork Producers Association

Scope of Impact: State Specific

TENNESSEE AGRICULTURAL RESEARCH AND EXTENSION SYSTEM
Goal 3 - A Healthy and Well-Nourished Population

3.0 Overview

3a. Results

Research and extension programs were conducted to help Tennesseans optimize their nutrition and dietary practices, improve their diets, self-care practices, and lifestyles resulting in improved health. Major programs of greatest statewide emphasis included the Tennessee Nutrition and

Consumer Education Program (TNCEP) and the adult and youth Expanded Food and Nutrition Education Program (EFNEP).

During 2003, 95 counties utilized local Tennessee Nutrition and Consumer Education Program (TNCEP) coalitions to design and deliver nutrition education to food stamp recipients. Tennessee families receiving Food Stamps report a lack of knowledge in the area of cooking, food purchasing, managing food dollars, and identifying alternatives to purchasing fast foods and pre-prepared foods. During 2003, Tennessee conducted the TNCEP program (a \$7.8 million nutrition education program) in 94 counties. Half the funding was contracted through the Tennessee Department of Human Services and USDA Food Stamp Program. The other half was matched through in-kind contributions by The University of Tennessee Agricultural Extension Service and the 95 county nutrition coalitions.

In healthy lifestyle programs other than nutrition, Extension made 19,404 educational contacts with 4-H and other youth and 30,908 contacts with adults. Of the total youth and adult contacts, 13,027 (25%) were in multi-session, special interest health programs. Topics were exercise, arthritis self-help, and youth tobacco prevention. These special interest health programs used pre and post-tests, post-test only and/or interviews for program evaluation purposes.

3b. Highlights

Extension organized and advised 1,448 TNCEP coalition members in providing county-level education. These coalition members represented 237 local and state government agencies and officials, educators, community organizations, businesses, Extension faculty, and more than 140 Food Stamp recipients. Coalitions appoint a chairperson and secretary, but operate as a council of equals. A bilingual Head Start Pilot Project was conducted in four counties to teach migrant workers and their children. TNCEP Celebration is an annual, two-day event showcasing programming excellence. More than 304 Extension staff and program partners participated to learn more about successful county programs, nutrition education strategies, food safety training, and coalition development.

2003 saw 2,901 Tennesseans walk 174,763 miles, an average of 60 miles per person during the four-week program. The average participant walked just over 2 miles each day. In Overton, Cheatham, Coffee, Weakley and Cannon Counties, Extension educated over 4,000 youth in the dangers of tobacco use.

3c. Benefits

UT and TSU Extension Agents and their county TNCEP coalitions taught 7,593 adult food stamp recipients how to run out of food less often without having to use emergency food assistance with 6,498 (85%) planning to adopt the better resource management practices. After a follow-up evaluation of the 6,498 planned adopters, conducted from three months to one year after the program, 5,562 (86%) report they are running out of food less often. EFNEP reached the most needy families, those that are low-income with young children. It has been shown to be a cost-effective program because of changes in food selection and practices that reduce the risk of chronic disease and increase ability to purchase healthy foods. In the adult program alone, homemakers reported a per capita savings of \$4.60 on money spent on food per month. For

4,430 families that graduated, this is a total savings of \$244,536 in one year. If families continue these practices for at least five years, as supported by research, EFNEP helps families save over \$1,222,680 for a minimal one-time cost of approximately \$156 per family in the adult program (assuming 60 % of the total budget is spent on adult EFNEP).

Of the 239 arthritis sufferers in Extension self-help classes, 52% learned new ways to deal with pain, fatigue, anger, fear and frustration that tends to accompany arthritis; and 85% adopted at least one new technique to cope with their arthritis, such as a regular exercise routine. A Cannon County 4-H Teen Health Council was successful in toughening their high school policy against tobacco usage. Instead of head turning adults, students now seen smoking on school grounds are cited by the Student Resource Officer, sent to court to appear before the judge, pay a \$95 fine and attend eight hours of a tobacco education.

3d. Assessment of Accomplishments

The outcome indicators show that the food nutrition and health programming continues to achieve the ambitious goals set in the five-year plan of work. Tennessee families most at risk are gaining the nutrition education they need to live healthier, more productive lives. A special accomplishment is the involvement of at least one food stamp recipient on every local TNCEP coalition.

3e. Allocations for Goal 3

<p>UT 1862 Research - \$871,099</p> <ul style="list-style-type: none"> •Hatch - \$280,063 •State - \$591,036 	<p>FTEs for Goal 3</p> <ul style="list-style-type: none"> •UT 1862 Research - 4.80 scientist and 20.90 non-scientist •UT 1862 Extension - 106.0 •TSU 1890 Extension - 7.0 professional and 2 para-professional
<p>UT 1862 Extension - \$10,563,130</p> <ul style="list-style-type: none"> •Smith-Lever b and c - \$1,709,796 •Smith-Lever d - \$1,880,765 •State/County - \$6,972,569 	<p>TSU 1890 Extension - \$362,903</p> <ul style="list-style-type: none"> •NARETPA Section 1444 and 1445 - \$230,537 •State/County - \$79,374 •Grants/Contracts - \$52,992

3.1 Key Theme: Human Nutrition

Title: Improving the Lives of Food Stamp Recipients

Issue: By June, 2003, the Tennessee Department of Human Services recorded 754,188 individuals in Tennessee who were receiving Food Stamps, a 25% increase from the previous year. The number of households receiving Food Stamps has increased 27% percent to 327,054 households. Currently, Tennessee ranks 9th in the country in total households receiving Food Stamp benefits according to Food and Nutrition Service of USDA.

Tennessee's food stamp recipients carry a number of risk factors for poor nutrition and nutrition-related health issues: not having adequate food and adequate nutrition to feed themselves and their families, not selecting a diet based on the Food Guide Pyramid, low consumption of fruits, vegetables, whole grains, and/or dairy products, and little to no food preparation skills.

Another issue is that the state's human service and education professionals - from Department of Human Services personnel to law enforcement - are not adequately trained to assist and understand food stamp recipients.

What has been done: TNCEP trained 58,832 volunteer nutrition educators in 1,269 train-the-trainer sessions. Community personnel, including classroom teachers, day care providers, and school food service workers, participated in these educational sessions. These volunteers conducted an average of four community-based nutrition education programs each for individuals or small groups.

Extension faculty, county coalition members, and program partners conducted 18,284 teaching sessions. As a result of these classes, 42,226 contacts were made with Food Stamp eligible recipients. Educational programming occurred in places frequented by Food Stamp recipients such as Head Start Centers, County Health Clinics, Public Housing, Title I Public Schools and others. As part of the "Tennessee Welfare-to-Work Families First" program, 49 counties conducted educational programs for welfare recipients. At commodity distribution sites, 23 counties taught families who received food assistance.

Through social marketing and mass media, 5,439,559 indirect contacts were made with Tennesseans. While all contacts made through these point-of-delivery methods were not Food Stamp recipients, they were the targeted audience of this education effort. Specific efforts were made to reach every Tennessee household receiving Food Stamps. Two strategies for reaching families were to provide news stories to local newspaper vendors and radio stations. In addition to local media coverage, nine cable television outlets and 40 radio networks across the state aired TNCEP news stories through Extension's UT Connections Program and the nationally syndicated Ag Day Program. Four stories were released through the UT Hotline and Radiosource.net.

Through matching partner participation, 95,782 hours were contributed to TNCEP by 5,092 educators. The cost benefit to the program is \$2,332,151. Through non-matching volunteer, private program support in communities, more than 4,776 hours were contributed to TNCEP by 679 volunteers, which is a cost-benefit of \$80,609.

Poverty simulations were conducted for program partners, community leaders, and agencies with shared program goals. These workshops allowed 578 individuals in 12 sessions to experience and address issues relating to families with limited resources.

TSU conducts training in Davidson County at more than 30 sites such as family resource centers, the county jail, local schools, local YMCAs, homeless shelters, faith-based organizations, etc.

There is an increased awareness of the need to make healthy decisions in lifestyle practices. A significant number indicated that they have tried new recipes, their children are requesting that new foods that were initially introduced to them be prepared and served again. There have been 1,200 individuals to participate in Davidson County alone.

Impact: In Davidson County, TSU conducts pre and post-evaluations to ascertain what the participants know and are practicing prior to receiving the training and what they have learned and plan to change or have changed after the training. Of the 1200 participants:

- 60% indicated that they now use shopping lists.
- 70% indicated that they have begun reading food labels more carefully.

The TSU results reveal that participants have changed their behaviors such as washing their hands more regularly. Participants also alluded to changes in shopping habits in that they are more cognizant about their shopping habits in order to stretch their food dollars. They reported preparing their foods using low-fat and low-sodium methods, and they are consuming more fruits and vegetables in their diets as opposed to what they did prior to their receiving the training.

Four poverty simulations were conducted for 285 West Tennessee teachers, ministers, and others human service workers. A qualitative evaluation revealed these participant thoughts and feelings:

“Wow! The Poverty Simulation really opened my eyes as to what some people are going through.”

“We wanted to go through the Poverty Simulation at Caywood [School], because next year our Free and Reduced numbers are going to sky rocket. This way we have taken a pro-active approach to a situation that we will be facing this time next year. Hopefully we will ALL be better prepared.”

“I grew up in poverty but I managed to get out with education. This simulation was a humbling event. It made me remember where I came from.”

“My heart was blessed by the eye opening experience that took place. It reminded me of the basics that have been taught all of my life. To be thankful for where I come from and where I am today. I believe that some of us in that room today may be only a paycheck or a few away from being in the situation in which we only pretended to be for a moment today.”

County best practices served as a purposeful sample for evaluating program impact. Data was collected in a variety of ways, including pre and post-tests, observation, and phone or face-to-face surveys. Data was collected from three to 12 months after the interventions. Evaluation results indicate TNCEP is making a change in knowledge level, skills gained, attitudes toward foods, and behavior. Statewide impacts include:

Outcome Indicators	Number of Food Stamp Recipients Taught	Number Who Plan to Adopt Practice	% Who Planned to Adopt	% Who Adopted Practice**
Select a diet based on the Food Guide Pyramid	124,760	110,177	88.3%	58.9%
Eat more fruits, vegetables, whole grains and/or dairy products	129,912	113,896	87.6%	52.5%
Eat fewer high-fat, sodium and/or sugar foods	110,601	93,627	84.6%	40.1%
Improve food preparation skills	99,984	79,377	79.3%	75.2%
Increase physical activity	80,478	71,225	88.5%	55.9%
Maintain a healthy weight	72,899	66,295	90.0%	33.7%
Reduce risk factors for diet-related diseases	63,400	55,615	87.6%	67.3%
Manage diet-related diseases	48,760	44,115	90.4%	57.0%
Read food labels to help select the most nutritious food	11,749	8,950	76.1%	84.4%
Use a shopping list	9,282	7,845	84.5%	84.1%
Plan meals ahead of time	8,714	7,022	80.5%	83.2%
Manage family resources to ensure adequate provision for food	7,237	6,049	83.5%	63.7%

**Based on a purposeful sample provided by county best practices at three months to one year. Perhaps the words of one third grade participant complete the TNCEP success story: “I learned that when I eat healthier foods, I feel better. I tried it, and it works!”

Funding: Smith-Lever; Tennessee Department of Human Services through the USDA Food Stamp Program; NARETPA

Scope of Impact: State Specific

Title: Hawkins County 4-H Emphasizes Five-A-Day the Stir Fry Way

Issue: Middle School students are not including enough fruits and vegetables in their diet. Students lack skills in correct food preparation methods and food safety knowledge. This was confirmed by advisory groups, including the Hawkins County TNCEP Coalition. A food and

nutrition survey given to 146 middle school students revealed poor knowledge of proper nutrition and poor nutrition practices. The guidance counselor at Surgoinsville Middle School and the 4-H Agent planned a hands-on cooking program that would promote the use of vegetables with emphasis on a low-fat and low calorie dish.

What has been done: 77 eighth grade youth participated in a stir fry cooking classes. Food safety procedures were discussed with handwashing as the focal point of discussion. Recipes, instructions, equipment and supplies were given to student groups. Each group had at least three fruits/vegetables in their particular recipe.

Impact: Of the 77 students:

- 100% gained knowledge of the importance of eating at least five fruits and vegetables each day.
- 98% gained knowledge about cleanliness.
- 80% gained knowledge about cooking meats thoroughly.
- 67% demonstrated how to measure food items correctly.
- 96% were impacted by the importance of reading the recipe/instructions first.
- 73% took their information to share with their families.
- 86% tasted asparagus for the first time.
- 78% tasted some vegetables prepared another way besides frying.
- 59% said they did not like vegetables, and 53% changed their mind after tasting!

Students made the following comments about the program:

- “I did not know that you could mix different flavors.”
- “I had never cracked an egg.”
- “I had never cut an onion.”

Funding: Smith-Lever and Food Stamp Nutrition Education

Scope of Impact: State Specific

Title: Achieving Healthy Diets Through Tennessee’s EFNEP

Issue: According to the US Census Bureau, 44.2 % of Tennesseans were living in poverty from 2000-2002. Families living in poverty are more likely to be food insecure (i.e., lacking access, at all times, to enough food for a healthy lifestyle for all members of their family). Without food security, it is difficult for families to prepare healthy, nutritious meals for their children. Children experiencing food insecurity may experience growth failure, iron-deficiency anemia and other physical problems as well as poor psychosocial development and learning difficulties.

What has been done: The Expanded Food and Nutrition Education Program (EFNEP) reached 7,306 low-income families (25,307 persons) and 23,322 youth in FY2003. Education was delivered by 78 paraprofessionals supervised by 10 Extension agents. Almost 80 % of families

participated in one or more food assistance programs and for those that reported household income (2,054), over 56 % reported living at or below 50 % of the poverty level.

EFNEP reached families and youth in various settings including individual homes, offices where families received services such as food stamps and WIC, community centers in low-income housing complexes, community libraries, drug rehabilitation programs, displaced homemaker programs, county detention centers, schools, vocational schools, public schools, Head Start centers and day-care centers.

Tennessee Adult EFNEP: Approximately 69% of the families enrolled were white, 28 % were black and 2% were Hispanic. 64% (6,441) of children were eight years old or younger. Families who completed the program, i.e., graduated when educational goals were met, received an average of 10.7 lessons over average period of three months. Education included lessons on choosing low-cost, nutritious foods; methods of food preparation to reduce fat, sugar and sodium; feeding children; food preparation for pregnant women; and food safety.

Tennessee Youth EFNEP: The majority of youth (79 % of 23,322) received nutrition education through school enrichment programs. Approximately 15 % (3,385) received education through special interest, short-term programs and day camps. 56% of youth were white, 40% were black and 3% were Hispanic. Half of youth were ages nine to 12 years and 35% were ages 6 to 8 years. Youth received education in how to choose healthy, low-cost foods and how to handle foods safely.

Impact:

Tennessee's Adult EFNEP: As a result of participation in the EFNEP adult program, 90% of families reported making a positive change in their diets. Fat intake decreased, while intakes of fiber, iron, calcium, vitamin A, vitamin C and vitamin B6 increased. In addition, there were measurable changes in nutrition-related behaviors. As a result of education provided by EFNEP, 84% (3,648) of participants showed improvement in one or more food resource management practices, 89% (3,672) showed improvement in one or more nutrition practices and 65% (2,825) of participants showed improvement in one or more food safety practices.

Tennessee Youth EFNEP: After completion of a series of five to six lessons, 91% (21,790) of youth reported they were eating a variety of foods, 94% (22,585) reported increased knowledge about nutrition, 88% (20,857) reported increased ability to select low-cost, nutritious foods and 92% (22,495) reported improved practices in food preparation and safety.

EFNEP is reaching the most needy families, those that are low-income with young children. It has been shown to be a cost-effective program because of changes in food selection and practices that reduce the risk of chronic disease and increase ability to purchase healthy foods. In the adult program alone, homemakers reported a per capita savings of \$4.60 on money spent on food per month. For 4,430 families that graduated, this is a total savings of \$244,536 in one year. If families continue these practices for at least five years, as supported by research, EFNEP helps

families save over \$1,222,680 for a minimal one-time cost of approximately \$156 per family in the adult program (assuming 60% of the total budget is spent on adult EFNEP).

The following county-specific and region-specific impacts demonstrate the strength and quality of the statewide program:

In Memphis-Shelby County, EFNEP reached 782 families with 3,225 family members. Of these, 85% were food stamp recipients, 40% were age 21 or older, 71% were pregnant. Group teaching was used with 72% of the participants and 28% were taught individually. These were households in poverty; in fact, 71% of the families had household incomes less than 50% of poverty level (the poverty level is family of 3; \$13,880 which includes most EFNEP families). As a result of Extension assistance or recommendation, 12% of the families enrolled in a food assistance program. Also, 113 nutrition school enrichment programs (with over 700 individual meetings) were conducted for 2,776 youth.

In Upper East Tennessee (Carter, Greene, Washington, and Johnson Counties), the EFNEP Area Agent used her “Recipe of the Week” television segment to extend the reach of Extension food nutrition programs. This segment remains the most watched TV segment besides the weather. Josh Smith, WJHL-TV co-host stated: “Recipe of the Week has become one of the most popular segments on Newschannel 11's morning newscast. Every week, practical recipes are presented in an informative, educational and entertaining way. Our viewers received nutrition education and inspiration to view food preparation as important part of daily life. An estimated 100,000 people view our newscast every day. An estimated 20,000 people log onto wjhl.com-our station’s website-to view the recipe section. Under [the UT Extension Area EFNEP Agent’s] leadership, the “Recipe of the Week” segment has become one of our viewer’s most talked about reasons to watch our station.”

In four West Tennessee counties, Benton, Carroll, Crockett, and Madison, 5446 youth in kindergarten through third grade participated in youth EFNEP. This effort included 359 trained volunteers.

- 93% (5064) were willing to try new foods.
- 97% (5282) increased their knowledge of nutrition as a result of lessons taught.
- 92% (5010) improved their ability to select more nutrient dense foods.
- 93% (5063) improved food safety awareness and hand washing practices.

As a direct result of the SPIFFY (Special Programs in Foods for Youth; the youth EFNEP program) in Crockett County, one school replaced high-fat and high-sodium snacks in school vending machines with healthier choices.

In Nashville-Davidson County, a pre and post survey is taken on each participant who graduates from EFNEP. Extension program assistants administer the survey. A total of 497 individuals with low incomes were taught through group meetings. Findings show that after the Extension EFNEP lessons:

- 47% (278) showed improvement in meal planning.
- 41% (243) showed improvement in comparing prices at the grocery store.

- 46% (273) used a shopping list.
- 61% (363) improved on reading the Nutrition Facts on food labels to make food choices.

In Chattanooga-Hamilton County and Rhea County, 408 families (1367 family members) and 1325 youth received intense lessons in the areas of nutrition, food safety and food resource management. Results from the Adult EFNEP survey and 24 Hour Food Recall indicates that, of the 205 participants surveyed:

- 94% (193) showed improvements in their diets.
- 86% (177) showed improvement in food resource management.

A survey of 1190 youth in Hamilton and Rhea Counties showed that:

- 90% (1070) increased their knowledge of the essentials of human nutrition.
- 91% (1082) have improved their practices in food preparation.
- 82% (980) now eat a wider variety of foods.

In four Upper Cumberland counties (Fentress, Overton, Putnam and Scott Counties) 301 graduating participants saved a collective \$1324.40 monthly and \$15,892.80 annually on their grocery bill. In addition, of the 301 surveyed:

- 54% less often ran out of food before the end of the month.
- 55% more often used a grocery list when shopping.
- 51% used the Nutrition Facts on food labels to make food choices.
- 44% reported that their children ate breakfast more often.

Individual success stories from the Upper Cumberland EFNEP effort included:

- A Family Mission homemaker stated, “I learned that I need to make a budget and stick to it rather than having compulsive buying.”
- “I now read the food label to help me select healthier foods.
- After EFNEP, one homemaker stated, “I am trying to eat breakfast. I used to never eat and sometimes I would wake up hungry and then maybe just drink coffee.”
- A child in a Head Start tasted cottage cheese and the mother told the Extension Agent later that the child now asks for it.
- One child in a SPIFFY homeschool group ate carrots for the first time and the mother asked the Extension Agent, “How did you get her to try this?”
- One of homemakers remarked that she had been in many different weight loss programs over the years and all had failed because she could not stick with the program. She said the Food Guide Pyramid was the answer to her prayers because it gave her a choice of foods and was very easy to follow.
- A teenage homemaker said she learned so much from EFNEP conducted in her high school. She had tried all the EFNEP recipes she had learned and her family was very impressed.

Funding: Smith-Lever d (Federal EFNEP funds); NARETPA; State Department of Human Services funding for “Cooking School”

Scope of Impact: State Specific

Title: 4-H Teaches Better Nutrition

Issue: Various local Tennessee advisory committees agree that teaching children, youth and families good nutrition is vital to the overall health and well-being of their community. 4-H youth were targeted because focusing education efforts on healthy eating at an early age helps develop good habits for a lifetime. Target audiences for this program will included 4-H clubs and 4-H school enrichment programs with special emphasis for those students eligible for free and reduced lunch.

What has been done: To reach as many Tennessee youth as possible, especially youth from low-income households and minority youth, 4-H clubs and school enrichment groups were organized in public school classrooms, after-school settings and in community centers.

Impact: In Hamilton County, 225 fourth and fifth grade 4-H members increased their knowledge and skills related to the science and health benefits of peanuts while 525 4-H’ers increased their knowledge and skills related to the science and health benefits of eggs. 1,675 4-H youth demonstrated their knowledge of nutrition and culinary arts through participating in the Hamilton County 4-H Classroom Baking Contests. 57 Sullivan County teens demonstrated healthier nutrition choices by making healthy after-school snacks in 4-H Middle School Cooking Schools. Jackson County taught healthier outdoor grilling techniques to 120 4-H members in the county’s eighth grade 4-H clubs, with 100% gaining knowledge of healthy grilling alternatives. In Pickett County, 286 youth participated in a 4-H Health Fair, and evaluations showed that: 98% of the youth gained knowledge about healthy eating habits in relation to longevity. 4-H teens in Trousdale County organized a READ (Read, Eat and Do) Program for Head Start children and their parents. 16 parents and children participated with these outcomes:

- 67% parents said they would incorporate more family time activities into their monthly schedule.
- 90% of parents and children enjoyed the easy nutritious foods they prepared together.
- 20% said it was the first time they had ever cooked with their children.

The Extension Agent saw one of the parents in the grocery store after the program and the parent said she had read the book every single day to her child. The mother stated, “I think I have it memorized myself.” Increasing family time and involvement in good nutrition was the result of this Extension program.

Funding: Smith-Lever

Scope of Impact: State Specific

3.2 Key Theme: Health Care

Title: Dining with Diabetes Cooking Schools

Issue: The Tennessee Health Status Report provides a benchmark and objective appraisals of the health status of Tennesseans. Approximately 6% of adult Tennesseans reported that they had been diagnosed by a professional with Diabetes. This is up from 4% in 1997. The prevalence of Diabetes appears to be inversely associated with income and education. The lower the income and education, the more likely an individual was to report having been diagnosed with Diabetes. Tennessee ranks second in the nation with persons diagnosed with Type 2 Diabetes. In Tennessee 9.1% of adults ages 45-64 have Diabetes which the highest prevalence in the United States, and ten years ago, the rate was just 5.6%.

What has been done: Extension organized Diabetic Cooking Schools in eight rural counties to teach better cooking practices for the diabetic diet. The schools targeted low-income individuals and families. In many cases, Extension teamed with the local Health Department dietitian(s) to offer the cooking schools which reached 287 Tennesseans. These Diabetic Cooking Schools were multi-session programs. Two diabetes education days and cooking schools were conducted in Lewis and Wayne counties. These programs helped over 100 additional participants learn to manage their blood glucose levels by planning and preparing healthy meals with less fat, salt and sugar and including more fruits and vegetables. Bi-monthly newsletters for diabetics were mailed to 200 Lewis and Wayne county residents. These newsletters promoted improving eating habits, increased exercise and better self management of diabetes. The minority population was targeted through personal invitations, personal letters and publicizing all events at a churches that have predominately minority congregations.

Impact: In Wayne, Bradley, Fentress, Jackson and Overton counties, participants learned to eat smaller portions, to use artificial sweeteners more effectively, to eat a better variety of foods including more fruits and vegetables, to read food labels and to count carbohydrates in their diet. Students also indicated that they had learned to cook with less fat and salt and to eat smaller portions. They also indicated that they shared information with other Diabetics.

In Hancock County, all nine of the participants report having their diabetes under control. Participants report monthly on what information they have used since the previous class. Three have asked their doctors to examine their feet, three have shared recipes they have adapted to lower fat and sugar, two have brought food labels to class to show examples of things discussed in class. One has been able to reduce the amount of insulin taken. Was this course successful? Consider that the county's doctor now considers the course one imperative for the diabetic and refers diabetics to Extension for the course.

In Madison County, 61 participants were reached. The end-of-program survey showed that:

- 100% planned to try at least one new recipe.
- 89% gained knowledge of nutrition as it relates to their disease.
- 100% reported they would recommend the program to others.

- 75% planned to use herbs and spices as substitutes for salt more often.
- 87% planned to use low-fat and non-fat dairy products more often.
- 66% planned to eat the recommended servings of vegetables each day.

After three months, a follow-up telephone survey was completed with the 61 Madison County participants. Impacts included:

- 80% followed through with preparing at least one new recipe at home. The average number of new recipes prepared at home was. One respondent reported that one of the recipes had become a new family favorite.
- 55% were eating at least three vegetables each day.
- 78% were using low-fat and non-fat dairy products more often.
- 44% were using herbs and spices as substitutes for salt more often.

In Lewis County, 26 committed to adopting at least one of the recommended behaviors to control their diabetes. Of this number 13 (50%) were randomly selected and contacted after three months in a follow-up phone call or visit to determine the level of practice adoption. Of this number 80% (11) were still following at least one of the behaviors they had adopted. 70% (18) reported they had increased their fruit and vegetable consumption from two servings a day to five servings a day. Exercise and physical activity calendars were completed by 60% (16) of the participants (90% (23) reported an increase in physical activity from 10 minutes a day to 30 minutes a day. Six month follow-up found that 50% (13) were still following recommended practices including controlling blood sugar and increased physical activity. The local physician reported that he had seen an improvement in the blood glucose levels of patients who had attended the cooking schools and other Extension diabetes programs.

Funding: Smith-Lever

Scope of Impact: State Specific

Title: Walk Across Tennessee

Issue: One of the biggest health issues facing the United States is obesity. According to Center for Disease Control and Prevention 13% of children are overweight and nearly 60% of adults are overweight. Overweight and lack of exercise lead to so many health problems, primarily type 2 diabetes. Tennessee exceeds the national average in diabetes for ages 18-44, and regular exercise is greatly needed to help combat this disease. A number of County Extension Advisory Councils identified health promotion as a major priority in their counties.

What has been done: Extension formed or involved existing local health councils for the Walk Across Tennessee program in eight Tennessee counties. The four-week program provides educational resources and walking logs to teams of eight, forming support networks. Extension hosts local education and recognition events for walkers. Walk Across Tennessee was promoted to FCE clubs, health councils, 4-H clubs, and other groups.

Impact: FY 2003 saw 2,901 Tennesseans (63% 4-H youth) walk 174,763 miles, an average of 60 miles per person during the four-week program. The average participant walked just over 2 miles each day.

In Sevier County, 233 participants were surveyed. Results indicate that:

- 22% were not exercising before the program.
- 44% increased the exercise they were already doing because of this program.
- 6% found people to walk with.
- 17% reported that the program kept them going when they felt like quitting.
- 6% increased the time they spent with their family.
- 8% motivated their friends and family to exercise.
- 21% reported greater energy.
- 17% decreased the amount of time they spent sitting and doing things like watching TV.
- 21% reported feeling less stress.
- 100% planned to continue walking.

The program motivated school leaders at New Center School to start a walking program for K-8 students to walk each day for 30 minutes. They continue to do that even with the four-week program ended and the new school year. Teachers walk with the students, helping to build rapport also as they walk. Teams of eight students are averaging 40 miles per week. The Sevier County program also included one Nursing Home resident - a lady in her 80's! One man has gone down six pant sizes and contributed the start of his weight loss to Walk Across Tennessee and still continues to walk daily.

In Jefferson County, one fourth grade teacher reported that a student lost 25 pounds of excess weight during Walk Across Tennessee. Due to involvement, family ties and peer participation, this activity was a success to his entire family.

In Jackson County, 72 walkers lost a combined 122 pounds and comments from participants included:

“Feeling better and stronger...removed stress, and provided an activity to do with family.” “I have more energy, flexibility, and strength; it decreased the time spent watching TV.”

Cannon County participants reported a number of benefits. According to one man, the program “helped with weight control, lowered blood pressure and cholesterol levels.” One mother noted that the program “gives you a sense of accomplishment and you set an example of the importance of exercise to your family.” As a result of Walk Across Tennessee, the County Mayor has kept Dillon Park mowed for the use of more walkers. The program was so successful among the county’s senior citizens that the Cannon County Senior Center began collecting treadmills for an exercise room in order for senior citizens to walk at their Center.

Of Carter County’s 126 participants, result included:

- 121 (96%) are currently walking with others.

- 31% had also started one other exercise, including running (13), swimming (11) and bicycling (16).
- 50 respondents (40%) were walking 6-7 days per week, 22 participants (17%) walking 5 days per week, 15 participants (12%) walking 4 days per week and 10 participants (8%) walking 3 days per week.
- The majority of participants (51) were walking 30-45 minutes per day, 19 were walking 60 minutes per day and 16 were walking 90-150 minutes per day.
- 10 participants indicated they lost weight during the campaign, could breathe easier, lowered their blood sugar, lost inches and lowered their insulin needs.
- Comments from participants:
 - “Our family, kids included, were more active and walked together.”
 - “WAT motivated me, gave me more energy and a goal to reach. When I started, I never thought that I could walk 20-30 miles a week, but I reached that goal. I haven't been this healthy since high school.”
 - “WAT helped me exercise on a regular basis.”
 - “It helped my family become closer and gave us quality time together.”

One participant in the Walk Across Tennessee program had to have a handicap parking permit because her excess weight prevented her from walking any farther. She started walking in January, 2003. When she heard about the Walk Across Tennessee, she became involved and recruited nine teams (72 people) for the program. She was the captain for seven of those teams. At the end of eight weeks, she received the award for walking the most miles in Carter County, 576 miles and had lost over 70 pounds in five months. She has continued her walking and has lost over 100 pounds since last December.

Funding: Smith-Lever

Scope of Impact: State Specific

Title: Bradley County’s Remote Area Medical Clinic

Issue: The economically disadvantaged individuals in Bradley County did not have adequate access to health care and health care education. The Bradley County Health Council identified eye and dental care as three targets for Extension education.

What has been done: The free RAM (Remote Area Medical) Dental and Eye Clinic reached 457 limited resource individuals. The two-day free clinic addressed the needs for free dental and eye care. Extension organized the volunteer room and arranged food for the volunteers as well as hosted the dentist and three assistants from Michigan.

Impact: 457 patients including 66 children (14%) were served. Free dental work for 221 patients for the two days included 251 extractions, 126 fillings, 88 cleanings and 48 exam only. Eye care for 236 patients included 45 receiving eye tests and 191 receiving new glasses that were made in

a mobile lab at the facility. A total of 176 professionals and other volunteers helped with the free clinic. The value of the clinic was \$57,175.

Funding: Smith-Lever

Scope of Impact: State Specific

Title: Arthritis Self-Help

Issue: The Tennessee Arthritis Foundation states that 11/2 million adults in Tennessee have some form of arthritis and is second only to heart disease as one of the leading causes of disability. There are over 120 forms of arthritis that may cause pain, stiffness, and swelling in joints and other supporting structures of the body.

What has been done: Extension taught a six-week self-help course to 239 arthritis sufferers in nine counties.

Impact:

- 52% learned new ways to deal with pain, fatigue, anger, fear and frustration that tends to accompany arthritis.
- 85% are now practicing one or more new techniques to help cope with their arthritis, such as a regular exercise routine.
- 52% learned how to use breathing exercises to control their pain.
- 48% discussed available arthritis pain medications with their doctor as a result of this course.

Funding: Smith-Lever

Scope of Impact: State Specific

Title: Educating Youth about Tobacco Dangers

Issue: In a number of Tennessee counties, 4-H has taken a lead in assessing youth health issues. With regard to tobacco usage among youth, the findings have been disturbing. For example, in Cannon County, needs assessment surveys revealed that smoking by minors was considerably higher than the national average.

What has been done: In Overton, Cheatham, Coffee, Weakley and Cannon Counties, Extension educated over 4,000 youth in the dangers of tobacco use. Extension also organized 4-H LifeLinks or Teen Health Councils which served as advisory and action groups. These teen groups determined the most pressing teen health issues at their school, and some examples were sexual involvement, tobacco, self-esteem issues, relationships, and family life. Extension organized these groups in communities where teens were especially engaging in risky behaviors. Extension has trained, co-planned, and evaluated these teen health groups. Extension used

newspaper articles, radio programs, group meetings and visits to recruit and train peer mentors who implemented the program. The Cannon County 4-H Teen Health Council also implemented a Kick Butts Day at the high school including an anti-tobacco poster contest.

Impact: In Cheatham County, 54 ninth graders participated in 4-H LifeLinks tobacco education program with these outcomes:

- 94% increased knowledge about the harmful effects of tobacco use.
- 98% plan to be smoke free.

4-H LifeLinks members reported that they gained leadership skills, mentoring skills, communication skills, self-esteem, and knowledge of subject matter.

Follow-up surveys of the 1400 Overton County 4-H youth educated about the dangers of tobacco use, found that 62% were better able to make an informed decision about using tobacco products as a result of their 4-H experiences.

In Coffee County, over 1,000 youth were educated, and there was a 21% increase in the number of students who recognize that smokeless tobacco leads to cavities, loss of teeth, cancer of the pallet and cancer of the tongue.

In Weakley County, 475 students participated in a demonstration of how healthy lungs function versus how a smoker's lungs function. The agent used an educational kit containing pig lungs so youth can actually see what smoking does to their lungs. One participant asked if she could call her grandfather so that he could see it for himself. Over 90% of students reported that they gained information about the harmful effects of smoking. Over 90% said that seeing a smoker's lung made them much less likely to smoke in the future. The program has been praised by all the county's junior high teachers for the information it provides students and the impacts realized.

A policy change has been implemented at Cannon County High School resulting from the 4-H Teen Health Council's anti-tobacco efforts in the community. Students caught smoking on school grounds are cited by the Student Resource Officer and sent to court to appear before the judge and pay a \$95 fine. Students must attend eight hours of TEG (tobacco education group) taught by the high school social worker. Extension also assisted in providing training for the social worker.

Funding: Smith-Lever; Tobacco Initiative Grant

Scope of Impact: State specific

Goal 4 - Greater Harmony Between Agriculture and the Environment

4.0 Overview

4a. Results

The Tennessee Extension Pesticide Safety Education Program trained 1,468 farmers, so they may better identify pests, adopt Integrated Pest Management (IPM) principles, and become good stewards of pesticides. Over 4,500 plant and/or pest samples and their control measures were identified through UT Extension's Diagnostic Lab or Distance Diagnostics Web Site used by homeowners, agricultural producers and pest management professionals. To reduce development of pathogen resistance and our reliance on chemical pesticides, UT research focused on biological controls.

Continued emphasis is being placed on responsible use of lime and fertilizer materials to avoid environmental problems with nitrogen and phosphorus while maintaining acceptable yield levels. Extension made 177,780 educational contacts in projects and activities related to achieving harmony between agriculture and our environment. Of these contacts, more than 50,000 were with 4-H youth. In forestry, Extension made over 20,000 educational contacts with youth and adults. TSU and UT continued efforts to educate under-served forest landowners through such efforts as the formation of five additional County Forestry Associations in 2003 which brought the total to 26 statewide. With these associations, Extension conducted 45 forestry programs and 14 forestry field days.

4b. Highlights

Regarding biological controls, UT research was conducted on integration of individual microbial biological controls for management of both plant diseases and insect pests, an area with very little previous research. UT's discovered that *Beauveria bassiana*, known for its ability to control insect pests, can also protect tomato seedlings against disease caused by the soilborne pathogen *Rhizoctonia solani*.

Unsubsidized and economically sound lime and fertilizer recommendations were provided to Tennessee agricultural producers and urban residents in a timely manner and at minimal cost. Through over 18,600 soil tests, producers were informed of sound fertility practices through news articles, group meetings, on-farm demonstration and personal contact.

Extension contacted both youth and adults in improving wildlife habitat. As a result of Extension's instruction, Tennessee landowners established approximately 9,000 acres in native warm season grasses. In addition, 5,818 youth participated in school year environmental education programs at 4-H Centers, and comments from teachers acknowledge that the programs enhanced formal classroom education in soil and water.

4c. Benefits

As a result of the Tennessee Extension Pesticide Safety Education Program, there were reductions and savings to Tennessee agricultural producers of \$2,088,000 from the previous year on expenditures for pest control. The UT Experiment Station finding that *Beauveria bassiana* can control both insect pests and protect tomato seedlings from the soilborne pathogen *Rhizoctonia solani* will broaden the applications of this unique biopesticide and reduce agriculture’s reliance on chemical pesticides.

Demonstration and Experiment Station field plots evaluated different aspects of forage, tobacco and corn fertility requirements. Fertilizer costs resulting from commercial laboratory soil test recommendations were shown to again be higher in corn production systems than University of Tennessee recommendations. Yield levels were the same, indicating greater return on fertilizer dollars spent by farmers using University of Tennessee soil testing services.

Extension’s attention to wildlife habitat and land use issues paid big dividends for Tennessee’s environment in 2003. Landowners who planted native warm season grasses saw bobwhite quail populations jump by a 100% average and rabbit populations increased by 300%. Approximately 2,700 Tennessee 4-H members have participated in the 4-H FACE (Food and Cover Establishment) for Wildlife Contest over the past four years, planting food plots which improved wildlife habitat on more than 40,000 acres. An Extension Forestry Program taught 132 under-served forest landowners who had a 30% knowledge gain on the Southern Pine Beetle Initiative.

4d. Assessment of Accomplishments

UT and TSU Extension and the UT Experiment Station find that partnerships forged in support of goal four performance goals, such as multistate projects and work with other public agencies, were meritorious in FY 2003. Multistate Research and Extension efforts, such as the Quality Lumber Initiative and the Southern Pine Beetle Initiative, and work with the Tennessee Wildlife Resources Agency and the United States Geological Survey contributed to a sustainable agricultural system that protects and supports a healthy environment.

4e. Allocations for Goal 4

<p>UT 1862 Research</p> <ul style="list-style-type: none"> •Hatch - \$948,393 •Multistate - \$423,575 •McIntire-Stennis - \$398,243 •State - \$3,933,307 	<p>FTEs for Goal 4</p> <ul style="list-style-type: none"> •UT 1862 Research - 25.40 scientist and 90.60 non-scientist •UT 1862 Extension - 24.4 •TSU 1890 Extension - 5.5 professional and 0.5 paraprofessional
<p>UT 1862 Extension</p> <ul style="list-style-type: none"> •Smith-Lever b and c - \$394,568 •Smith-Lever d - \$299,801 (IPM) •State/County - \$1,609,054 	<p>TSU 1890 Extension - \$259,454</p> <ul style="list-style-type: none"> •NARETPA Section 1444 and 1445 - \$229,654 •Grants/Contracts - \$18,168 •State/County - \$11,632

4.1 Key Theme: Sustainable Agriculture and Pesticide Application

Title: Pesticide Safety Education Program

Issue: Farmers must control insects, diseases, weeds and vertebrates, which cause millions of dollars in damage, in order to produce food to help feed Tennesseans and the world. The Tennessee Agricultural Statistics Service reported that in 2002 Tennessee farmers spent over \$97 million for the purchase of general-use and restricted-use pesticides, in order to control insects, diseases, weeds and vertebrates on 90,000 farms, that brought in \$2.1 billion in cash receipts. Pests in household, structural, ornamental and turf potentially can cause millions of dollars in damage each year. A few insects cause bad allergy problems for some people in buildings. Revenues of the Pest Control Industry in Tennessee were approximately \$150 million in 2002. Consumers spent this in order to control household and structural pests. Companies that spray for the public or where food is being processed or handled or where there is temporary or permanent lodging of others must be licensed to perform pest control.

What has been done: Private Applicators (farmers, greenhouse and nursery operators) and Commercial Applicators have been educated on IPM practices, safe use of pesticides and certified and re-certified in order to buy or use the active ingredients of 305 federal and state restricted-use pesticides, RUPs, which are needed in controlling these pests. Through the Pesticide Safety Education Program, certification and licensing educational programs and publications are produced to assist commercial pest control operators in becoming certified and many licensed in order to help home owners and commercial businesses control household and structural pests.

Impact: Without these educational programs and expenditures for pesticides incorporated into an IPM system, pests would have ravaged crops and yields and cash receipts would have been cut by as much as 50-100% on individual farms. The Tennessee Pesticide Safety Education Program trained 1,468 farmers to better identify pests, adopt IPM principles, and become good stewards of pesticides. It also qualified them to become certified to buy and use general-use and restricted-use pesticides to control these pests. As a result there were reductions and savings to Tennessee agricultural producers of \$2 million from the previous year on expenditures for pest control. Through the commercial certification and licensing programs, 1,522 commercial applicators in addition to licensing applicators were trained to identify these problems, implement an IPM program, use pesticides safely and use reduced risk pesticides when necessary and possible. There were 14,503 people who received re-certification training. 100% of the applicators surveyed after training reported that they had adopted at least one new safety practice, which protects people and the environment.

Funding: Smith-Lever

Scope of Impact: State Specific

Title: Household and Structural Integrated Pest Management

Issue: Our urban pest management programs directed at the pest management professional (PMP), county Extension agents, Master Gardeners and the public can potentially impact every resident of Tennessee. According to the FY2001-02 Revenue Options, the Tennessee pest management industry is estimated to represent revenues of approximately \$150 million annually. Greater than 5631 pest management technicians are certified to provide urban pest services to the 5.5 million residents of the state. Adoption of integrated pest management (IPM) in and around structures will reduce and balance the risk of unnecessary exposure to pest control products with the health risk associated with the pests, provide effective pest control and sustain the pest management industry.

What has been done: In 2002, 200 pest management professionals were trained in IPM through 12 videotaped and interactive TV sessions for pesticide applicator training in category seven. Ants have been identified as the number one plague of the pest management professional. Seventeen formal presentations that emphasized ant, brown recluse and termite management, urban pest identification or IPM were provided to over 2593 PMPs. A training program developed for pest management professionals to prepare them for the Department of Agriculture's licensing examinations in wood-destroying organisms (WDO) and general rodent and pest control (GRC) trained 23 PMPs in 2002 and tripled the number trained in 2003 to 69. A new training program in Public Health Management - Mosquito Control (PHMC) was added in 2003. Demonstrations in ant and termite control were conducted to explore new strategies for controlling these pests.

Pest identification is one of the key steps to managing pests. Before management decisions can be made, the pest must be properly identified. Over 150 household, structural, landscape or vegetable pests were identified in the Urban IPM lab or through the UT Agricultural Extension Service Distance Diagnostics Web Site for agents, homeowners and pest management professionals. In addition to the educational processes listed above, IPM information was also disseminated through publications (printed and electronic), mass media (newspaper, newsletters), phone calls, e-mails, office visits and other meetings.

Impact: The University of Tennessee Agricultural Extension Service provides training to pest management professionals (PMPs) prior to taking the General and Rodent Pest Control (GRC) and the Wood-Destroying Organism (WDO) Licensing Exam offered by the Tennessee Department of Agriculture. Each training class is offered a "practice" quiz before and after training. Our training has increased scores by 23% for the WDO quiz and 31% for the GRC quiz. A better educated PMP will provide more effective and safer services.

Funding: Smith-Lever; demonstrations supported through contracts and donations

Scope of Impact: State Specific

Title: Integrated Pest Management in Child-serving Facilities

Issue: Pest management programs in schools need to balance the risk of unnecessary exposure to pest control products with the health risk associated with the pests. Integrated Pest Management (IPM) can help accomplish this goal. An IPM in Schools Program was initiated in the spring of 1996 as a joint venture between The University of Tennessee and The Tennessee Department of Agriculture, Division of Regulatory Services. Our IPM program has been promoted throughout the state. In 1997, results from a school system survey indicated 11.7% are using IPM. Phone calls were made in 1999 to those 10,000 or more student school systems that were classified as not using IPM to determine if their pest management practices had changed. In 2001 the program was expanded to include all child-serving facilities and a new team was formed, UT YEAH (youth, environment and health) team.

What has been done: This year's efforts included analyzing a pest management survey sent to the 152 school systems, developing and disseminating a survey for childcare facilities and submitting grants to the Environmental Protection Agency and the USDA Southern Region IPM program. Presentations or materials on child-serving facility IPM were made to the UT Advanced IPM graduate class, 200 + pest management professionals attending pesticide applicator training in category 7, 140 superintendents attending a statewide meeting, and 300 principals, teachers and other school leaders at the Department of Education's LEAD conference. I have had consultations with several school systems in East Tennessee as well as provided In-service training for Scott County and Oneida City school systems. Two new publications were developed and added to our UT E&PP school IPM web site.

Impact: Integrated pest management (IPM) programs in schools balances the risk of unnecessary exposure to pest control products with the health risk associated with the pests. In 1997, survey results suggested that 11.7% of Tennessee schools were using IPM, although 30 % of respondents thought they were using IPM. During the next five years, training was provided to pest management professionals, school superintendents, teachers, environmental educators, parents and environmental advocates. In 2002, according to respondents, 58.5% indicated they were using IPM; however, after adjustments for applying pesticides on a predetermined schedule or spraying surfaces/baseboard most or all of the time were taken into account, we estimated only 24.5% of the school districts responding to the survey were using IPM. While the adoption is slow, we have doubled the number of school systems using IPM. Because children attending urban schools were more likely to be in an IPM school, we will target future efforts to rural communities.

Funding: Smith-Lever; Philip G. Koehler and Faith M. Oi. (2001). Promotion and Maintenance of IPM in Schools and Daycares Through Training and Notification. M. Rogge and K.Vail cooperators (US EPA Region IV Urban Initiative)

Scope of Impact: State Specific

Title: A Dual Biocontrol against Plant Pathogens and Insect Pests

Issue: *Beauveria bassiana* is a well-known fungal pathogen of insect pests. Isolates of this fungus are commercially available for insect control in greenhouses and field crops. However, the potential of this fungus to control plant diseases is virtually unknown. In previous studies we established that a newly discovered isolate of *B. bassiana* could protect the tomato seedlings from damping-off disease caused by the fungal pathogen *Rhizoctonia solani*. Research is needed to evaluate the full potential of this fungus as a biological control for both plant diseases and insect pests.

What has been done: Previously we provided the first evidence that a newly discovered isolate of *Beauveria bassiana* is endophytic in tomato and can protect seedlings from damping-off disease caused by the fungal pathogen *Rhizoctonia solani*. We have found that the most effective delivery method for biocontrol is seed treatment with spores of *B. bassiana*, at a rate of 1×10^7 colony forming units per seed. Spores of this isolate can germinate and grow in an artificial diet solution for aphids. Several rates of *B. bassiana* spores were suspended in artificial diet and presented to feeding aphids to test the ability of spores to directly affect mortality, feeding and reproduction of tomato aphids (*Macrosiphum euphorbiae*). High rates of spores acted as antifeedants and aphid reproduction was reduced as spore concentrations increased. However, spores growing within the diet solution did not directly affect aphid mortality because spores were larger than the oral aperture of aphids. Effects are attributed to production of secondary metabolites during fungal growth.

Impact: Soilborne plant pathogens cause an estimated \$4 billion annual loss to crop production in the United States. To reduce development of pathogen resistance and our reliance on chemical pesticides, research is underway on biological controls, however, relatively little research has been done on the integration of individual microbial biological controls for management of both plant diseases and insect pests. Our discovery that *Beauveria bassiana*, known for its ability to control insect pests, can also protect tomato seedlings against disease caused by the soilborne pathogen *Rhizoctonia solani*, will broaden the applications of this unique biopesticide and lead to new management options for seedling diseases.

Funding: Hatch; National Research Initiative

Scope of Impact: National

Title: Protecting Soils and Plants with Beneficial Microbes

Issue: Healthy soils naturally contain many microbes that are beneficial to plant growth and soil tilth. One of these microbes, mycorrhizal fungi, forms symbioses with roots that help plants better absorb nutrients and help soils preserve structure. Soil disturbance can reduce mycorrhizal symbiosis, resulting in smaller plants and increased soil erosion.

What has been done: We tested to see if mycorrhizal symbiosis could help plants resist drought as well as aid in mineral nutrition. We also tested soils to see if allowing mycorrhizal plants to colonize them would change their water retention properties. Inoculating roots with mycorrhizal

fungi did allow plants to maintain more normal behavior as soils dried. The symbiosis also had a small effect on the moisture properties of the soils themselves, and we are testing this further.

Impact: Re-introducing mycorrhizal fungi to soils not only greatly increased plant growth and health, it also helped plants fare better when exposed to drought. This happened even when control plants were given adequate fertilization to make up for not having the mycorrhizal fungi; the symbiosis strengthened plant stress resistance beyond improving nutrient absorption. Soil was also affected; mycorrhizal soil had better structure than nonmycorrhizal soil, after just seven months. Managing soils to maintain healthy, strong populations of mycorrhizal fungi is an important component of good environmental stewardship. An online information exchange about mycorrhizal symbiosis was developed to improve communication among researchers, school teachers and industry about this vital natural resource. The importance of this web site as a global resource for mycorrhizal symbiosis was recently recognized by *Science* magazine.

Funding: Hatch; USDA NRICGP Award 00-35100-9238

Scope of Impact: State Specific

Title: Biological Control of Exotic Vegetation in Tennessee

Issue: Exotic vegetation poses a severe economical and environmental threat to agriculture and natural resources in Tennessee. One of the most prolific and most recognized exotic weeds is musk thistle, *Carduus nutans* L., which was accidentally introduced from Europe, becoming a major weed in Tennessee by the 1970s. Landowners were forced to use their time, labor, and money (ca. \$10-25/acre) to control this exotic weed. Many groups and agencies, such as farmers, landowners, state agencies, and land managers, were impacted by musk thistle. This aggressive, highly competitive and reproductive weed reduced land quality and value, hindered agricultural practices, impacted revegetation efforts, and threatened native plant communities. Musk thistle has invaded thousands of acres in Tennessee, creating a seed bank of millions of seeds that can survive in the soil for 10 to 20 years posing a potential problem for many years.

What has been done: A biological control team was developed to address the use of biological control in integrated pest management (IPM) programs against musk thistle. Two plant-feeding insects [the head weevil, *Rhinocyllus conicus*, and the rosette weevil, *Trichosirocalus horridus*] were released and redistributed in 60+ thistle-infested counties throughout Tennessee. These weevils attack plant development at two growth stages: within the seed head (destroying developing seed) and within the rosette (killing it or causing growth deformities). County agents, farmers, and landowners participated in the distribution of these insects as part of an overall IPM program against musk thistle. The IPM program includes localized use of chemical herbicides, mowing, establishment of a healthy sod, digging individual plants, use of seed-free straw, and biological control.

Impact: These weevils are well established in Tennessee. Research collected 10 years after the initial releases of biological control agents demonstrated about 94% (to less than 0.5

plants/square meter) reductions of musk thistle. These plant reductions benefit landowners, and local and state governments, by providing significant savings in time, labor, and money. We estimate that this program saves Tennesseans about \$3 million annually (\$1 million saved by state agencies and \$2 million saved by landowners). In Tennessee, these introduced biological control agents have not been observed to impact native thistles. Other benefits include:

- a natural, non-toxic, environmentally compatible area-wide control method.
 - a method compatible with other control tactics, such as mowing.
 - a permanent, self-perpetuating control method.
 - reduced dependency upon herbicides
 - a reduction in labor-intensive methods for thistle control.
 - protection of rivers, lakes and groundwater from potential chemical pollution.
- This program was used as a blueprint for implementation in other states.

Funding: Hatch; Tennessee Department of Transportation; Federal Highway Administration; SARE/ACE

Scope of Impact: State Specific

4.2 Key Theme: Land Use

Title: Economic Impacts of Growing Bio-Energy-Dedicated Crops on Agricultural Land

Issue: Developing additional sources of renewable energy is a national interest. Additionally, there is significant opportunity to take advantage of the synergism between agricultural and energy policies. The generation of energy from agricultural feedstock is a significant component of the proposed Energy Bill currently being considered by Congress. The passage of that Bill and elements contained in agricultural legislation have implications for agriculture and bio-energy-dedicated crops.

What has been done: Analysis shows that the widespread introduction of bio-energy-dedicated crops would benefit a more diverse set of farmers than one based on the transformation of corn into ethanol only. An energy strategy based on the transformation of bio-energy-dedicated crops would imply a 22 million acre shift from land that is currently planted to wheat, soybeans, corn, sorghum, and cotton. Furthermore, benefits would reach not only farmers growing a more diverse set of crops, but benefits would also be less concentrated in the corn belt and be more evenly distributed among the other agricultural regions.

Impact: The results of this research program support efforts to establish pilot bio-mass crop projects that might eventually become feasible alternative crops for American farmers. The production of bio-energy dedicated crops has the potential to generate large positive impacts across the agricultural sector as land is shifted toward bio-energy-dedicated crops, providing a reduction in the production of traditional commodities and reduced surplus in the commodity markets.

Funding: Hatch; National Research Initiative

Scope of Impact: National

Title: Managing Native Grasslands for Sustainable Wildlife Populations

Issue: Native grasslands represent one of the most endangered ecosystems in North America because most grasslands have either been cleared for agriculture, have reverted to forest, or have been cleared for human development. Wildlife associated with native grasslands as a result are threatened by this habitat loss. Species of economic importance, such as the northern bobwhite, have experienced significant population declines over the past 30 years. Developing proactive management strategies for these species is desirable at this time before these species become threatened or endangered and management options become more limited.

What has been done: We conducted a research project at Fort Campbell Military Reservation in Tennessee and Kentucky to evaluate how grassland birds are doing in areas where habitat has remained largely intact over the 60 years since the military has managed this landscape. Our research demonstrates that wildlife populations on Fort Campbell are being sustained in spite of widespread declines elsewhere in the region. These results suggest that the population declines of grassland birds, such as the northern bobwhite, would best be addressed by landscape scale changes in land management practices. Small-scale habitat management aimed at individual landowners are not likely to be successful without consideration of the landscape context.

Impact: Public and private land managers and landowners interested in wildlife management for grassland wildlife species, such as northern bobwhite, benefit from the knowledge gained in this study. This study provides landowners with a strategy for sustaining wildlife on their lands and it focuses attention on landscape context and the provision of native grasslands as important considerations for management success.

Funding: Hatch; Department of Defense Legacy Program; United States Army at Fort Campbell

Scope of Impact: Multistate (KY and TN); Integrated Research and Extension

4.3 Key Theme: Agricultural Waste Management

Title: Improved Waste Management on Tennessee Dairy Farms

Issue: In December 2002, the federal regulations on Concentrated Animal Feeding Operations (CAFOs) were updated by the Environmental Protection Agency. Each state with permitting

authority had to update their standards and regulations to meet the new federal standards. In 2003, the state of Tennessee faced this challenge. The goals in developing the new regulations were to protect environmental resources from animal wastes and to do so in a manner that would not financially burden our state's livestock producers. Additionally, producers need continuing education on waste management.

What was done: Extension Dairy Specialists represented the dairy industry on an advisory committee, the State Water Quality Committee, that was charged with developing new state CAFO standards. Several meetings of this committee were held over the course of the year. Additionally, 20 meetings were held with dairy producers from across the state, and two meetings with dairy producers and allied industries were held to gather opinions and concerns. Producer concerns were shared at the State Water Quality Committee meetings. The Tennessee Department of Environment and Conservation proposed standards based upon committee discussions. They held public hearings across the state before finalizing the proposal.

Additionally, Extension Dairy Specialists were involved in the development and delivery of a Dairy Waste Management Field Day which presented information to producers on how to reduce environmental impact from their operation. Extension Dairy Specialists were also involved in the development and delivery of the Comprehensive Nutrient Management Plan Development Courses which certifies Technical Service Providers.

Impact: The average attendance at the public hearings on the proposed CAFO standards was 60 people. Many of those in attendance were dairy producers. Several producers gave oral and written comments to the Tennessee Department of Environment and Conservation regarding their proposal. The proposed CAFO standards that were developed by the State Water Quality Committee are now being analyzed by the EPA for final approval.

Of Marshall County's 42 dairy producers,

- 40% attending the CAFO meetings stated that they felt better about the new regulations that were coming into effect.
- 100% of those in attendance learned who to contact to get help in filing a CAFO permit
- 100% of those in attendance learned who to contact in getting a Nutrient Management Plan developed.

Funding: Smith-Lever

Scope of Impact: State Specific

4.4 Key Theme: Water Quality

Title: Soil Testing and Nutrient Management

Issue: The responsible use of lime and fertilizer materials is critical to avoiding environmental problems with nitrogen and phosphorus while maintaining acceptable yield levels.

What has been done: Over 18,600 soil tests were conducted for Tennessee producers and urban residents. Producers were informed of sound fertility practices through news articles, work shops, county meetings, on-farm demonstration and personal contact.

Impact: Unsubsidized-economically sound lime and fertilizer recommendations (over 18,600) were provided to Tennessee agricultural producers and urban residents in a timely manner and at minimal cost. Demonstration and Experiment Station field plots evaluated different aspects of forage, tobacco and corn fertility requirements. Fertilizer costs resulting from commercial laboratory soil test recommendations were shown to again be higher in corn production systems than University of Tennessee recommendations. Yield levels were the same, indicating greater return on fertilizer dollars spent by farmers using University of Tennessee soil testing services.

Funding: Smith-Lever; U. S. Borax; Foundation for Agronomic Research; Tennessee Department of Agriculture

Scope of Impact: State Specific

Title: Clean Water in Tennessee Priority Program

Issue: Citizen surveys and focus groups consistently document Tennesseans' concern for quality water for drinking, agriculture, business and industry, recreation and other uses.

What Has Been Done: An interdisciplinary team of Extension personnel plans, delivers and evaluates water quality programming. In 2003, the team convened an interagency, multi-state stream restoration workshop attended by over 50 professionals. Extension supported five county water quality programs with mini-grants, technical assistance and educational assistance.

Impact: Over 700 individuals participated in county water quality education programs, increasing their knowledge of water quality issues and practical steps available to protect and improve water resources.

Funding Sources: Smith-Lever; \$250,000 in extramural funds

Scope of Impact: State Specific

4.5 Key Theme: Natural Resources Management

Title: 4-H Natural Resources and the Environment

Issue: Tennessee is experiencing rapid growth and environmental changes which can dramatically affect the accessibility and quality of natural resources. It is the youth of today who

will be most impacted by a change in Tennessee's natural resources. To make informed decisions, Tennessee youth who will become the leaders of the future, must understand the interconnectedness between human and natural resources. Opportunities for exploration, education, evaluation and application must be provided.

What has been done: Natural Resources and the Environment is a Tennessee 4-H Priority Program. Opportunities for youth and adults to explore their environment, examine the interconnectedness of human and natural resources, develop outdoor classrooms, apply the knowledge they have gained, improve the environment and address environmental issues have been provided. Educational efforts include school year programs at 4-H Centers, camps and conferences, outdoor learning laboratories, judging teams, service learning projects and classroom programs.

Impact:

In 2003, 5818 youth participated in school year environmental education programs at the W. P. Ridley and Clyde Austin 4-H Centers. Comments from teachers acknowledge that the programs are designed to promote team building and cooperative learning while enhancing formal classroom education in science and related areas, and teaching State Department of Education objectives. Written evaluations from the Ridley 4-H Center show that 67% of the participants stated they would adopt practices or behaviors learned as a result of participating in the Environmental Education program. Comments include statements referring to recycling, planting trees, taking care of the environment and other related topics. 84% of the participants indicated they learned more about agriculture, forestry, global connections, team building, water/soil, wildlife, heritage skills, and entomology. Follow-up evaluations from the environmental programs show that as a result of participation teachers and students reduced, reused and recycled; planted trees, shrubs, flowers and gardens; enhanced wildlife habitat; incorporated educational activities into classroom curriculum; and presented community programs. Nearly 5,500 youth in grades 4-6 participated in Junior Camp programs which emphasized Environmental Stewardship. The theme focused on participants developing environmental awareness, sensitivity and understanding and encouraging them to become better earth stewards and responsible world citizens. Evaluations show that more than 87% of the participants rated the educational project sessions and special programs of Earth Works, Wild Things, and Global Connections as excellent or good. When asked what they learned about taking care of nature and the environment, written comments from campers were related to not littering, providing food, shelter and space for wildlife, and plant needs. A summer camp staff member at each of the four 4-H Centers, provided additional natural resource and wildlife activities for more than 6,200 Junior and Junior High Campers.

County agents also conducted club-based environmental education programs for their 4-H members involving:

- 1,032 elementary-aged youth who learned the dangers of littering and developed environmental awareness.

- 2,005 youth who participated in an Amazing Animals educational series with pre-post tests indicating 98% knowledge gain in areas related to animals and environmental education.
- 3,300 middle school youth who participated in units related to Oceans, Marine Mammals, Animal Identification, and Wildlife Management. Over 80% could recall specific information related to the units of study.
- 959 elementary and middle school youth who participated in a litter prevention essay contest, while more than 100 took part in an Environmental Awareness Day where they were engaged in learning centers, planted trees in the park and took trees home to plant.
- 65% of 1,500 5th and 6th graders who stated they had learned more about wildlife and the environment through participation in a Wildlife Jeopardy game while teachers reported that it reinforced their science curriculum.
- 700 elementary and middle school 4-H'ers who participated in a recycling education program with half of the youth indicating that they now recycle as a result of the program.
- 150 sixth graders who increased post-test scores by 13% as a result of participation in a Forest ecology and Creek study program.
- 78 eighth graders of whom 82% reported learning more about water quality and 90% learned more about soil properties while 42% said they were more concerned about the environment and would take on the responsibility of practicing soil and water conservation.
- 200 middle school youth who increased their knowledge and attitudes and planned to make a social practice change as a result of an educational program focus on water resources and water quality.
- 35 teachers and 2321 fourth graders who learned how to plant and take care of trees and gained knowledge about the benefits of protecting natural resources through participation in the ReLeaf Tennessee program. More than 1120 of the participants reported correctly planting a tree.
- A day camp for nearly 200 fifth graders that resulted in 100% of them reporting an increase in knowledge about conserving their natural resources.

More than 600 high school students and their coaches, many of them 4-H members or leaders, participated in the Envirothon, an environment evaluation contest. These participants and coaches learned about natural resource issues and applying their knowledge to real-world situations. Statewide, 6,643 youth and 641 adults donated 60,766 hours in serving 113,976 community

members through 124 different environmentally focused service learning projects. These projects are valued at over \$95,000.

Funding: Smith-Lever; Environmental education programs at the 4-H Centers are supplemented by more than \$25,000 in grants and gifts; county 4-H donors

Scope of Impact: State Specific

Title: Tennessee 4-H Wildlife Project

Issue: Educating youth about natural resources management is critical to the future of our environment since there is an ever-increasing urban society where fewer children than ever before have a connection with the land.

What has been done: The 4-H Junior High Wildlife Conference is a week-long camp offered each year that includes courses related to wildlife and natural resources management. 4-H Wildlife Judging teaches youth how to evaluate and manage habitat for all types of wildlife. 4-H Food and Cover Establishment (FACE) contest gives youth an opportunity to enhance wildlife habitat by planting plots for wildlife habitat and food. All youth enrolled in the TN 4-H Wildlife Project complete grade-level project work outlined in a series of workbooks offered at each grade level.

Impact: The Tennessee 4-H Wildlife Project teaches 4-H'ers the basic principles of wildlife ecology and management. The Tennessee 4-H Wildlife Project has increased from 12,694 in 1999 to 17,487 in 2003, making this 4-H project the sixth largest in Tennessee. Pre- and post-test scores of 149 youth who participated in the Jr. High Wildlife Conference in 2003 showed an increase in knowledge of 45% concerning issues related to wildlife ecology and management. Approximately 2,700 Tennessee 4-H'ers have participated in the FACE Contest over the past 4 years, planting food plots and improving wildlife habitat over more than 40,000 acres.

Funding: Smith-Lever; Tennessee Wildlife Resources Agency has provided \$150,000 in the last five years

Scope of Impact: State-specific

Title: Deer Damage and Management Options For Reducing Losses to Agricultural Production

Issue: There are growing concerns about agricultural damage caused by wildlife. Agricultural and wildlife professionals believe wildlife-caused damage has increased over the last 30 years. The white-tailed deer is the leading species of wildlife associated with this damage. Increased conflicts between humans and deer will continue that directly affect the sustainability of agriculture. What we don't know is how to objectively and efficiently assess deer damage. Lack

of such knowledge is an important problem, because until we understand factors affecting deer damage, we can't effectively manage deer populations and land use to alleviate conflicts between deer and agriculture.

What has been done: UT researchers completed preliminary investigations of applying remote sensing technology to deer management. Global positioning system (GPS) telemetry collars were attached to 16 female white-tailed deer at Chesapeake Farms, Maryland during 2 summer growing seasons.

Impact: Movement and location data collected from these deer showed agricultural crops were among the most selected habitat types in both years. The deer had minimal home ranges in this high-quality agricultural system and their use of natural cover and food sources declined as use of crops increased. Availability and quality of surrounding habitat seems to affect the timing and intensity of deer use of agricultural crops.

Funding: Hatch; Dupont Agricultural Products; University of Tennessee SARIF Program

Scope of Impact: Multistate (TN and MD)

Title: Biodiversity Research in Tennessee

Issue: Biodiversity represents the biological diversity (i.e., richness and variety) of organisms in a habitat and is vitally important to the health, stability, and success of that habitat. Biodiversity among plants and insects is a tremendous asset, providing new medicines, new foods, and new chemical resources. However, insect biodiversity in Tennessee is poorly understood. This biological diversity should be indexed, catalogued, used, preserved, and conserved. Only by understanding this diversity can we assess long-term impacts of introduced exotic pests, identify potentially beneficial insect products, and use insect genetics as tools in biotechnology.

What has been done: A biodiversity team was established to conduct research to identify the insect fauna associated with various habitats, as well as ornamental and forest trees (such as northern red oak, yellow poplar, dogwood, and southern magnolia) that are economically, environmentally, and socially important to industries and the general public. Documentation of native species and the development of management strategies against pest species are essential to maintaining the economic and environmental viability of our forests. An insect database consisting of more than 6,500 species common to plants in eastern Tennessee has been developed.

Impact: A newly-created insect species database strengthens basic faunistic and biological data, enabling scientists, as well as the general public, to better assess any future impact, either natural or man-induced, on related habitats within the region. This information is a foundation for implementation of management programs on state, federal, and private lands, to conserve naturally-occurring species, enhance biodiversity, and protect these lands from pest species. Several examples of faunistic results are provided below:

- Arnold Air Force Base: researchers identified 1,845 arthropod species in nine habitat types (e.g., grassland wetland, hardwood, pine, and riparian).
- Southern magnolia: identified 480 species in 119 families in 12 orders; 44 insect species identified from flowers. Yellow poplar - identified 725 insect species (101 were predators).
- Northern red oak: identified 301 species of beetles in the Great Smoky Mountains National Park; data contribute significantly to the goal of the ATBI to document all species in the region, resulting in better forest management to maintain species diversity, increasing wildlife and providing a more balanced, environmentally sound ecosystem.
- Eastern hemlock - identified 281 insect species in 86 families in nine orders.

Aesthetic benefits from this research contribute directly and indirectly to the welfare of the citizens of the state. For example, over 14 million people visit the region annually to enjoy the forests; during their visits, they contribute more than five billion dollars to the region.

Funding: McIntire-Stennis Cooperative Forestry; Hatch; parts of this program were funded by CH2MHill, Discover Life in America, and the U.S. National Park Service

Scope of Impact: Multistate (TN and NC)

Title: Elk Restoration in Tennessee’s Northern Cumberland Plateau

Issue: Historically, elk (*Cervus elaphus*) ranged throughout a large part of North America. Loss of habitat and unregulated hunting reduced elk numbers nationwide. The eastern elk that ranged as far south as Louisiana, Mississippi, Alabama and Georgia became extinct. In eastern North America, elk restoration efforts are now being conducted in Arkansas, Kentucky, Michigan, Minnesota, Pennsylvania, Tennessee, Virginia, Wisconsin, and Ontario. In 1999, citizens groups from the northern Cumberland Plateau region of Tennessee expressed their interest in restoring elk to the area. The restoration zone includes 670,000 acres in Campbell, Scott, Morgan, Claiborne, and Anderson counties of Tennessee. Research is critical to know how reintroduced elk will adapt to Tennessee’s social, biological, and ecological conditions.

What has been done: UT Research has been establishing movements, mortality, recruitment and habitat use of reintroduced elk in the Cumberland Plateau area of east Tennessee and are adding to the knowledge base of elk ecology in eastern North America.

Impact: The results of the research have assisted in maintaining healthy, productive elk populations in Tennessee while minimizing human-elk conflicts.

Funding: Rocky Mountain Elk Foundation; Tennessee Wildlife Resources Agency; McIntire-Stennis Cooperative Forestry

Scope of Impact: Eastern North America

Title: Effects of loss of eastern hemlocks on avian population demographics.

Issue: Eastern hemlock is an ecologically important trees species in southern Appalachian forests because it provides structure for wildlife habitat and moderates associated forest microclimate, making it cooler in summer and warmer in winter. These microclimate modifications have significant benefits for wildlife. Eastern hemlocks are being lost throughout the Appalachians because of mortality caused by the hemlock woolly adelgid. Hemlocks may become a rare species regionally within the next decade without aggressive management.

What has been done: Before we lose all hemlock forests in the region, it is important to understand what role hemlocks are playing in supporting resident wildlife populations and to decide how much investment should be made to save these forests. To answer this question, we have implemented a research project on avian populations in hemlock forests of the southern Appalachians. We documented which species are associated with hemlocks and their reproductive performance. At the same time, we examined cove hardwood forests with a limited hemlock component to understand what the consequences are to loss of hemlocks.

Impact: Research results show that some avian species are particularly successful in hemlock forests, with nesting success about twice as great as nesting success by individuals in nearby cove hardwood forests. This suggests that loss of hemlocks will significantly impact avian populations for certain species and efforts to save at least some hemlock forests will be critical for sustaining populations of these species.

This study documents the importance of eastern hemlock and supports efforts by public and private land managers and landowners at saving representative stands in the southern Appalachians.

Funding: Hatch; U.S. Geological Survey

Scope of Impact: State Specific

Title: Residential Energy Consumers' Preferences for Green Power from Bio-energy

Issue: Bio-energy development is of interest to agricultural producers, policymakers, utility companies, and consumers of electricity including residential and commercial. Bio-energy use can reduce air emissions, is a renewable source of energy, and contribute to economic activity in rural areas. Results from this study convey market information from potential consumers of bio-energy regarding their willingness to pay premiums for renewable electricity from agricultural crops or forest products wastes.

What has been done: A mail survey of Tennessee residential electricity consumers was conducted. The results from this survey suggest that the %age of residential electricity consumers who are willing to pay premiums for electricity is much lower than found in prior studies, at 38 % compared with prior estimates as high as 90 %. Findings suggest that there is a slightly lower preference for electricity from crops or forest wastes than for electricity from solar or wind

sources. However, among those willing to pay more for renewable energy, over 80 % would be willing to pay more for bio-energy from crops or forest products wastes.

Impact: The results from this study suggest that while most consumers are not willing to pay more for electricity from renewable sources, over 30% are willing to pay. The majority of the consumers who would pay more are receptive to purchasing electricity from bio-energy sources, including crops and forest products wastes. Concerns among those who would not support using these sources are environmental sustainability of agricultural crop production and potential promotion of deforestation. The results also suggest that current pricing of electricity from renewables could be increased or the block of power typically offered (150 kWh or about 10-11% average household use) could be expanded.

Funding: Hatch

Scope of Impact: State Specific

Title: Tennessee Quality Lumber Initiative – Research for a High Return on Investment

Issue: Tennessee sawmill owners had a need to know if real-time statistical process control could improve their operations. Research was conducted to determine if real-time statistical process control would be a low-cost, low-risk investment that could lead to target size reduction and substantial improvements in lumber recovery and lower manufacturing costs.

What has been done: The research focus of the Tennessee Quality Lumber Initiative (TQLI) was to examine the effect of real-time statistical process control (SPC) on lumber thickness variation and target sizes. Case studies were conducted at four hardwood sawmills in the southeastern U.S. and a softwood sawmill in Oregon from 1999 to 2003. The research program complemented the research mission of the University of Tennessee Forest Products Center, which is to ensure the competitiveness of the forest products industry in Tennessee, the region and beyond.

There was statistical evidence at the all case study sawmills that real-time SPC had an effect on target sizes. Improved awareness of real-time lumber thickness led to immediate reductions in target sizes. Identifying sources of thickness variation that led to thickness variation resulted target size reduction and improved log recovery. Case study mills had targets size reductions from 0.030” to 0.120”, which were wood species dependent. Log recovery improved at all case study sawmills. One mill had an improvement in quality of higher-grade lumber.

The study not only benefitted participating case study sawmills but also resulted in software licensing of the real-time statistical process control system and the initial startup of a new information technology business in Tennessee.

Impact: This research lead to an average return on investment (ROI) of 16:1. Company T invested \$15,000 and returned \$180,000 (12:1 ROI). Company M invested \$27,000 and returned \$752,000 (28:1 ROI). Company O invested \$13,000 and returned \$210,000 (16:1 ROI). Company

R invested \$19,000 and returned \$76,000 (4:1 ROI). The average company invested \$18,500 and the average return was \$304,500 (16:1 ROI). Financial analyses were verified by participating companies accountants. These research results lead to the startup of a new Tennessee information technology business called EWOOD Technologies, LLC.

Funding: Hatch; McIntire-Stennis; Anderson-Tully Corporation, Boise Corporation, Georgia-Pacific Corporation; Whitson Lumber Company

Scope of Impact: Multistate (TN and OR)

Title: Sustaining Tennessee Oak Forests

Issue: The future of oak forests in Tennessee is uncertain because fewer and fewer oak seedlings are surviving to become mature trees, and research over 15 years has established that increased competition between oak seedlings and other hardwood competitors is responsible. Oak forests are important to the forest products industry and the wildlife-associated expenditures in Tennessee. Together these expenditures total over \$27 billion each year. Managers need reliable, cost-effective techniques for improving the survival of oak seedlings.

What has been done: Research on techniques for improving the competitive position of oak seedlings in Tennessee oak forests has focused on two approaches to this problem: techniques for reducing overabundant hardwood competitors of oak, and techniques for directly increasing the growth rate and competitive ability of oak seedlings and sprouts. Tests of shelterwood cutting and prescribed burning, which have shown promise for reducing the abundance of less desirable competitors of oak elsewhere in the eastern United States, have been implemented on two sites in Tennessee. Improved, high-quality oak nursery seedlings and effects of season of cutting on the growth rate of oak stump sprouts generated after cutting have been investigated to determine methods that will directly improve the growth rate and survival of seedlings and sprouts.

Impact: Tests of shelterwood cutting and prescribed burning demonstrated that shelterwood cutting must be combined with additional understory control measures to reduce the overall abundance of competitors, and that two or more prescribed burns are required for prescribed burning to be a viable technique for reducing the abundance of competitors of oak seedlings. Tests of how season of cutting affects the growth of oak stump sprouts demonstrated that sprouts from oak stumps cut in September grew twice as tall as sprouts on stumps cut in May. As a result, forest managers and landowners can improve the height growth of oak stump sprouts by 100% if they cut their oak stands in the fall rather than in the spring. Increased survival will accompany these increases in height growth. Field tests of carefully graded and selected high-quality oak nursery seedlings grown from known seed sources demonstrated that these seedlings are superior to standard nursery seedlings in growth and survival. These trials also indicated that competition control shortly after planting will enable managers and landowners to realize the full potential of these seedlings, thereby maximizing returns from their investment in these premium seedlings.

Funding: McIntire-Stennis; National Wild Turkey Federation

Scope of Impact: State Specific

Title: County Forestry Associations

Issue: Regulation of publicly owned forests has restricted commercial timber harvesting on nearly 1.6 million acres of forests in Tennessee. Concurrently, the forest products industry is divesting of a large amount of their 1.4 million acres of forests, and much of that is being purchased by nonindustrial private forest (NIPF) landowners. These two activities have increased the pressure on NIPF landowners to supply logs needed to produce Tennessee's wood products. Traditionally, NIPF landowners have not practiced responsible forest management to the degree of public or industrial ownerships. A stage was needed to connect NIPF landowners together with natural resource professionals in order that forest management educational programs could be delivered to this important audience.

What Has Been Done: Partnering with the Tennessee Forestry Association and the State Division of Forestry, UT Extension lead the formation of five additional County Forestry Associations in 2003, bringing the total to 26 statewide. UT Extension conducted 45 evening forestry programs and 14 forestry field days throughout Tennessee.

Impact: 1,200 NIPF landowners owning nearly 480,000 acres of forest were educated on responsible forest and wildlife stewardship. 653,000 tree seedlings were planted by members of these associations. 14,400 acres of forest were harvested, generating \$9 million of revenue to Association members. Educational efforts on forestry best management practices (BMPs), reduced soil erosion and protected aquatic life in adjacent streams and rivers.

Funding: Smith-Lever; Tennessee Forestry Association funds the start-up costs of forming County Forestry Associations; local forest product industries are sponsoring participant meals and other expenses

Scope of Impact: State Specific

Title: Education Targets Under-served Forest Landowners

Issue: A multi-state, multi-institutional research and outreach effort was used to promote sustainable forest management to under-served landowners in the South Central United States. This effort involved 1862 and 1890 land grant institutions, consultant foresters, landowners, state and federal agents, and others in Tennessee, Mississippi, Louisiana and Arkansas. In Tennessee, three focus group sessions were conducted in 2002 and involved about 36 landowners. Twelve focus group sessions were conducted and involved 97 landowners for the South-Central region. The focus group information provided the basis for developing a questionnaire that was mailed to 6,000 landowners in the South Central Region. For Tennessee about 1,500 landowners were involved in the study. The mail questionnaires were used to gather information about landowner educational needs pertaining to forest management.

Through the Southern Pine Beetle Initiative, landowners may be eligible to receive a cost share program that will assist them to plant and manage their pine species destroyed by the southern pine beetle. There are so many questions out there on how to market and eventually harvest a standing stand of pine attacked by the southern beetle while maintaining Best Management Practices.

What has been done: The results of the study were used to plan the Tennessee workshops. In 2003, four landowner workshops were conducted in Montgomery, Tipton County, Shelby and Wilson Counties with 180 participants.

Impact: The participants reported owning a total of 15,187 acres of forests and felt the information they received would help them earn an additional \$138,000 from managing their timber. 48% had used a forester before the workshop, while 93% plan to use a forester in the future. Also, 22% reported having a written forest management plan before the workshop, while 61% plan to obtain a forest management plan in the future.

Southern Pine Beetle Initiative training had 132 participants from 15 counties. Prior to the training, 49% of participants reported that they had at least moderate knowledge of the Southern Pine Beetle Initiative. After the training, 79% had at least moderate knowledge about the Southern Pine Beetle Initiative.

Funding: NARETPA; SARE Grant

Scope of Impact: Multistate (TN, LA, MS and AR)

Title: Native Warm-Season Grasses for Wildlife Habitat and Livestock Forage

Issue: Land conversion, clean-farming practices, and the establishment of tall fescue pasture have limited the amount of nesting and escape cover available for many wildlife species in Tennessee. Establishing native warm-season grasses and associated old field cover is an excellent way to improve early successional habitat for wildlife, particularly bobwhites, rabbits, and several species of songbirds.

What has been done: Demonstration and research plots of native grasses were maintained on three UT Experiment Stations to develop sound establishment and management techniques and monitor wildlife response. Seven seminars reached 130 people concerning the establishment and management of native warm-season grasses. Producers tallied native grass hay production and a wildlife census was taken on those properties. Professionals with the Tennessee Wildlife Resources Agency and USDA Natural Resources Conservation Service, and private landowners learned the correct techniques for establishing and managing native grasses, including the use of prescribed fire to improve and manage habitat conditions for wildlife.

Impact: Tennessee landowners established approximately 9,000 acres in NWSG last year.

Dramatic improvements in habitat quality have been made. Participating landowners saw bobwhite quail populations increase by an average of 100% and rabbit populations increase by 300%. Forage production was phenomenal with producers averaging over 10,000 pounds of quality forage per acre.

Funding: Hatch; Smith-Lever; Tennessee Wildlife Resources Agency; Natural Resources Conservation Service; BASF; Quail Unlimited

Scope of Impact: State Specific; Integrated Research and Extension

Goal 5 - Enhanced Economic Opportunity and Quality of Life for Tennesseans

5.0 Overview

5a. Results

As Tennessee has lead the nation in personal bankruptcies three of the past five years, significant statewide outputs were in Extension Family Economics Programs in which 33,493 youth and 49,047 adult educational contacts received training and information in FY 2003. The youth programs were delivered in connection with rural and urban public schools to ensure that limited resource and minority youth, especially those from areas of persistent poverty, were targeted for financial education.

As Tennessee continues to have at least the fourth highest divorce rate in the country, *Parenting Apart: Effective Co-Parenting*, has been offered in 71 of 95 counties at some point during the last three years. In 2003 this Extension training was offered in 60 counties.

Service learning, coordinated through the 4-H Seeds of Service (SOS) program, was a major focus of 4-H programming across the state. Designed as a resource for youth and adults, 4-H SOS provides education and resources that enable youth to develop life skills and a service ethic. Reports show that 55,612 4-H'ers and 5,104 adults conducted more than 1,880 service learning projects in 2003, committing more than 303,644 hours to the community. More than 477 youth and adults participated in 4-H service learning workshops at the state, regional and national level.

5b. Highlights

Extension agents across the state delivered financial management programs to 33,493 young Tennesseans during 2003, up from 23,785 in 2002 and 13,289 in 2001. Youth programming included *On My Own* (14,966), workforce education (8,733), youth basic financial education (9,128) and the Spend, Save and Share program (666). More than 9,000 young people were reached with basic financial education in 2003, a 221% increase over last year.

Parenting Apart: Effective Co-Parenting has been recognized by Tennessee's Parenting Plan Coordinators who consistently say they think Extension classes are among the best offered across the state. Over the past three years, more than 13,200 parents have been trained, an average of 4,400 participants per year.

5c. Benefits

Totals of estimated debt reduction and savings for adults and youth participants in Extension programs for 2003 indicate a positive economic impact on Tennessee families of \$5.3 million. Among more than 24,000 Tennessee youth in financial management training:

- 16,865 learned how to write a check and keep a checkbook register
- 18,070 changed spending habits and 3,373 made a spending plan.
- 6,505 began or increased savings, for a total estimated savings of \$208,172 per

month and over 2.4 million per year.

Based on *Parenting Apart: Effective Co-Parenting* participant surveys from over 3,200 Tennessee parents, these benefits were revealed that 94% of participants agreed that the class helped them to understand how children are affected by divorce. A qualitative analysis of 106 follow-up surveys showed that the class was successful in helping parents focus on children’s needs (i.e., “Thank you for bringing my child’s view to the forefront so I recognize his feelings. It’s not always easy to recognize his viewpoint when I’m angry at dad.”). Regarding parenting apart, TSU Extension taught fathers who are incarcerated. Of the 120 inmates taught who were fathers, the number willing to receive visits from their children changed from 60% before the class to 100% after.

Evaluations, reflection activities, and service activity reports show that 4-H’ers developed a wide variety of skills and knowledge through their service, from teamwork and concern for others to clothing construction and landscaping skills. Their service learning activities benefitted more than 429,697 people and met true community needs in the areas of environment (274 projects), health (48 projects), public safety (11 projects), education (146 projects), other human needs (1,244 projects), and other community needs (157 projects). When calculated by Independent Sector’s nationally accepted dollar value for volunteer time (\$16.54/hour), the 4-H service learning projects are valued at over \$5,022,271. Community beneficiaries rated the effectiveness of 372 projects, with an average rating of 4.38 on a five-point scale, where 5 = highly effective.

5d. Assessment of Accomplishments

UT and TSU’s planned programs in children, youth and community development mobilized local resources to respond to felt needs in Tennessee communities. Planned programs included these evaluation methods: pre-test and post-test, end-of-program survey, interview, or other reliable data. UT and TSU Extension agree that great strides were made in 2003 in program evaluation that yielded documented, measured outcomes. The evaluation of financial management and parenting education programs represent excellent statewide outcomes.

5e. Allocations for Goal 5

<p>UT 1862 Research</p> <ul style="list-style-type: none"> •Hatch - \$253,070 •Multistate - \$62,459 •State - \$1,163,932 	<p>FTEs for Goal 5</p> <ul style="list-style-type: none"> •UT 1862 Research - 7.0 scientist and 19.90 non-scientist •UT 1862 Extension - 111.0 •TSU 1890 Extension - 9.0 professional and 3.0 paraprofessional
<p>UT 1862 Extension</p> <ul style="list-style-type: none"> •Smith-Lever b and c - \$1,790,171 •State/County - \$7,300,340 	<p>TSU 1890 Extension - \$618,147</p> <ul style="list-style-type: none"> •NARETPA Section 1444 and 1445 - \$361,970 •Grants/Contracts - \$180,054 •State/County - \$76,123

5.1 Key Theme: Community Development

Title: Developing Management Skills of Morgan County’s Small Business Owners

Issue: According to the Economic Statistics Report from the East Tennessee Development District, the per capita retail sales for all Morgan County business is approximately \$2429, compared to \$12,310 for nearby Anderson County and \$8760 for nearby Roane County. The 2000 Census Report shows that approximately 60 % of the workforce commutes out of Morgan County to work in other counties, namely Anderson and Roane. While out of the county, these commuters make many of their purchases which has a negative effect on the Morgan County Small Business Economy. Also, many Morgan County Small Business Owners struggle because they lack business management skills. There is also a lack of Morgan County entrepreneurs. There was a real need for small business owners to improve management skills and confidence and a need for more retail development in the county.

What has been done: The Extension Agent and Rural Development Specialist assembled a local planning committee to organize and conduct an 11-month Small Business College in the county. The program planning committee included representatives from the County Commission, Industrial Board, Micro-loan Committee, Chamber of Commerce, UT Extension Service, and County Executive Tommy Kilby. The committee decided that they would offer this course free of charge and that the UT Extension Service and Chamber would promote the effort. Each organization assisted in sponsoring individual meetings and provided the materials, and Extension offered 22 hours of instruction over 11 months.

Impact: 19 individuals attended the first session to learn about developing a business plan. As a result of their participation, 8 individual businesses developed a business plan for their business. One participant opened a new thrift store in the county--creating a new business and employment for herself. Another participant in the class was able to obtain a \$10,000 micro-loan as a result of his participation in the class. The class enabled him to learn about the loan being available and how to develop a plan to get the loan. This new business created a job for the male displaced worker. The owner of an Internet homemade soap business adopted the use of a software bookkeeping program as a result of her participation in the class. She also learned information about how to market a new line of pet soaps. Through their participation in the program, 12 individuals increased their knowledge and skills in the areas of taxes, financing a business, visual merchandising, community assessment for a business, using a computer in a small business, marketing and customer relations, personnel management and accounting for non-accountants. An end of program survey indicated that even though the program was offered at no charge to participants, 100% thought it was so valuable to them as business people that they would have been willing to pay for the course.

Funding: Smith-Lever; Morgan County Chamber of Commerce; Morgan County Industrial Board

Scope of Impact: State Specific

Title: Public Policy Research - Report to Tennessee’s Governor

Issue: State executive leaders, administrators, decision makers, and the general public need to understand the role of agriculture in the state's economy and what issues are of short- and intermediate-term interest to the agriculture sector.

What Has Been Done: The Agricultural Policy Analysis Center at the University of Tennessee prepared a comprehensive report, written in an easy-to-understand format, summarizing the outlook for production agriculture in Tennessee for submission to the Governor. The agriculture outlook report was part of a broader economic report to the Governor of the state coordinated by the University of Tennessee's Center for Business and Economic Research.

Impact: The report on the economic outlook for Tennessee has been widely circulated among the Governor's staff, state agencies, legislators and their staff, and the general public. The inclusion of a separate agriculture outlook section in the comprehensive economic outlook publication has increased the general awareness of the important role of the agriculture sector in Tennessee and has drawn much needed attention to the state's agricultural issues, primarily declining net farm income, declining farm numbers, and the continuing uncertainty surrounding tobacco, a major cash crop for the state.

Funding: State funds allocated to UT Center for Business and Economic Research

Scope of Impact: State-Specific

Title: Dreamers of Ideas. . .Entrepreneurs of Tomorrow

Issue: Throughout the rural South including Tennessee and Mississippi, people in many counties with or without marketable skills, have not benefitted from the nation's prosperity in general and struggle to make ends meet. The South's working poor is a population in need of considerable support to help them move up the economic ladder. In the rural South, this is a significant population with limited prospects for moving up the economic ladder (Rupperd, 2000). Additionally, some major problems that rural counties in Tennessee and Mississippi have faced are poverty, job depletion through factory closings, disappearance of small farms, and an increase in youth related crime. To counter these society ills, an entrepreneur project has been conducted by Extension, the College of Business and the Department of Agricultural Sciences at Tennessee State University for the past year to address such issues for a few select counties in Tennessee (Dyer, Haywood and Crockett) and Mississippi (Bolivar, Clay and Washington). It is our intent that small-business entrepreneurial programs can be used as a motivating factor that plant seeds within communities for sustained future economic growth and development.

What has been done: The following counties were involved: in Tennessee, Crockett, Dyer, Lauderdale, Hardemen, and Haywood; and in Mississippi, Bolivar, Clay, and Washington. An Advisory Council was established with Extension staff and community leaders from the participating counties to provide guidance and implementation. The project's team adapted the business curriculum for use by the participating counties. These individuals were trained to

conduct business development workshops for 122 rural people in topics such as Home-based Business, Market Plan and Advertising, and Taxes and Record-keeping.

Impact: As a result of this program, at least 21 individuals wrote business plans. This program also established an Advisory Council linking Extension, local agencies, county government, small business, and community leaders to foster growth and development in their respective counties.

Funding: Smith-Lever; Tennessee State University College of Business

Scope of Impact: Multistate (TN and MS)

5.2 Key Theme: Family Resource Management

Title: Teaching Young Tennesseans to Manage Money

Issue: Through a recent survey, University of Arkansas researchers estimated an average of 27 applicants for every job paying a living wage. Teens control or influence \$458 billion of consumer spending each year. Over 48% of young people say they have a say in the purchases their families make (Teenage Research Unlimited, 1999, 1997). Only 41% of teens say they save money only “sometimes” (Rand Youth Poll, 1998). 28% of students with a credit card roll over debt each month (Youth & Money Survey, 1999). The average graduate student applying for Nellie Mae loans had \$4,776 in credit card debt; 6% had credit card balances exceeding \$15,000, and today’s college students who have student loans leave college owing an average of \$12,000 in student loans (Nellie Mae, 2000).

What Has Been Done: Extension agents across the state reported delivery of Financial Management programs to 33,493 young Tennesseans during 2003, up from 23,785 in 2002 and 13,289 in 2001. Youth programming included *On My Own* (14,966), workforce education (8,733), youth basic financial education (9,128) and the Spend, Save and Share program (666). The strongest growth was in the area of basic financial education. The more than 9,000 young people reached with basic financial education in 2003 marked a 221% increase over last year.

Impact: Post-program and follow-up evaluation data was obtained from 6,011 high school and junior high students participating in *On My Own* financial education simulations, *National Endowment for Financial Education High School Financial Planning* and *Financial Peace* programs, and *4-H Consumer Education* programs across the state. Weighted %ages for reported impacts and three-month follow-up (conducted with a smaller follow-up sample) were:

Knowledge Gained

- 47% learned about the importance of savings and the time value of money.
- 60% learned about payroll deductions.
- 57% learned that using credit costs more in the long run.

Attitude Change

- 66% decided that it was important to make a spending plan.

- 52% became aware of the connection between occupation and lifestyle.
- 62% became aware of the importance of education to earnings.
- 79% became aware of the cost of children and their impact on lifestyle.
- 90% gained a better understanding of parents' financial concerns.
- 84% believed they would benefit in the future from participation in the programs.

Skills Gained

- 70% learned how to write a check and keep a checkbook register

Behavior Change (From follow-up sample, n=1410)

- 14% made a spending plan.
- 27% began or increased savings (average monthly savings \$32/month).
- 75% changed spending habits.

Interpolation of data to the 24,094 young people participating in the programs above indicates the following impact:

Knowledge Gained

- 11,324 learned about the importance of savings and the time value of money.
- 14,456 learned about payroll deductions.
- 13,734 learned that using credit costs more in the long run.

Attitude Change

- 15,902 decided that it was important to make a spending plan.
- 12,529 became aware of the connection between occupation and lifestyle.
- 14,938 became aware of the importance of education to earnings.
- 19,034 became aware of the cost of children and their impact on lifestyle.
- 21,685 gained a better understanding of parents' financial concerns.
- 20,239 believed they would benefit in the future from participation in the programs.

Skills Gained and Behavior Changed

- 16,865 learned how to write a check and keep a checkbook register
- 3,373 made a spending plan, and 6,505 began or increased savings (for a total estimated savings of \$208,172/month; \$2,498,065/year).
- 18,070 changed spending habits.

Funding: Smith-Lever; Startup funds for On My Own by Dr. John Dabbs of Oak Ridge, TN.

Scope of Impact: State Specific

Title: Tennessee Saves - Helping Tennesseans Build Wealth

Issue: Tennessee has led the nation in personal bankruptcies during three of the past five years (American Bankruptcy Institute). Because they spend too much and save too little, many Tennesseans will not have enough money to live with financial security through their working and retirement years.

- A recent study in the Wall Street Journals estimates that up to 70 % of the American public lives from paycheck to paycheck.
- 31% of wealth-poor households spend more than their income (CFA, NCUF, CUNA).
- The typical household holds consumer debt that totals well over one-half their gross financial assets (Joseph M. Anderson, Capital Research Associates).
- According to a report using data from the Federal Reserve Board's Survey of Consumer Finances, one quarter of U.S. households have net assets under \$10,000.

What Has Been Done: The growth trend in Family Economics programs that began in 2001 accelerated this year, marking a 200% increase in Tennesseans served over the last three years. Extension agents across the state reported delivery of information and training to 49,047 Tennesseans during 2003, up from 34,800 in 2002 and 15,553 in 2001. Adults served totaled 15,554. An additional 3,409 Families First clients were trained in 2003 by Department of Human Services (DHS) facilitators using curricula and techniques developed by Extension FCS specialists and agents called PACE (Parenting and Consumer Education). Major programming efforts for adults in Family Economics included *Tennessee Saves* and other savings and financial education (13, 925), *Ditch the Pitch* elder fraud prevention (1,330) and home buyer education (299). Intensive training of agents in basic and advanced Family Economics—over 130 instructor hours in 2003—contributed to the increase in programming. Development of the *Tennessee Saves* campaign also sparked additional interest in Family Economics among County Extension Advisory Committees and various stakeholder groups. The National Consumer Federation continues to use Tennessee's organizational plan as a national model for state savings education.

Impact: Four samples totaling 1,318 adult participants in Extension Family Economics programs showed the following weighted %ages for follow-up impact:

- 47% set financial goals.
- 71% developed spending plans.
- 24% followed their spending plans.
- 73% changed the way they manage debt.
- 84% planned to reduce expenses.
- 30% reduced expenses (average reduction of \$50/month).
- 25% discharged credit (average reduction of \$73/month).
- 37% increased savings (average savings of \$27/month).
- 84% reported that their money management was better as a result of their participation.

Given that these samples are indicative of the average participant in all programs, the following impacts are indicated for the 7,131 participants in adult financial counseling and education programs including Money Smarts and other personal finance training, bankruptcy education and home buyer education.

- 3,351 set financial goals.
- 5,063 developed spending plans.
- 1,711 followed their spending plans.
- 5,206 made plans to change the way they manage debt.
- 1,783 discharged credit (for a total estimated reduction of \$130,140/month; \$1,561,689/year).
- 5,990 made plans to reduce expenses.
- 2,139 reduced expenses (for a total estimated reduction of \$106,965/month; \$1,283,580/year).
- 2,638 increased savings (for a total estimated increase of \$71,238/month; \$854,864/year).
- 5,990 improved money management practices as a result of county Extension programming.

The total of discharged credit and increased savings indicated for participants in Extension Financial Management programs in 2003 is \$2,845,269. An additional average savings of \$4.85 per week was reported for 219 participants in DHS PACE programs using Extension-trained facilitators and curricula. The yearly total indicated for PACE participants saving at this rate is \$55,232 for a combined positive economic impact on Tennessee adults of \$2,900,500.

Funding: Smith-Lever funds and seed money from America Saves.

Scope of Impact: State Specific

5.3 Key Theme: 4-H Workforce Preparation

Title: 4-H Prepares Youth for the World of Work

Issue: According to the Tennessee Department of Education, many students graduate from Tennessee schools without the skills and attitudes it takes to get and hold a job. Employers are spending millions of dollars a year on remediation.

According to a survey of adult Tennesseans by The University of Tennessee Center for Business and Economics Research and Social Science Research, 86% of respondents thought students needed greater assistance deciding what type of career they would have after their education is complete. Respondents were concerned about graduates understanding of the modern workplace.

What has been done: In 30 Tennessee counties, UT and TSU Extension agents offered a number of 4-H programs targeted to introducing youth to the world of work and helping youth gain skills for the workplace. These programs were delivered through 4-H clubs, school enrichment, project groups, and camps.

Sharing an understanding of workforce skills demanded by employers, The U.S. Secretary of Labor's Commission on Achieving Necessary Skills Report (SCANS) provide valuable insights for planning educational programs for youth. The skills, as defined by the SCANS report, include

foundation skills and workforce competencies. 4-H targeted the foundation skills of writing, math, speaking, listening, problem solving, reasoning, learning, creative thinking, decision making, self-esteem, responsibility and sociability. In 2003, program emphasis continued to be placed on communication competencies.

Impact:

In Hardin and Henry Counties, almost 400 students were in 4-H programs teaching workforce skills. Evaluations revealed that:

- 90% of senior high students learned the importance of an education.
- 85% of students changed their selection of career paths.
- 80% of these youth learned more effective money management skills.
- 90% of project group members learned day-to-day workforce skills.
- 80% of Junior High students learned the importance of money management and career selection.

In Hardeman County, a post-program survey was used to evaluate the students knowledge gained in several areas. Of the 280 participants, 53% learned how to explore career possibilities, among several other impacts noted.

TSU Extension 4-H Agents trained 26 Davidson County high school students to provide leadership for their peers in the *Career Focus...Money Matters* program. Of 245 participants:

- 78% increased their awareness of career opportunities.
- 66% increased their understanding of the need of career planning.
- 96% increased their knowledge of the relationship between education and income.
- 71% increased their knowledge of budgeting money.
- 70% increased their knowledge of making wise financial choices.

The Davidson County program also touched the lives of 4th and 5th grade youth. Of 382 youth educated about goal-setting through their 4-H club program, 73% learned and demonstrated goal-setting as observed by their classroom teachers.

In Hickman County, 660 4-H participants were surveyed about their workforce preparation program that focused on the foundation skills, such as reading, writing and public speaking:

- 78% now say they are more comfortable speaking in front of groups.
- 82% learned how to create a poster to express themselves.
- 84% learned how to organize and develop a demonstration.
- "My public speaking skills shot through the roof with 4-H."
- "4-H taught me many skills I will continue to use in the future."

In Perry County, 240 youth were in the 4-H workforce preparation programs with these results: 90% of students felt that they had learned more about their career interests and know more about the different types of careers available; and 85% of students felt that the program helped them set new goals about their future and identify a career interest.

In the Central District, 22 youth participated in a Technology Camp with 95% of the youth reporting they were more comfortable with computers, 95% able to organize and develop a website, and 100% planning to use what they had learned at camp.

Funding: Smith-Lever

Scope of Impact: State Specific

5.4 Key Theme: Better Tennessee Parenting

Title: Parenting Apart: Effective Co-Parenting

Issue: Tennessee has one of the highest divorce rates in the nation. However, determining its rank nationally is complicated by a change in the way marriage and divorce data is collected through the National Vital Statistics system. Three states do not report divorce numbers or rates, so exact ranking of states in rates of divorce can no longer be made. The last year that this data was available (1994), Tennessee ranked fourth nationally with a divorce rate of 6.6, exceeded only by the states of Nevada, Arkansas, and Oklahoma. Tennessee continues to have the fourth highest divorce rate in the nation among states reporting, based on the calculations of UT extension Family Life Specialists who used data from the 2000 Census and the National Vital Statistics System for the year 2000.

Researchers have consistently reported that children whose parents divorce are at risk to experience psychological problems, be in an unhappy marriage themselves that likely results in divorce. Research has also established that children of divorce are emotionally not tied to their parents in adulthood, and that emotional ties tend to be weaker to their fathers (2003, Amato, *Family Relations*, p. 332).

The Tennessee State Legislature passed a bill in 2000 requiring that divorcing parents of minor children attend at least four hours of a court-approved parent education program designed to address the needs of children in divorce specifically. The program began January 1, 2001. Because the bill was passed without funding, it was necessary to charge a fee to participants to cover expenses. However, persons who could prove inability to pay were provided the Extension class at no cost. The Administrative Office of the Courts, the agency charged with overseeing this program, requested that Extension FCS Agents become providers of the program, especially in rural areas where qualified providers might be in short supply.

What has been done: *Parenting Apart: Effective Co-Parenting*, the four-hour course adapted and developed for use by Extension Agents, has been offered in 71 of 95 counties at some point since 2001. In 2003 the Extension program was offered in 60 counties. Reductions have been the result of position vacancies or lack of demand for the classes. Inservice training has been conducted annually to keep agents up-to-date on the latest research, introduce new resources, answer questions, and provide background information. In 2003 programs were evaluated at completion of the class and from three to six months following the class. The Administrative Office of the

Courts reports that they have not had any complaints about classes offered by Extension Agents, and Parenting Plan Coordinators consistently say they think Extension classes are among the best offered across the state. Over the past three years, more than 13,200 parents have been trained, an average of 4,400 participants per year.

Impacts: Participants report the following in evaluations after completing the four-hour class (based on 3,286 responses statewide):

Knowledge Gain:

- 94% of participants strongly agreed or agreed that the class helped them to understand how children are affected by divorce.
- 92% of participants strongly agreed or agreed the class increased their understanding of why it is important for parents to work cooperatively with each other.
- 91% of participants strongly agreed or agreed that the class increased their understanding of the importance of allowing both parents to have a meaningful relationship with the child/children.

Attitude Change:

- 92% of participants strongly agreed or agreed that the class was worthwhile.
- 90% of participants strongly agreed or agreed that they would recommend the program to other separating parents.
- Participants reported a significant decrease from pre-class (2.45) to post-class (1.73) in their level of resentment at being required to attend the class (based on a five point scale where 1= not at all resentful and 5= extremely resentful).

Skills Gained:

- 92% of participants strongly agreed or agreed that the class presented techniques for effective communication with their children and the other parent.

Aspirations Changed:

- 91% of participants strongly agreed or agreed that they would make a stronger effort to work with their ex-spouse for the children's sake.

The follow-up survey in 2003 yielded 106 usable surveys for an 18% return rate. Though the return rate was low, comparisons of those who returned the survey with all who were mailed surveys showed no differences in those who responded and those who did not. Participants reported a decrease in the following behaviors since completing *Parenting Apart: Effective Co-Parenting* class:

- Talking to others about the other parent when angry at the other parent.
- Asking the child about the other parent (using the child as a spy), and
- Sending messages by the child to the other parent.
- 83% of respondents were able to list specific things learned in class that had been helpful to them.

- 67% indicated they used the printed materials they received in the class.
- 23% went through mediation. Over one-fourth of those learned about mediation in the classes.

Qualitative analysis of statements included on three-year's worth of follow-up evaluations revealed the following themes regarding positive outcomes of the classes:

Class helped focus on children's needs - "Thank you for bringing my child's view to the forefront so I recognize his feelings. It's not always easy to recognize his viewpoint when I'm angry at dad."

Video that showed children's feelings about divorce was helpful - "The best thing about the class for me was seeing the children's reactions in the videos. That had a big impact on me."

Information by ages and stages was helpful - "The best thing was understanding how divorce affects children of different ages since I have to consider the age gap."

Learned communication skills - "(I learned) how to talk to my ex without getting so upset and how to try to convey my thoughts and feelings in a more positive way without getting my ex upset or on the defensive."

Learned that others are going through the same thing - "(It was helpful) to be in a room of people (at the same time) and realize that we are all going through the same thing."

Learned things I did not know/Saw I was doing things of which I was unaware - "By watching the tapes and reading the materials, I was able to see myself in both the *DOs* and the *DON'Ts* of parenting."

Learned importance of parents working together for children's sake - "My eyes were opened to how important it is to work with my ex-spouse."

Learned importance of children having a relationship with both parents - "I now know what the best thing for my child is and that is to always remember that she is always going to have a mom and a dad."

Funding: Smith-Lever; participant fees

Scope of Impact: State specific

Title: Teen Sexuality Education Programs

Issue: Though the teen birth rate is declining in Tennessee and nationally, births to teens are still a concern to those working with teen parents and with their offspring. In 2000, Tennessee ranked 39th nationally in the teen birth rate with 34 births per 1000 female teens ages 15 to 17 (Kids Count Data Book Online 2003). This is much higher than the national rate of 27 births per 1000

females ages 15 to 17. According to Kids Count, teenage childbearing is of concern because it often diminishes the opportunities for both the teen mother and the child. Risk factors include that most of the mothers are unmarried and as many as two-thirds do not complete high school. This creates a further risk of poverty for these single-parent families. Only 7 % of 15 to 17-year-old mothers received child support payments in 1999. Children born to teen mothers are less likely to receive the emotional and financial support that can help them to become independent, productive, well-adjusted adults.

The Casey Foundation's Plaintalk initiative has demonstrated the importance of better communication in promoting healthy behaviors among teens. Data from the National Longitudinal Study on Adolescent Health shows that "enhancing the connections of teenagers to their family and home . . . is essential for protecting teens from a vast array of risky behaviors, including sexual activity."

What has been done: Extension FCS agents in 13 counties reported conducting 16 sessions of the *Girl Talk* program in 2003. This program is designed to enhance parent-child communication about sexuality. Mothers or significant adults and daughters in the 9 to 12 age group are the targeted audience. There were over 200 participants, mothers and daughters, in these classes.

An Extension Agent in Sequatchie County helped teach a series of classes on sexual abstinence using the *why kNOw* curriculum to 158 eighth graders. An Extension Agent in Lauderdale County conducted a program on sexuality for 150 sixth grade girls through the schools.

Impact: Regarding *Girl Talk*,

- 54% of participants in seven counties reported having increased knowledge of sexuality and human sexual development.
- Over 103 participants in 10 counties indicated that communication between mothers and daughters about sexuality had increased and improved.
- 60 participants in seven counties indicated having more comfort talking about sexuality related issues.

In the *why kNOw* program:

- 130 out of 158 students in the program indicated they would delay sex until they were responsible adults, and 120 said they would delay sex until marriage.
- 128 indicated that through this program, they had gained skills for resisting peer pressure.

Program evaluation of Extension's *Basic Sexuality* Classes revealed that:

- 75% of the 150 participants said the information presented would help them to make wiser choices.
- 100% said they had a better understanding of their bodies and what is or will be happening as they go through puberty.

Scope of Impact: State specific

Funding: Smith-Lever

Title: Parenting Successfully

Issue: The state of Tennessee continues to have among the lowest rankings in child well-being, ranking forty-third out of fifty-one states in the latest KidsCount Data Book (2003). Rankings are from best to worst. Among the indicators in which rankings are poorest are % of low birth-weight babies (46), infant mortality (47), child death rates (43); rate of teen deaths by accident, homicide and suicide (44); teen birth rate (39); high school dropouts and teens not in school and not working (35), and % of children in poverty (34). In addition, Tennessee ranks second nationally in the rate of bankruptcies and fourth nationally (according to data from 2000) in the rate of divorces. These rankings indicate that Tennessee families need support and information to help them make wiser choices.

What was done: Extension Family and Consumer Sciences Agents offered parent education in a variety of settings including Head Start parent meetings, Even Start classes, Families First classes, prenatal classes, crisis pregnancy centers, and general group classes. They reached a variety of audiences from teen parents, to court-ordered parents, to middle-class parents, to limited resource audiences. They used a variety of techniques including classes, newsletters, news articles, radio spots, publication distributions, and book distributions. Extension Agents reported the following inputs and outputs: 253 classes were held involving 1200 individuals and 4500 total contacts; 23 news articles about parenting and family life were written for newspapers and magazines; 48 different newsletters were distributed to 4364 persons; 25 radio spots on family-related issues were developed; Healthy Children Ready to Learn parent education series publications were distributed to 1788 families; and 4000 books were distributed to 1600 infants and children to promote parents reading to and with their children.

Impact: Parenting Class Participants reported they:

- Tried or plan to use alternative discipline methods instead of spanking (70)
- Spent or plan to spend more time with their children (375)
- Have greater confidence in parenting abilities (619)
- Plan to become more involved in their children's education (10)
- Used new communication skills (384)

Healthy Children Ready to Learn parent education series:

In a random telephone survey of 46 recipients,

- 93% increased talking to their baby,
- 93% started playing games with their baby,
- 85% gained knowledge of healthy feeding practices,
- 78% increased health and safety awareness,
- 57% learned about intellectual growth and development, and
- 61% reported increased confidence in parenting abilities.

Written evaluations following a hospital visit and follow-up calls to new mothers receiving *Healthy Children Ready to Learn* booklets revealed that:

- 84% of families used the information,
- 76% reported reading to the baby,
- 38% used health information,
- 96% made an appointment for a well-baby check-up, and
- 9% were referred to agencies or persons for specific issues.

Scope of Impact: State Specific

Funding: Smith-Lever

Title: TSU Trains Fathers to be Better Parents

Issue: There are many Tennessee families with households headed by single females while fathers are either incarcerated or simply refuse to assume parental responsibilities. Studies have shown that in this country, 70% of juveniles in institutions grew up in single or no-parent homes. According to statistics, 75% of children in single-parent families will experience poverty before age 11; 85% of all children that display behavioral disorders are generally from single-parent households; and lower self-esteem and lower educational achievement is associated with children who are from fatherless families.

What Has Been Done: Three years ago, a training of trainers program was implemented with a local sheriff's department. As a result of the training, staff members of the sheriff's department have conducted parenting skills education for male inmates. Typically, from 12 to 17 inmates participate in the classes provided by the TSU Cooperative Extension Program every six weeks. In 2003, 120 inmates completed the entire training.

Impact: Initially there were approximately 60% of participating inmates who did not want to have any contact with their children in prison. As a result of the training, all of these inmates have expressed a willingness to receive visits from their children. Others have indicated that they plan to become more involved with their children in order to not allow the children to miss out on things that they missed themselves while growing up (i.e. emotional support from their father). Participating inmates became more expressive to the extent of asking questions about how to combat negative feelings regarding co-parenting, disciplining, and familial responsibilities. 85% of the inmates requested additional supplemental information on parenting and conflict resolution.

Funding: NARETPA

Scope of Impact: State Specific

5.5 Key Theme: Child Care

Title: Extension Cares for Tennessee's Children and Youth

Issue: In Tennessee, as in the nation, the need for quality care arrangements and programs for infants through teens has never been greater.

More than a third of all children under the age of six attend licensed childcare centers. Adequate training of child care providers is necessary for safe and nurturing learning environments. Child care providers need to know how to care for and educate infants and toddlers, preschoolers, school-age children and youth, and teens in out-of-school time. Child care provider training is a key to better child care.

What has been done: Extension made 8,820 educational contacts with child care providers, and 4,916 of those contacts were in group training sessions. The remainder were contacted by on-site visits, visits to the extension Office, phone, and mail with education in nutrition, teaching and learning techniques and stress management.

Impact: In Blount County, 280 childcare providers attended UT Extension classes, and over 80% of participants reported increased knowledge in nutrition and health, safety, child behavior, diversity training, and discipline. Over 60% plan to implement some portion of what they have learned in their classroom through curriculum and/or relations with staff and parents. In Carter County, a pre and post-test evaluation of 33 child care providers revealed a 47% knowledge gain in childhood serving sizes and an 18% increase in knowledge of asthma. 21 child care providers (63%) stated that they would make portable, storable learning centers for their child care facility. 21 of the participants had attended a UT Extension training in the past, and reported a number of positive changes in the quality of their child care including: providing healthier snacks and the right amount for the children; improved classroom activities based on child development principles; eliminated environmental hazards in their center; and developed ideas for reaching parents.

In Sullivan County, 73 child care providers were trained. According to a pre and post-test evaluation:

- 73% learned how to establish learning centers in their specific child care centers.
- Over 50% increased their knowledge about ways to enhance daily experiences in their child care center.

In Knox County, 32 child care providers mastered three new techniques to use in encouraging positive communication. 88 child care providers and parents learned new ways of preparing a vegetable dish, and 90% said they would try to prepare more plant foods for their families. 28 providers indicated they had learned a new way to protect children from poisons, container safety and use of the Poison Control Center.

A comparison of pre/post evaluations and observation of Greene County participants indicate that of the 21 child care providers trained:

- 75% of participants improved skills in exploring foods through the five senses to help children develop skills to observe and describe, compare and classify, and use language as reported on end of training evaluations.
- 90% gained knowledge of the benefits of daily physical activity for children and adults.
- 83% gained knowledge about the incidences for developing childhood obesity and risks for developing heart disease, diabetes, hypertension as adults.
- 45% of repeat clientele reported that they had made changes/improvements at their facilities as a result of participating in previous Extension Child Care Provider Training.
- Participant comments included: “The sessions gave me great ideas for serving healthy snacks. [This] training has really helped me to gain confidence with teaching children every day.”

In Anderson County, 39 Head Start parents and child care providers learned stress management techniques. The staff recognized Extension’s training as a key factor in their facility receiving an excellent rating.

In Madison County, 295 child care providers (55% minority) received Extension training with these impacts:

- 91% of food safety respondents self-reported that they planned to spend more time in handwashing and sanitizing surfaces.
- 76 % of money curriculum participants self-reported that they planned to incorporate information learned.
- 11 of the 16 centers that participated in at least one training sessions increased their environmental rating scores and 3 of the 16 centers had not been rated for the second time.
- Six child care centers that participated in the food safety program received a higher Health Department food inspection score than they did in the previous year’s rating.

In Lauderdale County, a post-test evaluation showed that 45 child care providers gained knowledge and skills that would help them in their work with children, and that 75% will work harder at communicating in a more positive way.

Funding: Smith-Lever; Hercules Grant

Scope of Impact: State Specific

5.6 Key Theme: 4-H Character/Ethics/Civic Education

Title: 4-H Citizenship – Service Learning and Civic Engagement in Tennessee

Issue: The goal of the 4-H program is to equip youth with leadership, citizenship, and other life skills that will make them successful, contributing members of society. One method of doing this is service learning, a process whereby youth learn and develop as they participate in service that meets real community needs. Service learning also engages young people as active citizens in their communities.

What Has Been Done: Service learning, coordinated through the 4-H Seeds of Service (SOS) program, was a major focus of 4-H programming across the state. Designed as a resource for youth and adults, 4-H SOS provides education and resources that enable youth to develop life skills and a service ethic through activities on the county, district, and state level. Reports show that 55,612 4-H'ers and 5,104 adults conducted more than 1880 service learning projects in 2003.

Impact: Evaluations, reflection activities, and service activity reports show that 4-H'ers developed a wide variety of skills and knowledge through their service, from teamwork and concern for others to clothing construction and landscaping skills. Their service learning activities benefitted more than 429,697 people and met true community needs in the areas of environment (274 projects), health (48 projects), public safety (11 projects), education (146 projects), other human needs (1244 projects), and other community needs (157 projects). 4-H youth and adults committed more than 303,644 hours to the community. When calculated by Independent Sector's nationally accepted dollar value for volunteer time (\$16.54/hour), the 4-H service learning projects are valued at over \$5,022,271. Community beneficiaries rated the effectiveness of 372 projects, with an average rating of 4.38 on a five-point scale, where 5 = highly effective.

Service learning activities at State 4-H Congress, Junior High Academic Conference, Teen Adventure Weekend, and Roundup enabled teens to expand their citizenship skills by participating in service that they could replicate in their home counties. More than 368 delegates at leaders at Congress collected over 16,000 personal hygiene items and letters of support for U.S. armed forces overseas. At Academic Conference, junior high 4-H'ers reinforced skills learned through 4-H project work as they spent 549 hours serving at 8 sites in Knox County. Campers at Teen Adventure Weekend dedicated 255 hours to serving residents of a local nursing home. Delegates to Roundup donated blankets for Project Linus and conducted a community car wash that raised over \$1100 for the Brian Brown Memorial Greenway.

More than 477 youth and adults participated in service learning workshops at the state, regional, and national level. At the Service Learning Academy, 31 Extension staff received extensive training in service learning and spent 93 hours volunteering in the Nashville community. A post-test survey that used a 5-point scale revealed an average knowledge gain of 31%.

Funding: Smith-Lever; Learn & Serve America grant under an agreement with the Tennessee Commission on National and Community Service

Scope of Impact: State Specific

5.7 Key Theme: 4-H Leadership Training and Development

Title: Tennessee 4-H Youth Development Volunteer Program

Issue: The measure of the health of a society is how well it takes care of its youngest generation. By this standard, we fail. Research indicates that the number one deterrent to high-risk behavior in youth is the presence of a caring adult. For the 1.23 million charities, social welfare

organizations, and religious congregations in the United States, volunteering is at the heart of citizen action and central to their ability to serve their communities. Tennessee's 4-H Youth Development Program relies heavily on volunteers to assist in delivering 4-H programs to more than 200,000 4-H youth in the state. Volunteers need quality training to serve effectively in their communities.

What Has Been Done: In 2003 the Tennessee 4-H Enrollment Report indicated that 14,000 volunteers helped to deliver 4-H programs. Statewide volunteer leader training was provided at the 2003 State Volunteer Leader Forum & Alumni Meeting to 167 individuals. The State Committee of Volunteer Leaders serves in a significant role in planning and conducting the Forum. 55 volunteers attended the 2003 Southern Region Volunteer Leader Forum in Eatonton, GA. There were 1,371 adult volunteer leaders and 2,402 youth volunteer leaders trained in the areas of leadership, parenting, and others in 2003. 1,487 adult volunteer leaders and 483 teen volunteer leaders were trained at one of the four 4-H Centers, for a total of 1,970 volunteers. This training helped to clarify their roles as leaders in the Tennessee 4-H Camping Program.

Impact: At the 2003 State 4-H Volunteer Leader Forum, 167 individuals received volunteer leader training.

- 100% of respondents reported that this event helped motivate them to be involved in 4-H.
- 65% of respondents indicated a gain of knowledge in service-learning.
- 100% of respondents indicated they gained useful information and planned to use what they learned.

At the 2003 Southern Region 4-H Volunteer Leader Forum:

- 92% of respondents indicated an increase in their understanding of 4-H as a result of the forum.
- 94% indicated their intent to increase their involvement in 4-H as a result of the forum.
- 92% indicated they were better equipped to work in youth/adult partnerships as a result of the forum.

1,970 Volunteer Leaders were trained for leadership roles at 4-H camp.

- 94% of respondents rated their training excellent or good.
- 94% of respondents indicated an understanding of their responsibilities as a volunteer leader.

Funding: Smith-Lever Funds

Scope of Impact: State-Specific

Title: Youth Leadership Dickson County

Issue: Dickson County teens are influenced by "leaders" within their various peer groups. Youth leaders need to be challenged to channel their leadership potential toward community development and improvement. The Leadership Dickson County Alumni Association identified youth leadership as a need in Dickson County. The Education Edge Steering Committee, in collaboration with school system personnel, identified the need to help students in building personal skills in preparation for the world of work. The County Director of Schools, high school principals, and other faculty members concurred that a Youth Leadership Dickson County program would be beneficial and directed that the program be designed as a series of enrichment experiences attached to the "American Business-Legal Systems" course at the county's two high schools.

What has been done: The agent developed the proposal and collaborated with the following to implement the YLDC program: Leadership Dickson County Alumni Association, Dickson County Chamber of Commerce, County Director of Schools, School Board, Dickson County High School Principal and Faculty, United Way of Dickson County, and corporate financial sponsors. The first students were recruited in 1997 and the program has expanded to the county's newly-opened high school. Program Components include: Individual Personality/Leadership Style Assessments; Group Team Building Exercises; and Tours and/or Resource Persons highlighting these community components - Culture & Heritage; Natural Resources & Environment; Health, Safety & Welfare; Education; Government; Courts & Laws; Business & Industry; Transportation, Communication, & Utilities; and Recreation & Hobbies. The agent coordinated all other activities with appropriate community leaders, makes logistical arrangements, and facilitates the involvement of the YLDC Teen/Adult Advisory Committee in ongoing program evaluation and implementation.

Impact: A total of 198 high school juniors/seniors have graduated from YLDC (12 in 2003). Each student participated in approximately 50 hours of leadership training. An Advisory Committee comprised of key community leaders as well as teens (program graduates elected to serve in this capacity by their peers) assists with program delivery and evaluation. A written post-then-pre evaluation at the end of each term provides documentation of program impacts.

Average knowledge increase of:

- 41% regarding the history of Dickson County.
- 40% in county and state government.
- 38% in the judicial system.
- 38% increase in Dickson County public agencies and leaders.

Average skill level increase of:

- 20% in the ability to work with different personalities on a team.
- 18% in the ability to feel comfortable in social/business situations.
- 28% in awareness of personal style and leadership ability.

When asked "What were the best things about the YLDC program?," written responses from participants included:

“I got to shadow someone who does what I want to go to college for. It helped me decide if I really wanted to be a lawyer or not. I also learned a lot about leadership that will help me in the future.”

“Getting the opportunity to be active in the community with other leaders and to learn a lot about myself. I really enjoyed Leadership in the Community and the Ropes Course.”

“Learning to work with others and getting many opportunities to see how government and local agencies operate and work.”

Funding: Smith-Lever; United Way of Dickson County; local corporate financial sponsorship; food and transportation) from the community

Scope of Impact: State specific

5.8 Key Theme: Home Environmental Quality and Safety

Title: Home Indoor Air Quality and Radon Education

Issue: Radon is the second leading cause of lung cancer in Tennessee. The major difficulty in education is that radon is a colorless, odorless gas. Of the 463 home radon tests in Tennessee during 2003, 145 (31%) were at or above the level recommended for treatment by the Environmental protection Agency.

What has been done: In radon education, Extension made 3,813 personal contacts through telephone, visits, group meetings and seminars. Mass media efforts included: 28 radio programs, 29 television programs, 28 news articles and 10 newsletters.

Impact: 463 Tennesseans in 64 of the state’s 95 counties (67%) tested their home for radon as a direct result of Extension educational programs.

In Decatur County, 61 (69%) of 6th grade 4-H’ers in a six-month environmental quality and safety program could list radon as a health hazard and 50 (56%) had talked with their family about radon dangers after the 4-H radon lesson; 50 (56%) had talked with their family about fire safety in the home after the 4-H fire safety lesson.

In Haywood County’s Brownsville Housing Authority, 15 public housing residents were trained in ways to have healthier homes. The director reports that the 15 residents do not have to be reminded now to dispose of trash properly and that these residents have approached the housing authority office with the need for both radon and lead poisoning.

In Overton County, 1,436 4-H’ers were taught the dangers of radon with 38% indicating they will check their own homes for radon when they own their own homes.

72 Weakley County homemakers learned common indoor air pollutants, their negative impacts to health, and prevention and control techniques as measured with a post-test only instrument. Of 95 child care providers who were trained in Integrated Pest Management, 62% are implementing the program to reduce the risk of chemical use around children.

226 Lincoln County households properly disposed of 29,455 pounds of household hazardous waste at a collection event organized by Extension.

A survey of 225 Williamson County FCE members showed that 87% had gained knowledge in mold growth in the home and inspection, prevention and treatment methods.

Funding: Smith-Lever; Tennessee Department of Environment and Conservation

Scope of Impact: State Specific

Title: Poison Prevention and Control

Issue: Poison prevention is part of Tennessee's overall health and wellness. In 2003, Tennesseans were at risk because the state's new Poison Control Center phone number was not widely known or widely distributed.

What has been done: Child care providers, parents, elementary students, teachers, homemakers, and others were provided with education about what to do in the event of a poisoning. Each personal contact was given a sticker to place on their phone to prominently display the new phone number for the Tennessee Poison Control Center.

Impact: Extension made 5,431 face-to-face contacts in 11 counties to share poison control information. In Monroe County, prior to the poison prevention class at Sweetwater Housing Authority, 25% of participants had never heard of the Poison Control Center and 69% did not know there was an access number. After the class, 100% of participants knew about the center and the access number and all of them were given stickers with the toll-free number to be placed on their telephones.

In Knox County, three Poison Control classes were taught to 28 teachers; 100% indicated they had learned a new ways to protect children from poisons and 100% became aware of the container safety and of the Poison Control Center phone number. In Benton County, 100% of Head Start parents/staff increased knowledge of poison control number and, according to the Head Start staff, some 22 % of parents/clientele had posted the poison control phone number in their home following Extension programming. A poison prevention program was conducted for 150 Madison County FCE members. Surveys indicate that:

- 35% learned one new poison prevention technique during the program.
- 27% learned that Tennessee had a poison control center and/or the new 800 number during the program.
- 99% are planning to make at least one change relative to poison control in their homes.

- 80% of FCE club members contacted at a two-month follow-up had followed through with at least one planned change.

In Obion County, 130 4-H members identified their home safety risk as oil stored in soft drink bottles, and all of them asked their parents to remove this hazard so that children or even adults would not mistake a chemical for a beverage and become poisoned. Also, 240 children learned to properly distinguish between toxic and non-toxic chemicals in the home.

Funding: Smith-Lever

Scope of Impact: State Specific

IV. Stakeholder Input Process

Actions were taken to identify stakeholders, seek stakeholder input and encourage stakeholder participation in Extension and Research programs. Stakeholder input was instrumental in not only conducting FY 2003 planned programs, but also formulating the FY 2005-2005 Plan of Work Update.

The merged UT and TSU Extension Advisory Councils continued to function in FY 2003 as a cohesive, contributory State Extension Advisory Council. Each institution nominates members to this Council. The original 22 Council seats have expanded to 23 to include a youth member. Members represent a broad constituency group representing the public and private sector, including the faith community, business, industry, government, health care, production agriculture, homemakers, private forest landowners and philanthropy. The administrator and associate administrator from TSU Extension and dean and associate deans from UT Extension serve as ex-officio members of the Council. The Council meets twice yearly and has a membership rotation process that replaces some members each year. Extension staff share program information so that the Council is informed of ongoing Extension programs. The Council continues to discuss substantive issues affecting Extension in Tennessee. The Council addresses issues of Extension organizational management and suggests and sets the course for planned programs. The Council makes varied and extensive recommendations to the Extension administrators. The Council provided input into the state programs conducted in FY 2003.

Under the guidance of the State Extension Advisory Council, Extension continued implementation of its State Strategic Plan, and significant action plans were completed in FY 2003, including:

- *Expanding funding base* - Completed marketing study with all personnel and State Extension Advisory Council, including a study of name changes for the University of Tennessee Agricultural Extension Service.
- *Engaging people and energizing internal processes* - Extension's employment process was reviewed, updated and shifted to a more efficient electronic format.
- *Valuing human resources* - Provided human resource management training for the four district directors and eight program leaders through Middle Managers Conference.

UT and TSU Extension utilized County Extension Advisory Committees to provide input for planned programs in FY 2003. Over 9,000 educational contacts were made with County Extension Advisory Committees in 2003. Typically, these committees meet from one to four times annually. Limited resource audiences were represented on these councils. One special accomplishment was the appointment of at least one food stamp recipient to every county TNCEP Coalition.

In addition to advisory committees, every Tennessee county also has one oversight committee of local citizens for Extension work (mandated through state legislation), and their input was also sought in planning and implementing FY 2003 programs. As mandated through state legislation, these committees met four times during FY 2003. After stakeholder input and needs assessment,

local plans were written by County Extension Agents. Each plan included a statement describing the stakeholder input and needs assessment process followed to justify the planned programs.

State and Area Extension 4-H Specialists and the Assistant Extension Director for 4-H Youth Development completed statewide 4-H listening forums where they received input from youth, parents, volunteers, donors, agents, community leaders and others. This input has given rise to a 4-H emphasis on 10 identified life skills, including a proposal for an evaluation system for life skill development through Extension 4-H programs. The input of this group was used in placing greater program emphasis and resources on 4-H youth civic education through service learning projects during FY 2003.

In the Family and Consumer Sciences, the FY 2003 planned programs began when planning the FY 2000-2004 Plan of Work in 1999. In addition, because of drastically changing communities, another statewide needs assessment process began in 2001 with visits to Tennessee counties for a review of local needs assessment and plans of work. This review was led by the Associate Dean for Extension Family and Consumer Sciences and state specialists in the Department of Family and Consumer Sciences. Focus groups were also conducted across the state in which Extension Agents and stakeholders participated. Extension Agents made personal contacts to secure a varied group of stakeholders including clientele representing minority racial and ethnic groups. After an environmental scanning process to complement the focus group process, Family and Consumer Science faculty and district program leaders developed initiatives and organized work teams. One example of how stakeholder input influenced the FY 2003 planned programs was in a greater emphasis on family resource management programs. In fact, the more than 9,000 young people reached with basic financial education in FY 2003 marked a 221% increase over last year.

The UT Experiment Station continued to seek and secure input into the research agenda pursued at the various stations across the state. Commodity group representatives, extension agents and individual farmers all provided input. UT Extension and UT Experiment Station field days held at the stations provided an opportunity for producers to provide their input directly to researchers.

V. Program Review Process

The program review process described in the FY 2000-2004 Plan of Work Update was utilized in FY 2003, and this protocol has not changed.

VI. Evaluation of the Success of Multistate and Joint Research and Extension Activities

Issues of Critical Importance - Multistate, multi-institutional, multi-disciplinary, and integrated research and extension activities were once again of critical importance in conducting both Research and Extension programs in Tennessee. These efforts helped to meet local, state, multistate and National goals.

Planned programs were based on the needs assessment process detailed in the FY 2000-2004 Plan of Work and input received from the State Extension Advisory Council and local advisory committees discussed in this report.

TSU Cooperative Extension's Third Tuesday programs showcased multi-disciplinary, integrated research and extension. These programs attracted limited resource and minority clientele to TSU's campus and farms for a host of training opportunities including forestry management and sweet potato production. An organic cropping program brought together researchers, extension agents and specialists and stakeholders in discussions that lead to the designation of a portion of the TSU research farm for organic agricultural research. In addition, TSU responded to stakeholder input and hired a state goat specialist.

All departments in the UT Institute of Agriculture have faculty with both Agricultural Extension Service and Agricultural Experiment Station appointments. Also, in every department, it is more the rule than the exception that faculty members hold joint Research and Extension appointments which greatly contribute to the state's integrated Research and Extension efforts.

UT and TSU Extension collaborate for a number of Extension programs, and offer joint programs in 14 counties where TSU Extension has professional and paraprofessional FTEs. TSU and UT are full partners in these 14 counties: Cheatham, Davidson, Dyer, Franklin, Giles, Hamilton, Hardeman, Henderson, Lauderdale, Lawrence, Montgomery, Rutherford, Shelby and Sumner. Statewide programs are delivered jointly, i.e. 4-H youth development and forestry.

Needs of Under-served and Under-represented - The UT Standardized Variety Trials are held in local counties, and this local connection helps to educate the under-served farmer by allowing farmers to see the local performance of new varieties of corn, soybeans and wheat. The results are widely disseminated to all farmers. TSU also conducted the Small Farmer Assistance Program to reach limited resource farmers.

Tennessee's northern border includes a number of counties which share both persistent poverty and an economic dependence on small acreage tobacco production. A number of efforts were made to fully assist these clients, such as on-farm demonstrations which tested both varieties and treatment practices and numerous farm visits. Sharing a tobacco specialist with the University of Kentucky adds to the expertise that can be offered to under-served and under-represented growers.

One of the largest FY 2003 multi-disciplinary efforts involved the UT Department of Family and Consumer Sciences and UT and TSU 4-H Youth Development faculty and staff who delivered the money management program to over 33,000 Tennessee youth. Conducting local programs in rural and urban schools ensured that limited resource and minority youth received this instruction.

Expected Outcomes and Impacts - Expected outcomes were described fully in Tennessee's FY 2000-2004 Plan of Work. Every Tennessee Extension employee described expected outcomes as part of the state's Annual Extension Planning Process. These Annual Plans were consistent with the Government Performance and Results Act criteria. These plans also described the multistate, integrated, multi-disciplinary and multi-institutional efforts.

Toward Greater Effectiveness and Efficiency - This FY 2003 Report of Accomplishments and Results shows the effectiveness and efficiency of all integrated, multistate, multi-disciplinary and multi-institutional by labeling these efforts beside the "scope of impact" headings found under each planned program.

In evaluating the success of these and other activities, UT and TSU Extension and UT Experiment Station find that efforts to offer multi-disciplinary, multi-institutional, integrated and multistate programs have been successful in FY 2003 in meeting both stated performance goals and responding to stakeholder input.

VII. Multistate Research and Extension Activities

In FY 2003, the Tennessee Agricultural Research and Extension System worked cooperatively with other states to achieve mutual goals. UT and TSU Extension made 112,031 educational contacts through multistate Extension Programs (67,723 of these educational contacts were made in multistate programs that also integrated research). The UT Experiment Station pursued a number of multistate research initiatives which are cataloged on the website of the Southern Association of Agricultural Experiment Stations.

- Value-Added Beef Marketing (AL) - The Giles County Beef Marketing Alliance expanded to include beef producers from Limestone County, Alabama.
- Integrated Research and Extension Improve Tennessee Tobacco Income (KY and NC) - UT Extension shares a state tobacco specialist with the University of Kentucky. Through the efforts of this special in coordinating research and extension activities, the most critical questions of tobacco growers are addressed. In FY 2003, the efficacy of black shank resistant varieties were researched and taught to growers in both states.
- Making Forages Work (KY) - West Tennessee Hay Day is an annual multistate educational program.
- Certified Crop Advisor Program (National)
- Applied Corn and Soybean Varieties Trials (KY)
- Southeastern Professional Fruit Workers Group (AL, AR, OK, GA, SC, NC, FL and MS)

- Southeastern Boll Weevil Eradication Program; Southeastern Boll Weevil Eradication Foundation Boll Weevil Monitoring Program; Cotton Nematode Control Committee; Seedling Disease Control Committee (Southern Cotton Producing States)
- Sudden Oak Death Survey of Nurseries (GA, NC, SC and VA)
- National Swine Registry (National)
- Pesticide Regulatory Education Program (National, EPA and UDSA)
- Blue Mold Control Information Program (KY and NC)
- Southern Region Extension Water Quality Planning Committee (Southern Region States)
- Southern Region Community Resource Development Committee (Southern Region States)
- Southern Region 4-H Volunteer Leader Forum (Southern Region States)
- National 4-H Curriculum Jury (National)
- National 4-H Youth-Adult Partnerships (National)
- Mid-South Fair 4-H Day program (MS and AR)
- Commercial Fruit and Vegetable Production and Upper East Tennessee Vegetable School (VA)

The following multistate efforts are specific to TSU Cooperative Extension which collaborates on these projects with other 1890 institutions:

- Small Farmer Assistance Program
- Third Tuesday Small Farm Expo Field Day (with Kentucky State University and UT Extension)
- Estate Planning and Land Loss Issues
- Food Safety Education for Food Handlers
- FF (Families First) News (Food Stamp Education Program)
- Forestry Issues for Private Landowners
- Small Business Development/Entrepreneurial Education in Rural Areas

VIII. Integrated Research and Extension Programs

In Integrated Research and Extension Programs, UT and TSU Extension and the UT Experiment Station involved 219,225 educational contacts in 2003. The following is an overview of 2003 integrated efforts:

- Assessing and Correcting Mineral Imbalances and Deficiencies in Beef Cattle on Tennessee Farms (Extension Program Title: Feeding is Fundamental) - Extension collected and research personnel analyzed 834 tall fescue samples from farms in 72 Tennessee counties. This research yielded nutrition information that helped Tennessee beef producers become more aware of animal health. The results and conclusions of the research caused all of the state's mineral dealers to reformulate their product lines. This will ensure greater productivity and health among the state's beef cattle.
- *A Marketing Systems Approach to Removing Distribution Barriers Confronting Small-Volume Fruit and Vegetable Growers* (TN, GA, KY and NC) - This

research mapped out the differences between successful produce marketing, including distribution channels. This research was then shared with growers at events such as the Tennessee Fruit and Vegetables Growers' Association.

- *Making Forages Work* - This effort took research results from fertilizing, pasture renovation, and liming and helped forage producers put these research results to work. Research by UT Extension and UT Experiment Station personnel determined that cattle could benefit with arginine added to their diet.
- *Extension Improves Northwest Tennessee Grain Production* - In all of these programs, Research was conducted on-farms in the *UT Standardized Variety Trial Demonstrations* in which varieties are planted to determine success under local conditions. The results are widely disseminated among West Tennessee grain producers.
- *Rethinking U.S. Agricultural Policy* - This integrated Research and Public Policy Extension Program brought research-based tobacco buyout scenarios to the United States Congress. More than 30 Representatives and Senators and their staff members conducted meetings with the UT researchers to gain more reliable policy analysis. This program help tobacco growers in all tobacco growing states.
- *TSU Assists Organic Farmers* - TSU Extension brought attention to the need for organic agricultural production research. The TSU Institute for Environmental and Agricultural Research has agreed to pursue this line of research which benefits Tennessee's nontraditional and under-served farmers.
- *TSU Revitalizes Small Farms through Integrated Research and Extension* - By conducting on-farm research trials in Hardeman County, TSU established that the adoption of superior performing tomato varieties and recommended practices could transform a hobby farm into a viable farming operation. The results were taught to 71 farmers through a field day.
- *Using Tennessee's Native Warm-Season Grasses for Wildlife Habitat and Livestock Forage* - Through Extension efforts, 130 landowners established 9,000 acres in native warm season grasses in FY 2003. Research indicates that these landowners average a 100% increase in quail population and a 300% increase in rabbit population.
- *Wood Technology Research and Extension Work in the UT Department of Forestry, Wildlife and Fisheries*
- *Tennessee Cotton Productivity* - The Cotton Variety Field Day shows producers the results of local research to encourage planting of higher yielding and more disease resistant cotton varieties.
- *Tennessee Soybean Production Programs*
- *Tobacco Fungicide Research and Extension Program*
- *Goat Programs for Small Farmers* - County goat education programs conducted jointly by UT and TSU.

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Appendix C

**U.S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Multistate Extension Activities and Integrated Activities
(Attach Brief Summaries)**

Institution Agricultural Experiment Station
State Tennessee

Check one: Multistate Extension Activities
 Integrated Activities (Hatch Act Funds)
 Integrated Activities (Smith-Lever Act Funds)

Actual Expenditures					
Title of Planned Program/Activity	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Competitiveness of Production Systems		636,286	695,597	808,219	
Management & Marketing		133,308	31,240		
Food Safety & Processor Level		136,363	116,255	57,835	
Balance Agriculture & Environment		160,025	86,946	9,529	
Promote Sustainable Management		103,667	109,610	28,408	
Utilize Agricultural Waste Products		87,766	69,700	34,480	
Preserve & Enhance Water Supplies		76,802	75,429	57,250	
Total		1,334,217	1,184,777	995,721	

3/15/2004

Date
Form CSREES-REPT (2/00)


Director

Appendix D

Multistate and Integrated Summary

<i>Program/Activity</i>	<i>Multistate Examples</i>	<i>Integrated Examples</i>
Committees, Meetings, Workshops and Conferences	Southern Region 4-H Volunteer Leader Forum; KY-TN Tobacco Expo	Making Forages Work; KY-TN Tobacco Variety Research; Southern Extension Farm Management Committee
Projects	A Marketing Systems Approach to Removing Distribution Barriers Confronting Small-Volume Fruit and Vegetable Growers; Sudden Oak Death Survey; USDA-SARE Value-Added Strategies Work	Assessing and Correcting Mineral Imbalances and Deficiencies in Beef Cattle on Tennessee Farms; Conservation Tillage Programs; Fort Campbell Military Reservation Study of Native Grasslands and Sustainable Wildlife Populations
Demonstrations and Field Days	UT Standardized Variety Trial Demonstrations; West Tennessee Hay Day; East Tennessee Beef and Forage Field Day;	UT Standardized Variety Trial Demonstrations; Using Tennessee's Native Warm- Season Grasses for Wildlife Habitat and Livestock Forage; TSU Small Farm Expo Field Day
Curriculum Development and Training	Southeastern Professional Fruit Workers Group; Southeastern Boll Weevil Eradication Foundation Boll Weevil Monitoring Program; Winter Vegetable School	Rethinking U.S. Agricultural Policy; Tennessee and Kentucky Tobacco Extension and Research; Technology Transfer through publications, videos, CDs, etc.