

Georgia
Annual Report of Accomplishments
FY 2002

The University of Georgia
College of Agricultural and Environmental Sciences
Cooperative Extension Service
Agricultural Experiment Stations

and

Fort Valley State University
College of Agriculture, Home Economics and Allied Programs
Cooperative Extension Program
Agricultural Research Station

March 1, 2003

Fred Harrison, Jr.
Dean and Director
College of Agriculture, Home Economics
And Allied Programs
Fort Valley State University

Gale A. Buchanan
Dean and Director
College of Agricultural and
Environmental Sciences
University of Georgia

The Georgia Annual Report of Accomplishment FY2002

Table of Contents:

Introduction

 Goal Matrix

 Impact Statement Database

Evidence of Accomplishments

 Goal 1

 Goal 2

 Goal 3

 Goal 4

 Goal 5

Stakeholder Input Process

Program Review Process

Evaluation of Success of Multistate and Integrated Activities

 Summary

 Actual Expenditure Reports

Contact Information

Signatures required on the cover page and the expenditure reports are not included in the electronic versions of this report. Signatures are on record with original report.

INTRODUCTION:

The Georgia Annual Report of Accomplishments and Results for year 2001-2002 represents a coordinated effort between the Georgia's 1890 and 1862 institutions – Fort Valley State University (FVSU) and the University of Georgia (UGA), and includes singular and combined results of Research and Extension units at both Universities.

Within the Extension Service UGA and FVSU state faculty with extension appointments coordinate efforts with UGA county faculty housed in 172 offices in 158 of Georgia's 159 counties. FVSU has 14 county agents, 13 of which are housed with UGA extension faculty. Extension programming is delivered as individual county efforts, multi-county programming through clusters of counties comprised of two to four counties per cluster, and state wide programming efforts.

The research programs of FVSU and UGA are conducted through the Agricultural Experiment Stations system. The UGA Agricultural Experiment Stations consist of three major campuses located in Athens, Tifton and Griffin, Georgia, as well as several research and education centers located strategically throughout the state.

Research and Extension faculty have made major accomplishments toward goals identified in the current Plan of Work. While reduced state funding has greatly impacted the efforts of our faculty, our organizations have been effective and productive during the past year. Many of the documented outcomes within this report demonstrated immediate and prolonged impact on the citizens of Georgia.

This report represents the Extension and Research programs of both the University of Georgia and Fort Valley State University as represented in the AREERA plan of work submitted in 1999. The accomplishments are recorded according to Key Themes and State Performance Goals. State Performance Goals may be linked to UGA and/or FVSU, research and/or extension. The following page contains a matrix identifying this linkage.

	Goal 1	Goal 2	Goal 3	Goal 4	Goal 5
1862 Extension	Performance Goals 1-1, 1-2, 1-4, 1-6, 1-7, 1-8	Performance Goals 2-1, 2-2, 2-3, 2-4, 2-5, 2-6	Performance Goal 3-1	Performance Goals 4-1, 4-2, 4-6	Performance Goals 5-1, 5-4, 5-5, 5-6, 5-7, 5-8
1890 Extension	Performance Goals 1-3, 1-5	Performance Goal 2-4	Performance Goal 3-2	Performance Goals 4-3, 4-4, 4-5	Performance Goals 5-2, 5-3, 5-7, 5-8
1862 Research	Performance Goals 1-9, 1-10, 1-11, 1-12, 1-13, 1-14, 1-15, 1-16, 1-17, 1-18	Performance Goals 2-7, 2-8	Performance Goal 3-3	Performance Goals 4-7, 4-8, 4-9, 4-10, 4-11, 4-12	Performance Goal 5-9
1890 Research	Performance Goals 1-19, 1-20, 1-21, 1-22, 1-23, 1-24, 1-25, 1-26, 1-27, 1-28, 1-29, 1-30, 1-31, 1-32, 1-33, 1-34, 1-35, 1-36, 1-37, 1-38, 1-39, 1-40	Performance Goals 2-9, 2-10	Performance Goal 3-4, 3-5	Performance Goals 4-13, 4-14, 4-15, 4-16	Performance Goals 5-10, 5-11

In addition to this report, hundreds of impact statements may be accessed at
<http://apps.caes.uga.edu/impact/>

This impact database website contains advanced search capabilities that allow the user to sort for key words and program goals. The 2002 impact statement are summarized in a document entitled Countdown 2002 and can be located at
<http://interests.caes.uga.edu/impacts/countdown2002/>

Many of the accomplishments highlighted in this report are summaries of these impact statements. The impact database contains a great deal more information than the limited summaries included in this report.

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

Today, agriculture remains the largest segment of Georgia's economy. The 2001 Georgia Farm Gate Value Report identifies 8.7 billion dollars in farm gate value for Georgia. Poultry accounts for 42% of the total value. The remaining 58% is greatly divided among a diverse agricultural system. The top ten commodities in the state are (listed in order): Broilers, Cotton, Timber, Peanuts, Beef, Dairy, Hatching Layers, Horses, Greenhouses, and Container Nursery.

There have been significant accomplishments toward improving the agricultural system in Georgia. The work has been diverse and representative of the industry in Georgia.

Faculty have development of a fermentation process to produce xylitol from synthetic sugars which was broadcast nationwide by Associated Press. The "Georgia Beef Challenge" demonstrated the ability of Georgia cattle farmers to overcome traditional regional market discounts that reduce income. New germplasm lines in Cotton have great potential to impact the industry.

Georgia leads the nation in Peanut production. Several accomplishments highlight advances in production and processing. Work with Tomato Spotted Wilt Virus has been well documented in this report.

The turfgrass, ornamental and landscape industries in Georgia are rapidly growing in number, volume and types of service. Extension efforts to support this growing industry are significant. A great deal of education has been accomplished in the area of water management. Our turfgrass breeding program has developed environmentally friendly cultivars that use water normally unfit for human consumption.

Four years of low winter rainfall and long rainless periods in the growing season have put added pressure on water resources. A great deal of work has been accomplished to better understand the state's irrigation practices and make them more efficient, including the dedication of the new Stripling Irrigation Research Park. The conversion from conventional, plowed tillage systems to conservation or minimum-till systems continue to grow in Georgia as a result of extension and research efforts.

Poultry continues to be a major thrust of our extension and research efforts as identified in our Plan of Work. Our work in Biofuels, which received popular press recognition when used as a fuel one of the main heating oil boilers on the UGA campus, has great potential for the poultry industry.

The University of Georgia is considered a leading authority in the research and application of new technology to poultry house design and operation. It is conservatively estimated that work in this area results in an economic impact of more than \$4 million annually to Georgia producers.

Finally, many of the documented accomplishments in this report revolve around the use of poultry litter.

Key Theme - Adding Value to New and Old Agricultural Products

State Performance Goal: 1-1

- a. Lignocellulosics, such as soybean hulls, cottonseed hulls, and hardwood waste, are examples of large, but untapped renewable carbon sources within Georgia. The predominant polymer in many renewable feedstocks is cellulose, which generates glucose upon hydrolysis. However, depending on the feedstock, large fractions of other six and five carbon sources are released when hemicellulose is hydrolyzed, particularly xylose. Any process (e.g., ethanol production) designed to utilize these residues must produce a high-value product from xylose.

We are developing a fermentation process to produce xylitol from xylose. Xylitol is a natural alternative sweetener that provides a cool oral sensation, can be utilized as a diabetic sweetener, and does not cause cavities. Xylitol is currently being used in a wide range of products: bakery products, spices, relishes, jams, jellies, chewing gum, confectionery products, pharmaceuticals, and oral hygiene products and sells for 2-7 dollars per lb. The microbial fermentation process is highly advantageous since it is selective and produces xylitol yields much higher than the chemical process. Xylitol, as well as other compounds that can only be derived from xylose, hold great potential in creating new high-value markets for Agricultural and Pulp and Paper industries in Georgia. For example, if xylitol is sold at \$7/lb and produced from cottonseed hulls (assuming 15% xylose in hulls and 80% xylitol yield), the potential exists to achieve a value \$1680/ton of hulls compared to the current value of \$44/ton @ 2.50 corn as roughage for cattle feed.

- b. A fermentation process for production of xylitol from synthetic sugars has been developed. An Associated Press news report on the project was carried nationwide. Several industries have contacted UGA on the possibility of developing this technology.
- c. Hatch Act, State Grants, State Funds
- d. State Specific

Key Theme - Adding Value to New and Old Agricultural Products

State Performance Goal: 1-1

- a. Georgia peanut growers, buying points, and shellers are faced with increased competition from other countries, as well as from the West Texas peanut production area of the U.S. Producing flavorful, aflatoxin-free, high quality peanuts is tantamount for maintaining a

viable peanut industry in Georgia, particularly in view of the low prices which have resulted from the 2002 Farm Bill. Biological and agricultural engineers are working on ways to cure peanuts that enhance or maintain flavor, as well as to increase curing efficiency. Several approaches were developed and tested which include dehumidification curing using electrical heat pumps, as well as computational-based, psychrometric strategies for controlling the curing rate in LP and natural gas dryers.

- b. Computational-based psychrometric strategies that control the rate in which peanut cure, as well as control methods that limit the temperature rise above ambient to no more than 15 degrees Fahrenheit, proved successful for producing flavorful peanuts and minimizing kernel splitting. Dehumidification curing using electrical heat pumps also proved feasible, as well as advantageous during periods of high humidity or when periodic weather fronts pass through. One company now manufactures microprocessor-based controllers designed specifically for peanut dryers and four buying points in the Southeast have adopted this technology. These controllers have been particularly helpful for producing seed peanuts, where drying too rapidly or over-drying results in poor germination. Another manufacturer now builds heat pump dryers. These dryers have been used on a limited basis at commercial buying points, but at present their cost inhibits wide-spread use.
- c. Smith Lever, State funds, Special Research Grants
- d. State Specific

Key Theme - Adding Value to New and Old Agricultural Products

State Performance Goal: 1-1

- a. Most national and international post harvest research efforts focus on extending the shelf life of fresh produce. However, changes made to extend shelf life often result in lower consumer satisfaction, even when eaten soon after harvest. Therefore, focus is needed for improving the quality of fruits and vegetables when eaten rather than only pursuing efforts to maximize shelf life. Fresh produce supply chains fit the classic pattern where overall system performance declines when each link in the supply chain tries to maximize profit individually. A systems approach has helped the electronics, automotive, and other industries improve performance by functioning as interacting systems. Limited applications have been made of the same tools to improve supply chains for fresh fruits and vegetables.

A round table workshop was organized for professionals representing the primary links in fresh fruit and vegetable supply chains (growers, packers, distributors, retailers) and supporting agencies and institutions (USDA-Ag Marketing Service, Georgia Department of Ag, GA Fruit and Vegetable Growers Association, CAES). The participants learned about system dynamics by forming teams that played a board game simulating supply chain management.

- b. New contacts and collaborations were established among the participants based on their mutual desire to improve fresh produce supply chains. For example, a series of technology exchange activities were initiated between CAES faculty, USDA personnel, and the Chief Operating Officer of a Georgia company that establishes national supply chains for food service facilities. CAES faculty members are also working with the president and managers of another Georgia company to apply their procedures for delivering vine-ripe tomatoes to tree-ripe peaches. Consumers are the source of money that flows to growers through fresh produce supply chains. More money will flow through each business link to growers when consumers spend more on fresh fruits and vegetables. Consumers will pull more fresh produce through supply chains when they are satisfied with the quality and safety of the vegetables delivered. (Chains work better when pulled than when pushed.)
- c. Hatch Act, Smith Lever
- d. Integrated Research and Extension

Key Theme: Agricultural Competitiveness

States Performance Goal: 1-1

- a. Many Georgia peanut producers are looking at reduced tillage methods for land preparation. Recent research has shown improved yield and grade and reduced Tomato Spotted Wilt Virus when planting peanuts in twin rows on conventional tillage compared to single row patterns. From 1999-2001, thirteen locations compared strip tillage to conventional peanuts planted following either oats or wheat. Initially, single rows surpassed twin rows when planted by strip tillage methods. Adjustments were made to move the subsoilers in to 27 inches when planting on a 36 inch spacing. This compared the yield of both seven and nine inch twin rows. Both twin rows and strip tillage with or without a cover crop have been shown to reduce Tomato Spotted Wilt incidence. Putting twin rows and strip tillage together have further reduced TSWV incidence but not to the extent that occurs under conventional planting methods. When averaged over tillage twin rows had significantly higher yield, grade and less TSWV than single rows. Strip till peanuts had less TSWV than conventional planted varieties. Experience has shown, however, that if you don't adjust strip tillage equipment to plant twin rows, it would be better to plant single row patterns.
- b. Under conventional tillage, with results on over 20 peanut varieties under irrigation, twin rows have 99% of the time resulted in higher yield, grade, and less TSWV. It is estimated that in 2002 TSWV resulted in a 4% reduction in dollar value of the Georgia peanut crop. This is a reduction of 8 to 9 million dollars of gross income for Georgia producers. Research on six varieties over three years has resulted in a 250 pound yield increase of twin rows over singles when planted by strip tillage and there was no difference in yield between strip tillage and conventional tillage. Changing cultural practices may help

producers reduce overall costs which will be necessary to remain competitive under the new farm bill.

- c. Hatch Act, State Funds
- d. State Specific

Key Theme: Adding Value to New & Old Ag Products

State Performance Goal 1-1

- a. Georgia calves are primarily sold at weaning and are traditionally discounted because they have a reputation of being inferior in quality and health status. These discounts have been estimated at \$5 per hundred pounds. For a producer with 100 cows and selling 75 of them per year, this amounts to approximately \$1,875 in lost income.

The Georgia Beef Challenge was organized by the UGA Department of Animal and Dairy Sciences to inform Georgia cattle producers about the health, performance and carcass merit of their cattle. Consignors also build reputation and markets for cattle in Georgia.

- b. The performance of the cattle was excellent and profitability was good, considering the negative impact that September 11 had on the market. The profit per head was \$69.56 with an added income to Georgia consignors of \$150,518. Information gained will aid participants in designing breeding programs. In 2001-02, 2,164 calves were consigned to the program (a 16 percent increase over the previous year).
- c. Smith Lever, State funds
- d. Multistate Extension: GA, IA

Key Theme: Agricultural Competitiveness

States Performance Goal: 1-1

- a. The absence of a UGA forage extension specialist coupled with the recent requirements for farm nutrient balance plans created the need for a pasture fertility training for county extension personnel in Georgia. An extensive two week multi-state in-service training was designed to deliver information to county extension personnel via the internet. Dr. Bob Lippert at Clemson University coordinated and “hosted” the training and cooperating states were Georgia, Alabama, South Carolina and North Carolina. Instructional topics included: nutrient recycling, nutrient uptake by various plant species, urea volatilization, forage quality as affected by soil fertility, effects of litter treatments on litter properties for land application, legume nutrient requirements and ability of

legumes to supply nitrogen to non-legumes, soil management for intensive grazing, soil and plant sampling, and soil pH ranges and lime considerations. Lessons were posted on the internet and agents were assigned a daily topic. On-line “discussion” took place via listserv for information clarification and topic expansion.

- b. There were 155 total participants with 64 Georgia county agents and specialists participating. The majority of agents appeared to like the web-based format of the training, although no formal evaluations were collected. Selected unsolicited comments from the participants follow: “I like the format as it allows me to continue working here in my county and yet remain on top of the information ladder”, and “good information in a concise format”. Several agents indicated that they printed off each lesson and filed them for future reference. Others asked and received permission to cut and paste information for use in producer meetings. On-line discussion via the listserv was less than expected, as agents appeared to prefer direct (and private) emails with instructors. This was probably the only major negative of this programming approach and should be improved in some manner as future programs are developed.
- c. Smith-Lever Act, State Funds
- d. Multistate Extension – GA, AL, NC, SC

Key Theme: Plant Genomics

State Performance Goal: 1-1

- a. The introduction of transgenic technology in the mid-1990s brought about a complete turnover of cotton varieties and cotton pest management technology. In 2002, over 90 percent of the cotton acreage in Georgia was planted with transgenic varieties. Coincident with these revolutionary changes in varieties and technology have been major yield fluctuations, severe and prolonged drought, and serious fiber quality problems. Some of the blame for losses in yield and quality has been attributed to new varieties, and thus, variety selection and performance have become paramount concerns in Georgia and across the U.S. Cotton Belt. Among the grower and general agribusiness communities, the process of traditional breeding is poorly understood and less so are the processes of the insertion of transgenes, regeneration of transformed cotton, and incorporation of genes into commercial cultivars. Because variety selection provides the foundation for yield and quality and because seed have become the "carrier" for important pest management tools, there is great opportunity to educate the agricultural community as to the complexities of cotton breeding and development.

In concert with four UGA faculty and staff members and scientists from two commercial seed companies, the UGA Cotton Team hosted the South Georgia Cotton Breeder Tour in Tifton in August of 2002. The tour included field stops and classroom lectures. Topics at The University of Georgia Gibbs Farm included the processes of actual hand pollination; the progression of back crossing, strain selection and variety development; observation of

a nursery containing novel *Gossypium* species; evaluation of nematode resistance, enhanced glyphosate tolerant lines, and new Bt lines; and procedures involved in the official variety trial tests. The tour included a stop at the new Delta and Pine Land Cotton Breeding Station, a facility established to aid commercial development of cultivars for the Coastal Plain. Classroom subjects at the NESPAL building included the lectures "How Transgenic Crops are Made," by Peggy Ozias-Akins, Molecular Biologist, and "The Interface of Classical and Molecular Breeding," by Lloyd May, Cotton Breeder, as well as a tour of the molecular genetics laboratory conducted by Peng Chee, Molecular Geneticist.

- b. The tour included growers, county agents, and agribusiness personnel from Georgia, Alabama, North Carolina, and Missouri. Participants gained an appreciation of the resources and time involved in cultivar development as well as the science and art of cotton breeding. The tour highlighted the commitment The University of Georgia has made to genetic advancement in cotton with both basic and applied sciences.
- c. Hatch Act Funds, Smith Lever, State Funds
- d. Multistate Integrated Research and Extension: GA, AL, NC, MO

Key Theme: Plant Germplasm

State Performance Goal: 1-11

- a. The Georgia cotton industry from production of fiber through yarn and textile manufacture accounts for about \$3 billion of the state's economy. Georgia is the third largest cotton producing state in the U.S. and largest in the southeast. The health of Georgia's cotton fiber and processing industries is threatened by lack of varietal improvement because crop yields and fiber quality have not improved in the last 10 years, while production costs have concurrently risen faster than the rate of inflation. Consequently, the unit cost of cotton production now exceeds returns from the sale of fiber for most Georgia growers. Additionally, Georgia's fiber processors face global competitive challenges that threaten textile-manufacturing jobs. Georgia's yarn and textile manufacturers cannot fully exploit more efficient manufacturing technologies to better compete in the global economy because fiber properties do not meet the requirements of these efficient yarn and textile production technologies.

Higher, more stable yields, combined with fiber properties demanded by textile manufacturers in Georgia and surrounding states are needed to revitalize these valuable industries. The University of Georgia Cotton Breeding Program develops high yielding germplasm and varieties with the needed fiber properties to support the Georgia's cotton industries

- b. The germplasm line GA98028 has exhibited a 10-20% yield increase relative to popular varieties Deltapine 458BR, Deltapine 5415R, Deltapine 5690R, FiberMax 989BR, and

FiberMax 989R in year 2002 trials conducted across Georgia, North Carolina, and South Carolina. Together, these five varieties were planted to 55% of the acreage in Georgia in 2002. GA98028 offers longer staple length than any of these varieties, a fiber trait desired by yarn manufacturers, with a micronaire reading that does not trigger price penalties to the grower for high micronaire fiber. GA98028 is slated for release in 2003 as a germplasm line to be shared with private seed breeding firms that are the exclusive source of cotton planting seed available to Georgia growers. Private cotton seed breeding firms can use GA98028 as a parent to enhance varieties they offer to Georgia growers. Once publicly released, the University of Georgia Cotton Breeding Program will begin to enhance the value of GA98028 even further, by adding genes from biotechnology providers conferring resistance to glyphosate herbicide and a spectrum of insects that annually cause significant yield loss, resulting in higher production costs for Georgia producers.

- c. Hatch Act
- d. State Specific

Key Theme: Plant Health

State Performance Goal: 1-11

- a. Persistent and cyclic drought events over the past few years have resulted in significant outdoor water restrictions in the state. Total outdoor water bans have been implemented in several counties and reduced utilization of potable water resources to maintain turfgrasses has been the target

The turfgrass breeding program at the Georgia Agricultural Experiment Station has developed a cool season tall fescue (*Festuca arundinaceae*) cultivar that is adapted to the extreme environmental conditions in the state. The cultivar--SOUTHEAST--has both direct and indirect high temperature tolerance, high humidity tolerance, acid soil tolerance and excellent drought tolerance and drought survival capabilities. The key attribute is persistence with minimal water and fertility inputs. This is the first tall fescue cultivar that has been developed in the southern USA that is truly adapted to the region.

- b. The new cultivar will not require high levels of fertilizers nor high volumes of potable irrigation water for long term maintenance, saving valuable potable water resources for human consumption. Because of its adaptability to the region and its extensive root system, the grass cultivar will persist with minimal pesticide and fertilizer applications while maintaining acceptable turf quality and performance when exposed to state or local mandated outdoor water restrictions.
- c. Hatch Act
- d. State Specific

Key Theme: Plant Genomics

State Performance Goal 1-11

- a. The security and safety of the US supply of food, feed, fiber and fuel crops faces many potentially devastating challenges, including ongoing competitive pressures in world markets, new and re-emerging disease and pest threats; and possible impacts of global change. The large 'genomes' of major crops, many of which have much more DNA than the human genome, poses a major obstacle to identification of key genes in these organisms.
- b. Research in the Plant Genome Mapping Lab (www.plantgenome.uga.edu) has recently led to development of a new method by which the genomes of Georgia's agriculturally important plants and animals can be efficiently explored for genes that can provide low-cost intrinsic genetic solutions to the needs of producers, processors, and consumers. Competitive funding (\$600,000) has been secured from the National Science Foundation to develop a pilot project toward such a "Genes for Georgia" initiative.
- c. Hatch Act
- d. State Specific

Key Theme: Agricultural Competitiveness

State Performance Goal: 1-11

- a. Georgia leads the nation in total annual peanut production with nearly half, and average state peanut yields have more than tripled in the latter half of the 20th Century. Publicly developed cultivars have played a major role in this overall progress, and the quality of this vitally important commodity has likewise been enhanced.

The Georgia Peanut Breeding Program is actively involved in the development of improved cultivars with desirable traits for increasing dollar value, yield, grade, disease resistance, insect resistance, virus resistance, nematode resistance, aflatoxin resistance, drought tolerance, better shelling characteristics, longer shelf-life, and enhanced flavor and nutritional qualities. Possibly, no other single research effort can benefit the whole peanut industry as much as an improved cultivar.

- b. One new peanut cultivar with a 10% yield and dollar return advantage over the current crop value estimate for the State of Georgia would mean an additional \$40 million increase annually. Georgia Green is such a new high yielding runner-type cultivar with a high level of resistance to tomato spotted wilt virus (TSWV). Since its recent release, Georgia Green has quickly gained acceptance throughout several major peanut producing

states (Georgia, Florida, Alabama, South Carolina, Texas, and Oklahoma). It has been found to be very productive across many different environments (irrigated and nonirrigated, single and twin row patterns, etc). Compared to Florunner the previously popular cultivar, Georgia Green was found to have a 30-40% increase in yield and 45-60% increase in dollar value.

- c. Hatch Act funds
- d. State Specific

Key Theme: Agricultural Competitiveness

State Performance Goal: 1-11

- a. Red clover is a very desirable forage legume for renovating grass pastures. Renovation with red clover positively impacts existing grass pastures due to their ability to fix nitrogen from the air thereby reducing the need for expensive nitrogen fertilizer. They also supplement the forage supply with a high quality protein source. Most red clover varieties in the southeastern USA generally do not survive in our grass pastures when used as a renovation legume.

A cultivar development program was begun in collaboration with FFR, a major forage seed company, to select and test a more persistent red clover variety for Georgia and the southeastern USA. Initial screening of parental material was accomplished under harsh grazing and grass competition conditions. The best surviving plants from this screening were then incorporated into a new experimental variety.

- b. Testing results indicated the experimental red clover variety possessed better stand persistence than the currently available red clover varieties when used as a renovation legume in grass pastures. This experimental variety should therefore positively impact animal production in the state and region by allowing producers to use a more dependable nitrogen fixing pasture legume. It will be sold during 2002 and 2003 under the name 'Cinnamon Plus'.
- c. Hatch Act funds
- d. State Specific

Key Theme: Agricultural Competitiveness

State Performance Goal: 1-11

- a. Small grains, (oats, rye, and wheat), are important commodities for Georgia's producers. Small grains are used for grain and forage crops and fit well as a double-cropping

alternative. New races of pathogens and insects occur annually and economic losses can occur with growing cultivars susceptible to leaf rust, powdery mildew, and/or Hessian fly. The development of resistant cultivars prevents yield and economic losses as well as protects the environment by the reduction in the amount of fungicides or insecticides used.

The UGA Small Grain Breeding Team is working to develop improved cultivars. Increasing yields and improving disease and insect resistance, and improving milling and the baking quality of small grains help insure their economic viability. New resistant genes for leaf rust, powdery mildew and Hessian fly are being crossed to adapted cultivars, and selected for resistance to combat the new races of pathogens and insects.

- b. The UGA Small Grain Breeding Team's regional program has resulted in the release of two broadly adapted cultivars. Two new small grain cultivars, AGS 2485 wheat and Horizon 474 oats, were released in 2002. These releases offer producers high yielding cultivars with excellent test weight and disease and insect resistance.
- c. Hatch Act
- d. Multistate Research GA, AL, FL

Key Theme: Agricultural Profitability, Agricultural Competitiveness

States Performance Goal: 1-12

- a. Limited resources mandate that states cooperate as efficiently as possible to meet the needs of common clientele. Such is the case with the small fruits industries in the Southeast and their participation in the Southern Region Small Fruit Consortium. The long term mission of the Consortium is envisioned to involve collaborative efforts at various sites across the region between small fruit growers and grower organizations, industries and service organizations allied with and/or serving small fruit growers, agricultural extension programs and research stations working together to enhance the development of the small fruit industries in the region. Participating states are Georgia, South Carolina, North Carolina, and Tennessee.
- b. The following describes the outcome of one of the research projects funded by the SRSFC: Climax rabbiteye blueberry is an important cultivar in Georgia. But due to its early blooming habit, it has not been a dependable producer. Spring freezes have caused crop reductions in many years. UGA horticulturists discovered that ethephon, a plant growth regulator that releases the naturally occurring plant hormone, ethylene gas, is very effective for delaying bloom of Climax. Experiments from 1997 to 2002 have shown that a 7-14 days bloom delay occurred with an application of ethephon in mid-October and early November. Fruit ripening was only delayed a few days. In years such as 2002, when a freeze occurred in late February, berry yield was greatly increased. The compound was of little value in situations where the freeze came late in the freeze season (such as mid-

March), since even the ethephon treated bushes had bloomed out. In Sept. 2002, a state registration was received for the use of ethephon on certain cultivars of blueberries. The Georgia blueberry growers now have a very useful tool available to them.

- c. Hatch Act, Smith Lever, State Funds, Grant Funds
- d. Multistate Integrated Research and Extension: GA, SC, NC, TN

Key Theme: Plant Health

State Performance Goal: 1-12

- a. Potable water resources are diminishing rapidly in the region. Turfgrasses can no longer be irrigated with these potable water resources and alternative sources (effluent, brackish) will be eventually mandated.

The turfgrass breeding program at the Georgia Agricultural Experiment Station has developed two seashore paspalum (*Paspalum vaginatum* Swartz) cultivars that can be irrigated with effluent (or gray water), various forms of brackish water, and in extreme cases for a short time period, ocean water might be used if the site is properly constructed. The cultivars--SEA ISLE 1 AND SEA ISLE 2000-- can be used for turfgrasses on golf courses, sports fields, home lawns, parks and other recreational areas. In addition, this grass can be used for land reclamation, dune stabilization, and bioremediation. Other attributes include: waterlogging or low oxygen tolerance, low light intensity (not tree shade) tolerance, drought tolerance with proper management, extremely high salinity tolerance, wear and traffic tolerance from high use.

- b. These turfgrass cultivars will use water normally unfit for human consumption. These cultivars are environmentally friendly in that they require about half the water and fertilizer of other warm season grasses and minimal pesticide applications. They have the ability of cleaning up polluted or contaminated waters or soil naturally.
- c. Hatch Act Funds
- d. State Specific

Key Theme: Plant Genomics

State Performance Goal: 1-12

- a. Approximately 30% of Georgia golf course fairways are overseeded in the early fall with perennial ryegrass to provide an attractive playing surface for golfers during the winter and spring months. Overseeded fairways are desirable during this time; however, weed control, particularly annual bluegrass, is very difficult to achieve due to the lack of

selective management programs for this purpose. In contrast to the dark green color of perennial ryegrass, annual bluegrass is light green in color and produces abundant whitish-silvery colored seedheads in the spring months. Additionally, this species produces large quantities of seed which serve as a weed seed reservoir in future years.

The University of Georgia Turfgrass Weed Management has been evaluating and developing strategies for the control of annual bluegrass in overseeded golf course fairways for the past several years. This on-going program seeks to identify preemergence and postemergence herbicides that will control annual bluegrass but not adversely injure perennial ryegrass and bermudagrass. Associated with this effort are numerous studies that identify the time interval between preemergence herbicide application date and perennial ryegrass seeding date. Selectivity and efficacy of postemergence herbicides for this purpose are evaluated during the winter and early spring months.

- b. Data from these experiments have resulted in new use directions on the dithiopyr (Dimension) and prodiamine (Barricade) labels that permit these herbicides to be applied 8 weeks in advance of overseeding. Other data generated from this program were used to support label use directions for rimsulfuron (TranXit) which can be applied 10 to 14 days before overseeding. Additionally, data from Georgia experiments is being used to support a Special Local Need label request for the use of bispyribac-sodium (Velocity) for the postemergence control of annual bluegrass in overseeded bermudagrass fairways. The net impact is that as a result of this research conducted in Georgia, golf course superintendents now have several herbicides that can be used to effectively control annual bluegrass in overseeded golf course fairways.
- c. Hatch Act funds, State funds
- d. State Specific

Key Theme: Plant Health

State Performance Goal: 1-12

- a. Broiler production is increasing in the Coastal Plain and studies were conducted to determine the best usage for the byproduct litter (a mixture of broiler manure and bedding). An abiotic disease called black root has devastated cotton production in many flatwoods soils in SE Georgia. To alleviate this disease, cotton farmers on flatwoods soils are creating a demand for more broiler litter than is available in SE Georgia.

A 6-year study of a 3-year irrigated intensive rotation, that included cotton, peanut, pearl millet for grain, wheat, and canola on an upland Tifton soil with high soil tests was concluded at Tifton in 2002. Field studies were conducted on five flatwoods sites in 2001 and 2002 to determine the residual effects of broiler litter on black root of cotton.

- b. The study on Tifton soil provided data indicating the positive value of broiler litter applications for all the included crops, except peanut. The agronomic and economic values of broiler litter for cotton were outstanding. Mean yearly lint yield and gross economic yield were increased by 584 lb/acre and \$337/acre, respectively by the application of 2 ton broiler litter/acre. Therefore, the gross value of broiler litter was \$168/ton when applied before planting cotton on an upland Tifton soil. On flatwoods soils, this research has shown that application of broiler litter often makes the difference between little or no cotton and a good harvest. Response to 4 ton broiler litter/acre has been as great as 972 lb lint/acre while applications of inorganic fertilizers containing most of the essential nutrients failed to alleviate the symptoms of black root and failed to increase yield above yields obtained in plots that did not receive broiler litter. Limited results indicate that the period of effectiveness of a 4 ton/acre application of broiler litter is at least 2 years. Farmers needing it for the control of black root will in the future be able to only apply it each 2 years and thereby likely obtain enough locally at lower cost than it presently costs for its transport from N Georgia.
- c. Hatch Act funds, Smith Level funds, State funds
- d. Integrated Research and Extension

Key Theme: Agricultural Profitability

State Performance Goal: 1-12

- a. Cotton and peanuts are a common combination for many producers in South Georgia. Unfortunately, cotton and peanuts both require approximately the same number of days to mature. As a result, cotton harvest is generally initiated following the completion of peanut harvest. Data from the Georgia Agricultural Statistics Service shows, averaged across the past five years, the Georgia cotton crop is 50% open during the first week in September. The Georgia cotton crop is only 50% harvested, however, during the first week in November, a time when the peanut harvest is greater than 90% complete. Due to excessive weathering, this delay in cotton harvest may cause significant losses in lint yield and quality.

Studies were conducted to determine the physiology of cotton fiber development and the extent of losses incurred in lint yield, fiber quality and profitability when cotton harvest is delayed. Controlled experiments were conducted such that cotton was harvested at thirteen different timings during the fiber development stage.

- b. Results from this study showed that a two-week harvest delay reduced the adjusted gross income \$20.61 per acre. These losses were incurred from reductions in lint yield and price discounts for unacceptable fiber quality. An additional two-week harvest delay (four weeks total) reduced income an additional \$61.84 per acre (\$82.45 per acre total) while a six-week delay resulted in an additional \$103.06 per acre loss (\$185.51 per acre

total). Thus, the rate of income loss increased exponentially with continued harvest delays.

- c. Hatch Act, Smith Lever
- d. Intergraded Extension and Research

Key Theme: Agricultural Competitiveness

State Performance Goal: 1-11

- a. Several engineered crops are currently in production, but all of these are inbred crops. The proper way to deploy an engineered gene in an open pollinated crop, such as most forages, is not all that clear. This work was undertaken to examine the way an engineered gene behaves during the breeding process for a forage crop, in this case, white clover.

Engineered several clover plants with a marker gene, then performed breeding and selection, selecting for higher levels of gene expression. After two generations, the plants expressed the engineered gene 4 times greater than the original.

- b. We now know that breeding an engineered forage can start with multiple engineered genes, not just one as previously thought, and that engineered genes can be accumulated for greater expression.
- c. Hatch Act, State funds
- d. State Specific

Key Theme: Plant Health, Agricultural Competitiveness

State Performance Goal: 1-11

- a. Very few crop cultivars contain all of the resistance genes available to fully protect the yield potential and reduce the risk of disease losses to the grower. Maintenance of working pathogen collections and distribution to those who need them is vital to the continued progress of cultivar development.

A multi-state group of soybean pathologists and breeders organized a Soybean Pathogen Germplasm Conservation System that would provide long-term maintenance and distribution of soybean pathogens.

- b. This group, lead by a University of Georgia scientist, obtained over \$2 million from four agencies to establish this System as a proof of concept project and model for other major commodities. The teams of scientists working on this project have been working for 1 to

3 years on aspects of the project and parts of several important pathogen collections have been deposited in the central maintenance and distribution center. This conservation system will help assure the future disease and nematode resistant soybean cultivars that growers need to continue profitable production of this crop in the USA.

- c. Hatch Act, Grant funds
- d. Multistate Research: GA IL, IN, OH, IA, AK, NC

Key Theme: Plant Health

State Performance Goal: 1-12

- a. Proper variety selection is the most important decision a farmer makes. Farmers want and need to grow the best adapted crop cultivars to be successful. But farmers do not have the time or the resources to plant several cultivars to determine which are adapted to Georgia growing conditions. That's where UGA Agronomists step in to help. The college's Variety Testing Team does the work and research for the farmers. They do variety research on public and private developed cultivars of corn, soybean, peanut, grain sorghum, wheat, barley, rye, oat, triticale, canola, summer annual forages, and winter annual forages each crop year. The research is conducted within each of the seven major geographic regions of Georgia to collect Agronomic data such as yield, bloom date, maturity date, test weight, height, lodging, seed size and seed shattering; also, tests for resistance/tolerance to pests and disease. The information is then published annually in five research reports which are made available to farmers, private industry, and other researchers in a timely manner. A web site on the internet, electronic bulletin boards and a computer CD are also used to distribute the information.

The Georgia cultivar evaluation and crop management (Statewide Variety Testing, SWVT) program during 2002 conducted numerous public and commercial row crop and small grain cultivars of corn, soybean, grain sorghum, peanut, wheat, barley, oat, rye, triticale, canola, summer and winter annual forages adapted to Georgia growing conditions. Five Georgia Ag. Experiment Station reports (Res.Rpts.nos.676, 677,682,683,684) on variety evaluation were published. Also, the program published data and information on cotton and tobacco. The SWVT web site (www.griffin.peachnet.edu/swvt) is used to make the data available electronically. Further, there are six years of data on the web site (1997-2002). Data was obtained and disseminated on cultivar resistance or tolerance to the prevalent pests found in Georgia on soybean, wheat, corn, and grain sorghum.

The Georgia cultivar evaluation and crop management (Statewide Variety Testing, (SWVT)) program during 2002 conducted numerous experiments within each of the seven geographic regions of the state, thus identified numerous public and commercial row crop and small grain cultivars of corn, soybean, grain sorghum, peanut, wheat, barley, oat, rye, triticale, canola, summer and winter annual forages adapted to Georgia

growing conditions. Five Georgia Ag. Experiment Station reports (Res.Rpts.nos.676, 677,682,683,684) on variety evaluation were published. Also, the program published data and information on cotton and tobacco. The SWVT web site (www.griffin.peachnet.edu/swvt) is used to make the data available electronically. Further, there are six years of data on the web site (1997-2002). Data was obtained and disseminated on cultivar resistance or tolerance to the prevalent pests found in Georgia on soybean, wheat, corn, and grain sorghum.

- b. Numerous public and commercial row crop and small grain cultivars of corn, soybean, grain sorghum, peanut, wheat, barley, oat, rye, triticale, canola, summer annual forages and winter annual forages were identified as adapted to being successfully grown in Georgia. One new medium-maturity high oleic peanut variety (Ga98-2508), two new high yielding herbicide resistance soybean varieties (HaskellRR and BoggsRR) and one new high yielding disease resistant wheat variety(AGS 2485) were released during 2002 using SWVT data. Peanut varieties identified by the SWVT program as adapted to Georgia growing conditions and having tolerance to Tomato Spotted Wilt Virus (TSWV) were used by the Georgia Cooperative Extension Service in 'production indexing' (a combination of cultural practices) that had a added value to the Georgia peanut producer in excess of \$50 million during 2002 mainly due to less TSWV disease. Wheat varieties that benefit from fungicide application were identified. Soybean varieties that are tolerant to several nematodes and soybean stem canker were identified. Data on superior cotton and tobacco varieties was published.
- c. Hatch Act, Smith Lever, State funds
- d. Integrated Research and Extension

Key Theme: Agricultural Profitability

State Performance Goal: 1-12

- a. Irrigated land area has become a key to Georgia's water policy and programs. In 2001 and 2002, the State spent \$10 million dollars trying to protect Flint River flow by temporarily removing irrigation from a portion of the basin's farmland. The enabling legislation, The Flint River Drought Protection Act of 2000, was drafted on the basis of irrigated acres believed to be in use in the basin. Using similar information, state officials from the Environmental Protection Division (EPD) have also suspended the permitting of additional irrigation withdrawals from all or parts of 30 southwest and 24 Coastal Zone counties in Georgia One result of this suspension has been a change in prices farmers must pay to buy or rent land that already has irrigation permits. Policy makers and experts agree that withdrawals for agricultural irrigation collectively make farming the largest or second largest water consumer in the state. However, they differ widely in values assigned to irrigated area. The latest Census of Agriculture places Georgia 6th in the eastern U.S. with 750,000 irrigated acres. UGA's 2000 irrigation survey estimated 1.5 million irrigated acres, making Georgia 3rd in the east after Arkansas and Florida. EPD

records, based on permits applications, total 2.1 million acres. Uncertainty in these numbers has already caused large expenditures by the State and its farmers. Incorrect numbers may soon affect decisions on allocation of Flint Basin water among States and policies enacted in the future to protect Georgia's water resources.

The college embarked on a detailed irrigation mapping effort using the latest technology in Geographic Information Systems, strong cooperation and support from EPD, and old-fashioned one-on-one meetings with thousands of the State's farmers and land owners. In each of 17 counties of the Lower Flint River basin, UGA research staff and county agents, as well as EPD personnel, sat down with farmers who had been issued withdrawal permits in the past 14 years. We displayed detailed aerial photographs, roads, streams and other landmarks on projected computer screens. Farmers pointed out precise locations of their wells and surface pump stations and outlined irrigated fields. In turn participants were provided verified permit maps signed by EPD that showed each permitted source and irrigation on a photo-based map with details about their permit conditions, a document valuable for good record keeping.

- b. To date our mapping efforts, in collaboration with EPD, have documented nearly 670,000 acres irrigated in the Flint River basin. With 90% of the permits issued in the 34 Dougherty Plain Flint Basin Counties, the locations of 6,133 wells and surface water withdrawal have been identified. In side-by-side comparisons of acreage indicated on permit applications versus that drawn on GIS-based maps for those permits, we have found that farmers are irrigating 180,000 fewer acres than EPD anticipated. A substantial portion of the extra permitted acres were due to duplicate permits or now unfarmed land, while even more represented permitted acres that have never been used. The differences can help explain why the Flint River has maintained flow in these severe drought years, despite predictions that with drought-year irrigation, the river would dry up. The correct irrigation acreage values will help state officials better negotiate with Florida and Alabama over water allocations, facilitate decisions on maintaining or lifting the withdrawal moratorium in the Flint Basin, and aid comprehensive water planning in Georgia. Permit maps will help protect farmer's rights to water and their investment in irrigated land.
- c. Hatch Act, Smith Lever, State funds
- d. Integrated Research and Extension

Key Theme: Agricultural Competitiveness

State Performance Goal 1-12

- a. For four years low winter rainfall and long rainless periods in the growing seasons continually threatened both municipal water supplies and agricultural production. Even as national prices received for farm products hit some of their lowest values in years, Georgia farmers had to spend additional millions on irrigation to protect their crop

investments and livelihood. Farmers made costly investments in new equipment and worked to keep aging center pivots operational even as pond and stream water supplies dried up. At the same time the Georgia Environmental Protection Division began to limit farmer efforts to develop new water sources and paid \$10 million to temporarily eliminate irrigation from 30,000 to 40,000 acres of farmland. Caught between dwindling water supplies and low commodity prices, farmers desperately need new information to help them conserve those supplies, while producing their vegetable and feed crops with maximum overall efficiency.

College scientists and extension specialists designed a new facility for sound science in irrigation and located it in the Dougherty Plain of the Flint River Basin. With more than 650,000 acres of irrigated farmland producing a wide variety of high value crops and feed, the area was ideal for irrigation research, engineering, and training programs. Following a generous land donation by Mitchell County farmer and conservationist, Mr. C.M. Stripling, State appropriations for buildings and equipment, and Federal and private grants, initial construction was started in fall of 2001. By spring 2002, scientists and engineers were conducting the first experiments and hosting public education meetings at the new facility. Irrigation engineering studies were conducted to determine actual water losses during center pivot irrigation as affected by sprinklers, weather, and time of day. Corn, cotton, and peanut were stressed using various irrigation scheduling techniques to determine how much water could be saved without sacrificing production and profitability.

- b. Since the May, 2002, dedication of the C. M. Stripling Irrigation Research Park, 13 programs have brought 350 people for training and education in water conservation and irrigation management. These include manufacturer-sponsored training for their dealers, 4-H and science teacher education, farmer field tours, and irrigation learning sessions for governmental leaders. Using its five center pivots, three lateral-move systems, and one subsurface drip facility, researchers found that water savings of 10 to 15% are possible with conversion to low pressure sprays on pivots or drop tubes, but that this difference comes at a greater risk of runoff and increased variability in distribution. Crop studies showed that efforts to meet a fixed irrigation plus rainfall amount per week are effective at preventing stress but increases water use. As much as two-fold differences in irrigation could be applied with no difference in yield. Radio linked soil water sensors proved to be a reliable means of transmitting soil water status to a central location so daily irrigation decisions could be made conveniently
- c. Hatch Act, Smith Lever, State funds
- d. Integrated Research and Extension

Key Theme: Agricultural Competitiveness

State Performance Goal: 1-16

- a. Weed control is essential for pine tree establishment in agronomic crop field sites. In the southeastern United States, a virtual plethora of year long weed spectrum is encountered due to the temperate climate for the region. Weed management in pine tree establishment has received little research attention due to a lack of long term commitment needed to conduct pine tree based research.

Research currently being conducted, has determined that successful establishment of winter planted pine trees (loblolly, slash, and longleaf) into previous row crop field sites was dependent on herbicide combinations of atrazine, pendimethalin (Prowl), hexazinone (Velpar), sulfometuron (Oust), and imazapyr (Arsenal). When applied in the year of pine tree establishment, combinations of these herbicides provided residual weed control for one year of common ragweed, pigweed species, cutleaf evening primrose, sicklepod, Florida beggarweed and Texas panicum, and many other broadleaf and grass weed species. Old field sites invariably have a moderate pH and fertility base that promotes weed growth. Proper weed control at time of pine tree establishment results in improved tree growth and development that promotes early harvest.

- b. Establishment of pine trees in agronomic field sites will be improved by proper herbicide selection, application timing, and continuous observation. These factors assist growers in maintaining profitable pine tree populations when converting fields from agronomic crops to pine trees.
- c. Hatch Act, State funds
- d. State Specific

Key Theme: Agricultural Competitiveness

State Performance Goal 1-16

- a. Canola has potential as an alternative crop for Georgia farmers. Canola has recently gained Federal and Sate support through passage of the 2003 Farm Bill which provides monetary loan payments for oil seeds and the potential construction of new oil crush facility in Claxton, GA. Imi-tolerant canola could afford farmers a non-GMO crop with potential market to Europe. However, common winter weed control problems associated with small grains are a concern.

Research conducted in 2001-2002 has indicated that wild radish, ryegrass, henbit, and shepherdspurse can be controlled greater than 90% with fall applications of imazamox (Beyond) herbicide in conjunction with an imi-tolerant canola cultivar. GMO canola cultivars (Roundup and Liberty Link) are prohibited in the Southeastern US. Thus, traditional and imi-tolerant canola can be successfully grown in Georgia as an alternative crop, and it has niche market potential as a non-GMO crop.

- b. This research for Georgia canola, could improve marketability by improving yield, decrease weed competition, and decreasing potential glucoside contamination from wild radish, by as much as \$20.00 per acre. For each 10,000 acres of Georgia canola production, farmers could realize an additional \$2,000,000.00 in profit.
- c. Hatch Act, State funds
- d. State Specific

Key Theme: Agricultural Competitiveness, Agricultural Profitability, Plant Health

State Performance Goal: 1-16

- a. The blueberry industry is generally expanding in south Georgia. In particular, production of southern highbush blueberry varieties provides for an earlier harvest – with substantial profit margins. These varieties are susceptible to numerous diseases which can limit yield potential. Summer and fall leaf spot diseases are especially prevalent in these varieties, and of these, Septoria leaf spot, caused by *Septoria albopunctata*, predominates. This disease reduces photosynthesis and causes defoliation, which results in decreased bud set and fruit yield during the following production year. Disease control recommendations were not available for Georgia blueberry leaf spot diseases prior to 2002, and producers were not aware of a need to control these diseases – especially in light of the fact that no fruit are on the plants at the time in which fungicides are required.

As the result of a collaborative effort of extension and research scientists in the Department of Plant Pathology, county extension agents, and blueberry producers in south Georgia, disease control recommendations have now been established for control of Septoria leaf spot on both highbush and rabbiteye blueberries. Aliette (fosetyl-Al), Abound (azoxystrobin), and Cabrio (pyraclostrobin) are now recommended for control of Septoria leaf spot.

- b. Recent work has shown that even moderate, premature defoliation of blueberries in the fall, caused by leaf spots, can substantially reduce the yield of blueberries in the subsequent season. Severe summer/fall leaf spot epidemics can virtually eliminate yields in the subsequent year. Potential yield increases due to fungicide treatment may be as high as 25-50% in fields with severe disease pressure. Following more widespread grower adoption, the impact of these efforts for the Georgia blueberry industry will likely be dramatic.
- c. Hatch Act, Smith Lever, State funds
- d. Integrated Research and Extension

Key Theme: Agricultural Competitiveness, Agricultural Profitability, Plant Health

State Performance Goal 1-16

- a. Georgia's vegetable industry is growing, and these high input crops suffer tremendous losses due to diseases for which the primary sources of inoculum are infested seeds. Examples of such disease are bacterial fruit blotch of watermelon (*Acidovorax avenae* subsp. *citrulli*) and neck rot (*Botrytis allii*) and center rot (*Pantoea ananatis*) of onion. In addition, peanut producers are constantly faced with seed quality issues which may be due to plant pathogens. More specifically, my research focuses on developing efficient classical and molecular detection assays for seedborne pathogens. Another goal of my research program is the development of effective biological control seed treatments for aimed at protecting seedlings from both soilborne and seed borne pathogens. Finally, my research objectives of my program include investigating the genetic population structure of seedborne pathogens and elucidating the process of seed infection by bacteria. The overall goal of my program is efficient disease management by excluding seedborne inoculum.

Many of Georgia's agricultural commodities are propagated through seeds, which in most cases are produced outside the state. As such, imported seeds have great potential to introduce new pathogens and aggressive variants of indigenous populations. Exclusion of primary inoculum is an integral part of disease management and seed health testing represents a feasible means by which this can be accomplished. In the case of bacterial fruit blotch of watermelon, seed testing was the most effective means of disease management and the implementation of an effective seed testing strategy saved the watermelon industry millions of dollars. Despite these savings, there is still a great need to improve seed testing efficiency. This can be accomplished by the use of molecular techniques including the polymerase chain reaction (PCR). One problem with PCR however, is that it is inhibited by seed compounds, and elaborate DNA purification steps are required to circumvent inhibition. This makes the assay unfit for routine seed testing. We developed an immunomagnetic separation assay for *A. avenae* subsp. *citrulli* which significantly improved the sensitivity and efficiency of PCR making it more applicable for routine seed testing. This technique holds great potential for the future of seed testing for bacteria and several of the leading seed companies and seed testing agencies in the US and abroad have expressed interest in adopting this technique.

- b. Currently, we are in the process of optimizing the technique for routine implementation. Using IMS-PCR we recently determined that *Pantoea ananatis*, the causal agent of center rot of onion was naturally seedborne and seed transmitted. This disease first appeared in the commercial Vidalia onion production regions in 1997 and has had a significant negative impact on onion yield. Initially, the source of primary inoculum for this disease was unknown but our findings suggest that seeds may have been responsible for introducing the pathogen. Growers and seed companies have been made aware of these findings and this may result in the implementation of seed testing programs which may mitigate future losses due to this disease. Finally, in watermelon seed production systems, symptomless fruits are selected for seed production with the assumption that the seeds within them will be pathogen-free. Our work has demonstrated that seeds within

asymptomatic watermelon fruits can be infested with *A. avenae* subsp. *citrulli*. This finding is significant because it indicates that visual inspection of watermelon seed production fields may be inadequate for producing pathogen-free seedlots. Additionally, we have proven that watermelon blossoms can be a pathway for seed infestation by *A. avenae* subsp. *citrulli* and that pollinating insects can vector the bacterium. This information may explain why infested seedlots are being produced from production fields with no reports of BFB. It may also lead to an effective strategy for preventing seed infection by protecting watermelon blossoms from pathogen invasion.

c. Hatch Act, Grant funds, State funds

d. State Specific

Key Theme: Plant Health

States Performance Goal: 1-16

a. The tomato spotted wilt virus is transmitted by thrips. Tomato spotted wilt virus has become a major limiting factor to the production of tobacco, peanut and other crops in Georgia and throughout the Southeast. Losses due to tomato spotted wilt have been as high as \$40 million in one year. The primary vectors of tomato spotted wilt virus in Georgia is the thrips, *Frankliniella fusca* and *F. occidentalis*. There are a number of other species of thrips in Georgia, but they do not transmit tomato spotted wilt. Knowing how tomato spotted wilt virus is acquired by *F. fusca* or *F. occidentalis* is being investigated to enhance our ability to develop management practices for tomato spotted wilt virus by preventing thrips from acquiring the virus.

The molecular basis of acquisition of tomato spotted wilt virus by the primary thrips vector in Georgia, *F. fusca*, and the route of the virus in the thrips are being determined. The potential components of the virus and the thrips that are involved in the recognition that occurs between the virus and the thrips midgut cells during acquisition have been identified and are being characterized. The route from the vector midgut to the salivary glands appears to have been elucidated and the organs involved are being further characterized. This information will provide additional insight into the development of means to lessen the impact of this disease.

b. A protein located in the thrips midgut has also been identified as viable candidate for the virus receptor. A cDNA library encoding the gene for this candidate protein is being characterized. The work underway to characterize the protein identified in the thrips' midgut will lead to a better understanding of the nature of this important disease.

c. Hatch Act, Grant funds, State funds

d. State Specific

Key Theme: Agricultural Competitiveness, Agricultural Profitability

State Performance Goal: 1-16

- a. Varroa Mites pose a serious threat to the Bee industry in North America. Without effective control strategies, there is serious risk to GA's beekeeping industry. An IPM program has been developed which for the first time has established an economic threshold for varroa mites that can be used in IPM programs for varroa mite control in bees. A combination of modified hive floors, apiary isolation, and use of resistant bee stock was used in a 3 state study for varroa mite management.
- b. Results indicate that hive floor screens slow onset of economic threshold levels of mites and increased brood production. Also bee colonies that expressed mite resistance had lower mite populations. An economic threshold of 60 to 190 mites on an overnight sticky floor sheet in a bee hive was established thus eliminating unnecessary chemical treatments.
- c. Hatch Act, Smith Lever, State funds
- d. Multistate Integrated Research and Extension: GA, TN, SC

Key Theme: Agricultural Competitiveness, Plant Health

States Performance Goal 1-16

- a. A leaf rust, caused by the fungus *Puccinia hemerocallidis*, on daylily (*Hemerocallis* spp.) was first identified in the U.S.A. in Georgia in Fall 2000. In 2001, the disease spread to gardens and daylily nurseries in over 30 states through the sale or sharing of infected daylily plants. The rapidity of disease spread greatly concerned daylily growers and enthusiasts. Of encouragement to enthusiasts is that in much of the northern parts of the country, daylily rust did not survive the 2001-02 winter to re-infect plants. However, approximately 80-90% of all daylilies sold in the U.S. are produced in southeastern nurseries, and in many of the nurseries daylily rust has become an endemic problem that requires control.

Disease management studies were initiated by Drs. Jean Williams-Woodward and James Buck, Department of Plant Pathology, to evaluate daylily cultivar susceptibility to the disease, as well as fungicide effectiveness in reducing disease development and spread.

- b. Natural resistance to the daylily rust exists within daylily cultivars. Approximately 17% of the 108 daylily cultivars screened in tests were resistant to the disease. There are approximately 49,000 named daylily cultivars, therefore cultivars chosen for evaluation were those grown extensively by commercial nurseries. As a result of this study, some commercial nurseries have stopped growing susceptible cultivars in favor of dependable

resistant cultivars. Growing resistant cultivars has lessened their dependency on fungicides and has saved some nurseries up to \$25,000 per year in chemical control costs for the disease. Fungicides are still and will be used to reduce disease development within nurseries growing daylily cultivars with mixed susceptibility. Fungicide efficacy studies have determined fungicides that can reduce disease development, and when used in rotation can lessen the potential for developing fungicide resistance within the rust pathogen population.

- c. Hatch Act, Smith Lever, State funds, Grant funds
- d. Integrated Research and Extension

Key Theme: Agricultural Competitiveness, Agricultural Profitability, Plant Health

State Performance Goal: 1-17

- a. The production of ornamental crops is one of the fastest growing segments of agriculture in the United States with an estimated value of over \$12.1 billion in 1998. The value of the greenhouse and nursery industry in Georgia is over \$300 million dollars and was ranked as the 5th leading agricultural commodity in 1997. Gerbera (*Gerbera jamesonii*) or Transvaal daisy is a popular cut flower and flowering pot plant and is widely used as a landscape bedding plant. Like several other greenhouse-grown plants, gerberas are susceptible to powdery mildew, a potentially devastating fungal disease. An important management tool for control of powdery mildew is the use of fungicides. However, increasing concerns about the impact of pesticides on the environment, worker safety issues, and the appearance of fungicide resistance in target populations contribute to the need for alternative pest control measures.

A potential alternative to traditional fungicides for control of powdery mildew is the use of acidic electrolyzed oxidizing (EO) water, which has gained attention from the food industry as a non-thermal method for sanitation. EO water is generated by electrolysis of a dilute salt solution in an electrolysis chamber where anode and cathode electrodes are separated by a nonselective membrane made from non-woven polyester fabric. Water collected from the anode (EO water) has unique properties such as high oxidation-reduction potential, low pH, and the presence of hypochlorous acid. These properties make EO water highly bactericidal and fungicidal. The objectives of our studies were: i) to determine how effectively EO water will control powdery mildew development on gerbera daisy compared to a non-treated control and a fungicide treatment; and ii) to evaluate EO water in combination with fungicides in an integrated management system for control of powdery mildew on gerbera daisy

- b. Our evaluation of EO water as a potential alternative to fungicides clearly demonstrated that EO water could control powdery mildew on gerberas. EO water significantly reduced the percent of powdery mildew when sprayed twice a week and when sprayed every other week, alternating with fungicides. EO water is a viable option for controlling powdery

mildew on gerbera daisies and provides an additional tool to reduce the use of traditional fungicides in greenhouses.

- c. Hatch Act, State funds
- d. State Specific

Key Theme: Agricultural Competitiveness, Agricultural Profitability, Plant Health

State Performance Goal: 1-17

- a. Pre-harvest and post-harvest aflatoxin contamination of corn and peanuts are serious impediments to production in Georgia and other southern states where conditions for fungal growth are favorable. In Florida, Georgia, and Alabama all peanut-producing states aflatoxin outbreaks from 1993 to 1996 caused losses averaging \$26 million annually. Currently, measurement of the aflatoxin contamination level of harvested material is conducted by using chemical immunoassays. These methods can only determine the aflatoxin levels in the sample tested, which can be an extremely small percentage of corn or peanuts in a wagon or storage lot. Consequently, the levels of aflatoxin in the sample are sometimes not representative of the entire lot or wagon of peanuts or corn. In addition, small samples at the peanut buying point are visually inspected for the *Aspergillus* species that produce aflatoxin. However, different strains of the fungus can be toxin or non-toxin producing, and are not visually distinguishable.

University of Georgia and USDA scientists have teamed together to examine the possibility of detection of aflatoxin using a trained wasp (biological sensor). The fungi were tested using the wasp sensor to determine if there are differences in the toxin and non-toxin producing strains of *Aspergillus*. The wasps were trained to detect volatile emissions of the fungus on peanuts and corn that produces aflatoxin as a secondary metabolite. *Aspergillus flavus* and *parasiticus* toxin and non-toxin producing strains were cultured and then tested for differences in volatile production under varying conditions.

- b. Tests thus far indicate that the aspergilli strains are distinguishable by their volatile production using the wasp biological sensor. It also appears that these differences in volatile production can be used to determine the length of time the fungi has been growing on corn and peanut substrates. Using the biological sensor, as well as standard analytical techniques, distinct compounds are now being identified to categorize fungi by their volatile production. These results will lead to the development of an aflatoxin detection system that can screen for aflatoxin quickly and more accurately by sampling the headspace of large allotments of peanuts or corn, which is a more representative sample of the peanuts or corn being inspected.
- c. Hatch Act, State funds, Grant funds
- d. State Specific

**Key Theme: Agricultural Competitiveness, Agricultural Profitability,
Diversified/Alternative Agriculture, Plant Health**

State Performance Goal: 1-2

- a. The turfgrass, ornamental and landscape industries in Georgia are rapidly growing in number, volume and types of services. These industries have also become major employers in Georgia. Turfgrass production and management is a major and one of the fastest growing industries in the State. There are approximately 1.6 million acres of turf in Georgia with a maintenance value of \$1.56 billion. Disease losses and control costs account for over \$200 million annually. The production and management of ornamental species has an estimated value of over \$6 billion in the United States. In Georgia the value surpasses \$350 million with an anticipated value added impact of \$1 billion. Due to Georgia's increasing population, the increased use and popularity of turf and ornamental species, as well as their high aesthetic value, the disease losses and control costs are enormous. Thus, there is a significant need to educate producers, managers and landscape companies' personnel and the general public on disease etiology, epidemiology and sound and effective disease management strategies on turf and ornamental species.

A series of statewide trainings, programs and materials on turf diseases identification and management have been developed and implemented. Emphasis has been given in how to rapidly and accurately identify a disease and how to apply the best and environmentally safest management strategies. Materials and programs have benefited County faculty, producers, greenhouse and nurseries managers, landscape companies' personnel, park and grounds maintenance government personnel and master gardeners. The ongoing trainings and programs and available publications will provide the necessary tools and knowledge to diagnose turf and ornamental problems independently. An accurate and rapid identification of a disease will allow county faculty, producers and landscape personnel to implement control measures or appropriate chemical control applications in a timely manner, saving money and avoiding unnecessary pesticide applications.

- b. A total of 2100 individuals have been directly contacted, educated and impacted with these series of trainings and programs. These include three major educational programs conducted: the Turfgrass Field Day, Southern Nursery Association Annual Meeting and Mow and Grow Expo (sponsored by the Georgia Turfgrass Association and the Georgia Green Industry Association) as well as a series of landscape personnel trainings. Indirectly, nearly 50,000 county agents, producers, growers, golf course managers, landscape personnel, grounds maintenance personnel and general green industry personnel have benefited from published materials in several journals and magazines with state wide circulation. One short TV show on these topics was broadcast regionally in one urban county with a potential audience of 125,000. Potential economic impact of these trainings, programs and publications will render savings on selective chemical treatments, on reducing or eliminating unneeded chemical applications, on consulting fees etc. Savings can be valued at several hundred thousand dollars. Intangible but

equally important benefits from these training are the benefits to the environment when reducing non-point source pollutants, such as pesticides.

- c. Smith Lever
- d. State Specific

Key Theme: Agricultural Competitiveness, Agricultural Profitability, Plant Health

State Performance Goal 1-2

- a. Vidalia onions currently rank 17th among Georgia's agricultural commodities with a farm gate value of \$82,559,218. Although Vidalia onions rank only 17th in farm gate value, they are produced on only 15,214 acres which makes the value per acre at about \$5,427 per acre. With such a high value per acre growers must ensure that they do everything they can to protect against weeds, diseases and insect pests. Of these pests, diseases usually account for the greatest losses in yield and quality. In 2002, Vidalia onions were hit hard by a relatively new disease, Stemphylium blight, caused by the fungus Stemphylium vesicarium. An estimated \$30,000,000 was lost to this disease when cost of control is added to the loss in yield and quality. Extension and research pathologists are cooperating with county extension faculty to determine the most cost effective ways to reduce losses to onion diseases while improving net returns.

Extension and research pathologists are cooperating with county extension faculty to determine the most cost effective ways to reduce losses to onion diseases while improving net returns. Fungicide trials conducted at the Vidalia Onion and Vegetable Research Farm in the spring of 2002 were designed specifically to determine the most cost effective fungicides and fungicide programs for control of foliar diseases of onion.

- b. Data indicated that all fungicide programs significantly reduced the severity of Stemphylium blight. All spray programs significantly increased yield over the non-treated check except the standard grower program. A cost analysis was conducted that used the yield difference between the fungicide treatments and the non-treated control multiplied by \$12.00 per 40 lb box minus the cost of the entire fungicide spray program. This information yielded a range of fungicide program values per acre of \$528 to \$2,141 with the standard program at \$785. Therefore if onion growers were to use the optimal fungicide program it could potentially net a total of \$20,630,184 over the standard program if used across the entire onion acreage.
- c. Hatch Act, Smith Lever, State funds
- d. Integrated Research and Extension

Key Theme: Agricultural Competitiveness, Agricultural Profitability

State Performance Goal: 1-2

- a. The Peach industry requires the production of blemish free fruit that meets high quality standards while providing assurance of food safety, worker safety and environmental stewardship. Thus, effective IPM programs are essential to the industry.

A joint state peach IPM program has been developed with South Carolina in support of the industry. Refined research efforts have enhanced our ability to forecast and monitor the development of key pests such as plum curculio and scale insect pests. Growers were provided with on-farm evaluation, refinement and demonstration of developing pest management tools.

- b. Outcomes include a better understanding of development of pests under Southeastern climatic conditions, wild host preference of Plum curculio in peach production systems, and low-risk pesticides. The primary impact has been the successful maintenance of peach production in GA and SC following cancellation of Organophosphate insecticides.
- c. Hatch Act, Smith Lever, State funds
- d. Multistate Integrated Research and Extension

Key Theme: Agricultural Competitiveness, Agricultural Profitability

State Performance Goal: 1-2

- a. Tomato Spotted Wilt Virus continues to be a threat to GA tobacco producers and new strategies to include effective insecticides are essential to control the thrips vectors and the spread of TSWV in crops. Thrips management research programs to include insecticide evaluations are ongoing in tobacco production systems.

- b. Two new insecticides, Admire (imidacloprid) and Platinum (triamethoxam) for thrips management have been labeled and additional experimental products are being evaluated. The use of Admire and Platinum have been shown to reduce TSWV impacts in tobacco by 50% and losses in tobacco due to TSWV could save growers as much as \$5,000,000 annually.

- c. Hatch Act, Grant funds, State funds
- d. State Specific

Key Theme: Agricultural Competitiveness, Agricultural Profitability

State Performance Goal: 1-2

- a. Limited resources mandate that states cooperate as efficiently as possible to meet the needs of common clientele. Such is the case with the small fruits industries in the Southeast.

States joined to participation in the Southern Region Small Fruit Consortium. The long term mission of the Consortium is envisioned to involve collaborative efforts at various sites across the region between small fruit growers and grower organizations, industries and service organizations allied with and/or serving small fruit growers, agricultural extension programs and research stations working together to enhance the development of the small fruit industries in the region. Participating states are Georgia, South Carolina, North Carolina, and Tennessee.

- b. Wine grape acreage in Georgia has expanded 30% in the past three years and this growth is expected to continue. The number of wineries is expected to double within the next five years. The wine grape industry in Georgia has developed a wine trail, complete with marketing information that will greatly increase the agritourism income of the wine grape growing region of the state. Agents trained via described short course are now prepared to assist this growing industry.
- c. Hatch Act, Smith Lever, State funds, Grant funds
- d. Multistate Integrated Research and Extension

Key Theme: Diversified/Alternative Agriculture

State Performance Goal 1-29

- a. Intensive tillage and high rate of nitrogen fertilization in the last few decades have reduced soil and water qualities and increased global warming by increasing soil erosion, organic matter oxidation, and nitrogen leaching, although they increased crop production. Scientists in Fort Valley State University have been examining soil and crop management practices consisting of tillage, cover crops, and nitrogen fertilization rates which sustain crop productivity, improve soil and water qualities, and sequester atmospheric carbon and nitrogen in plants and soils that help to reduce nitrogen fertilizer use and the deleterious effects of global warming.

In the year 2001-02, there tillage practices (no-till, chisel till, and strip till), four cover crops (rye, hairy vetch, rye-hairy vetch mixture, and winter weeds), and three nitrogen fertilization rates (0, 65, and 130 kg N/ha) were employed as split-plot treatments in a randomized block design with three replications. Cover crops were planted in October and sorghum was planted in May of the following year in all plots. Sorghum grain yield and above- and below-ground biomass were measured and analyzed for carbon and nitrogen concentrations for determining carbon and nitrogen uptake.

- b. Sorghum grain and above-ground biomass yields were significantly greater in hairy vetch and rye+hairy vetch mixture with or without nitrogen rates than in rye or winter weeds without nitrogen. Averaged across the treatments, sorghum grain and biomass yields were greater in chisel and strip till than in no-till, greater in hairy vetch and rye+hairy vetch mixture than in rye or winter weeds, and greater in 130 and 65 than in 0 kg N/ha. Carbon and nitrogen concentrations in sorghum grain and biomass samples are being analyzed and their results will be reported later. Similarly, belowground biomass (root) of sorghum and carbon and nitrogen concentrations in it are being determined and their results will be reported later.
- c. Hatch Act
- d. State Specific

Key Theme: Agricultural Competitiveness

State Performance Goal: 1-4

- a. Spotted wilt disease, caused by the tomato spotted wilt tospovirus, is the most important disease of peanuts in Georgia. It is influenced by many factors including planting date, variety, seeding rate, and many others. Since 1999, field observations from several commercial peanut fields suggested that Classic, a postemergence herbicide used for the late-season control of Florida beggarweed, may have an influence on the development of spotted wilt disease. Classic is used on approximately 25% of the peanut acres in Georgia at an annual estimated cost of \$875,000 (product + application).

In cooperation with USDA/ARS (Dr. Carroll Johnson, III), UGA Plant Pathology (Dr. Robert C. Kemerait), and UGA Crop & Soil Science (Dr. Phil Jost) faculty, field trials were initiated at nine locations in Georgia from 1999 to 2002 to assess the influence of Classic on the development of spotted wilt disease in peanut. Information generated from these studies was or will be presented at local county peanut production meetings in Georgia and the 2002 American Peanut Research and Education Society Annual Meeting in North Carolina. Additionally, the results will be published in a future issue of the refereed journal, *Weed Technology*. Extramural funding in the amount of \$13,000 was obtained from the Georgia Peanut Commission and DuPont Agricultural Products to support these research and extension efforts.

- b. Results of these tests indicated that Classic can increase the incidence of spotted wilt disease in peanut. Increases in spotted wilt are most likely to occur when Classic is applied later than 60 days after emergence. However, the increases in spotted wilt disease associated with Classic applications do not always result in decreased peanut yields. Consequently, the 2003 Classic label and UGA Spotted Wilt Risk Index will be amended to include this information. This will enable producers to make a more informed decision about the use of Classic on peanuts.

- c. Hatch Act
- d. State Specific

Key Theme: Agricultural Competitiveness

State Performance Goal: 1-4

- a. Due mostly to the current economics of farming, cotton growers in south Georgia are converting from conventional, plowed tillage systems to conservation or minimum-till. Since 1995, the number of cotton acres being "strip-tilled" (the most common form of conservation-tillage in South Georgia) has increased from approximately 75,000 to 525,000 acres. This major change in tillage systems has forced growers to reexamine other production practices and adjust them in order to maintain high cotton yields, quality and profitability. One area of reexamination includes fertilization and liming. Growers switching from conventional to conservation-tillage have many questions such as should I soil sample differently?, how does lime work if I don't plow it in ?, should I use a starter fertilizer?, do I need to manage nitrogen differently when using a cover crop ?, and can I still use poultry litter fertilizer if I change to strip-till ? Questions concerning nitrogen management and use of chicken litter in strip-till also have environmental implications that are related to water quality.

Different soil sampling techniques (depth and location) have been evaluated and monitored by working with growers and looking at soil test results. Conservation tillage cotton farmers were also polled concerning starter fertilizer materials, rates, placements and potential starter burn problem. Since nitrogen and poultry litter use are both agronomically and environmentally at issue, a number of on-farm research and demonstration projects have been conducted looking at use of these fertilizer materials. For example, immobilization of nitrogen following a small grain cover crop and giving nitrogen credits to winter legume cover crops were examined. Results from these field trials and observations were then transferred to the grower using traditional extension delivery methods such as field days, county meetings, TV, radio, newsletters and popular press articles. Many of these delivery methods reach not only state but also a regional audiences.

- b. Based on correspondence with county agents and directly with growers, these "new" techniques of fertilizing and liming conservation tillage are being adopted. Cases where these necessary adjustments have not been made and crop yields have been affected are few. Overall, conservation-tillage cotton growers have been able to maintain crop yields, quality and profitability when converting from conventional tillage. In addition, the number of cotton acres converted to conservation tillage– with minimal detrimental affects due to not adjusting fertilization and liming methods– continues to increase every year.
- c. Smith Lever, State funds

- d. State Specific

Key Theme: New Uses for Agricultural Products

State Performance Goal: 1-4

- a. The downward trend in fat content in the American food supply, and environmental pressures for new disposal methods for used cooking oils, poultry fat and other by-product fats, has created a large supply of by-product oils and fats which need new markets. An estimated 1.5 billion gallons of poultry fat, yellow grease, choice white grease and tallow are produced annually in the U.S. It is estimated that over 70% of energy purchased by industries nationally is used to produce steam in boilers. Fats and other by-product oils from food processing operations at times are less expensive than some fossil fuels and have similar heat values. Biofuels are known to have low sulfur and particulate air emissions when combusted. Also, biofuel combustion results in no net increase in carbon dioxide, a greenhouse gas, in the atmosphere.

To publicly demonstrate the potential fuel market for fats and oils, a team led by UGA Engineering Outreach has characterized and combustion-tested these biofuels to produce industrial steam. Poultry fat, by-product yellow grease from restaurants, choice white grease from pork processing, beef tallow, and mixtures of biofuels and fossil fuel oil have been laboratory tested for fuel properties and combustion tested in a large (100,000 lb/hr) steam boiler at the Athens Campus of UGA. With grant support from two agencies, a heating oil boiler at UGA was modified at low cost for biofuel, exhaust gas emissions were measured, and advanced flue gas recirculation methods were tested. Another objective of this demonstration was to publish procedures to guide industrial users of the above biofuels.

- b. Biofuels, either singly or blended with No. 2 fuel oil, are technically and economically viable alternative to No. 2 fuel oil. Biofuels are user friendly and less hazardous than petroleum fuels. A comprehensive Web report on the biofuels testing (UGA, Engineering Outreach Program) has been well-received by popular press and industrial boiler users (several in GA report current or future plans to test-use these biofuels). Result is improved income for GA poultry industry.
- c. Hatch Act, Smith Lever, State funds
- d. Integrated Research and Extension

Key Theme: Animal Health, Animal Production Efficiency

State Performance Goal 1-4

- a. Studies from the red-meat industry have shown that a modern increase in animal activity will reduce the fat content in meat and will offset postmortem toughening events. Observations made by our research group during a tendon rupture study have shown that broilers expending a moderate amount of muscle power also have reduced amount of fat in the body cavity although the rate of weight gain was not affected. Also, soft tissue samples taken from some of these birds indicate an increase in collagen fiber diameter that relates to an increase in meat tenderness. Our laboratory has also been successful in requiring 4- to 9-week old birds to step upward on an 8-inch riser in order to access water. Based on these results, the proposed study has a great potential for success.

Dr. Foutz has a collaborative interdisciplinary program focused on the interrelationships between abnormal musculoskeletal mechanics and activity. Preliminary results have been determined for five-week-old birds and data for seven-week-old birds have just been collected. These results indicate that bird growth rate, as measured by body weight and shank length, has not been affected by the riser system treatment. Bird body fat also does not appear to have been affected but bone strength, as measured via ASAE standardized shear test, appears to increase with the riser system. It is anticipated that body fat from seven-week-old birds will be reduced slightly

- b. The anticipated outcome is the development of housing practices that improve broiler health and livability while improving meat production. This study will provide insight into the improvement of meat quality through the use of increased bird activity with minimal modification of current housing practices
- c. Hatch Act, Grant funds, State funds
- d. State Specific

Key Theme: Agricultural Competitiveness, Agricultural Profitability

State Performance Goal: 1-6

- a. Georgia currently has over 11,000 poultry houses in operation with more being built each year. To be competitive in the U.S. poultry industry, poultry producers must utilize the best available technologies and management programs to achieve energy efficiencies and to provide optimum environments for maximum bird growth and performance. The proper operation of ventilation, cooling, and brooding systems is particularly critical in Georgia due to the severe summer climates.

Faculty in the Departments of Poultry Science and Agricultural Engineering have worked collaboratively in the development and implementation of research and educational programs related to in-house environmental control and energy efficiency. Programs have focused on improved heating and ventilation systems. Work has also been initiated to address air quality issues for confined feeding poultry operations.

- b. These research and demonstrational activities represent a continuation of a well developed long standing program focused on managing poultry house environments. These programs continue to have significant impact on poultry producers in Georgia as well as the United States and many foreign countries. As a result of these programs, the University of Georgia is considered a leading authority in the research and application of new technology to poultry house design and operation. It is conservatively estimated that work in this area results in an economic impact of more than \$4 million annually to Georgia producers.
- c. Hatch Act, Smith Lever, State funds
- d. Integrated Research and Extension

Key Theme: Animal Production Efficiency

State Performance Goal 1-7

- a. Each year over 1.2 billion broiler hatching eggs and 12 million commercial layer hatching eggs are produced to support the broiler and table egg industries in Georgia. it is imperative that Georgia’s breeder flocks and hatcheries achieve and exceed industry standards with regard to egg production, fertility, and hatchability. Development and application of new management programs for breeder flocks are necessary for maintaining production performances. Hatcheries are in need of improved sanitation and management programs to achieve maximum production of day old chicks.

Educational and research programs related to breeder flock management and hatchery sanitation and operation have been developed for poultry producers. These programs have focused on improving fertility through procedures developed to identify sperm quality characteristics of males and the improvement of hatchability of fertile eggs through improved egg sanitation methods and incubator ventilation systems.

- b. As a result of these programs, Georgia has remained competitive with regard to poultry breeder flock and hatchery management related performances. Georgia continues to either meet or exceed most industry standards for these important segments of poultry production. It is estimated that these programs positively impact the Georgia poultry industry with a dollar value of 60 million annually.
- c. Hatch Act, Smith Lever, State funds
- d. Integrated Research and Extension

Key Theme: Agricultural Competitiveness, Agricultural Profitability

State Performance Goal 1-8

- a. Georgia poultry producers spend over a billion dollars per year on feed. Availability of consistently high quality feed ingredients allows the producer to formulate feeds more efficiently. Since feed represents over 70% of the cost of producing poultry products at the farm level, producers can achieve substantial savings through effective ingredient analysis and utilization.

The feed services laboratory in the Department of Poultry Science has established the University of Georgia as the leading center of nutritive energy determination for poultry in the western hemisphere. This laboratory makes available a wide range of analyses available to enable poultry producers to effectively determine the nutritive quality of their feed. These analyses help poultry nutritionist formulate least cost rations with the most efficient performance standards. In addition, the laboratory conducts research related to innovative new feeding practices.

- b. The feed services lab continues to process hundreds of feed ingredient samples per year. It is estimated that the information provided nutritive value of the analyzed ingredients saves the poultry industry more than \$20 million annually.
- c. Hatch Act, Smith Lever, State funds, Grant funds
- d. Integrated Research and Extension

Goal 2: A safe and secure food and fiber system

The Centers for Disease Control and Prevention (CDC) and the Food and Drug Administration (FDA) have estimated that there are as many as 33 million reported cases of food borne illnesses each year in the United States. Research and Extension programs recorded many accomplishments toward the goal of a safe and secure food and fiber system.

Extension programs had impact with commercial or institutional food handlers with the ServSafe food safety educational program. A major thrust in this program cycle has been the education of our school children, especially the teaching of proper hand washing techniques.

Georgia has over 30 processing plants that produce over five billion pounds of poultry annually. Faculty salmonella detection and reduction programs in these plants have had great success. Other programs like the Low Angle Laser Light Scattering system have documented impact on the industry.

Key Theme: Food Handling

State Performance Goal: 2-1

- a. The reported incidence of food borne illness from pathogenic bacteria is increasing; these illnesses may be life threatening or trigger chronic disease. Changing patterns of consumption, an aging population, more persons with chronic illness and wide variation in food handling and preparation practices are some of the factors contributing to increased vulnerability of the population to food borne disease. Food safety and quality concerns often put different groups within society in conflict over perceived and real concerns. Approximately 97% of documented cases of food borne illness result from the mishandling of foods in food service establishments and in the home. The resulting percentage from food service establishments alone is about 77%. With an increasing number of meals being eaten away from home, there is the potential for an increased incidence of food borne illness. Employee education and certification in the sanitary handling of food is viewed by food protection experts nationally as one strategy for reducing food borne hazards to the consumer.

County Extension Agents conducted group training programs to teach safe food handling for consumers, elementary and high school students, child care providers, personal care home providers, school food service employees, restaurant employees, food processors, and other food service or distribution professional. County educators collaborated with relevant agencies, organizations and individuals who deliver food handling information to the public and food service industry. Faculty provided technical expertise in food safety to Extension agents and individual or industrial clientele. County Extension educators were trained and updated in food safety issues and recommended food handling practices yearly. Training was offered in use of specific curricula, such as the ServSafe (EFNRA) food service manager certification and employee training programs.

Over 17,300 educational contact hours in food handler education were provided to 12,085 program participants. Almost 89% of them were at-risk or low income audiences. · Almost 900 people participated in ServSafe® food safety educational program. Nearly 50% of them were commercial or institutional food handlers. Another 30% of them were school food service personnel. · As part of a federally funded food safety program directed by the University of Georgia Extension, two new curriculum packages were introduced to teach food safety based on the nationwide Fight BAC!™ Food Safety Education Campaign. The Fight BAC!™ Food Safety curriculum was used to educate over 3000 children in Georgia in 2002. · Media was a major strategy for food safety education; food safety articles in newsletters reached over 157,000 people; radio spots were broadcast to a listening audience of over 5.8 million; newspaper columns went to a circulation of over 2.5 million and television programs were targeted to over 1.7 million people.

- b. Almost 97% of participants said that the food safety training program was helpful to understand food preservation concepts. · After training, adult consumers and child care providers who participated in Food Safety and Sanitation extension programs cited specific food handling behaviors or practices targeted for improvement: 24% specifically planned to improve their hand washing practices; 40% planned to improve cleanliness and sanitation of facilities and equipment; 35% planned to improve temperature control of bacterial growth in foods (e.g. proper thawing, storage temperatures, holding temperatures, cooking temperatures, etc.); and 66% planned to increase the use of food thermometers. Additionally, most of the participants said that they intend to share food safety information with family members, employees, and coworkers to improve food safety habits at home and work. For instance, after training, a participant said, "I plan to maintain high standards and continued awareness of food safety and cleanliness". · A total of 560 food handlers received certification this year in ServSafe® workshops and employee trainings offered by County Extension educators. · Almost 85% of the school food service employees who participated in extension programs improved their food safety knowledge. · After training, school food service employees who were in Food Safety and Sanitation extension programs cited specific food handling practices targeted for improvement. For instance, 97% indicated that they intend to keep raw meat separate from other foods to prevent bacteria spreading from one food to another; 96% indicated that they intend to rinse fruits well with running cool water before they are served; 95% indicated that they plan to take steps in food preparation and food service to make the school food supply more secure. · Comparison of pre and post-test evaluations indicates that elementary school children who participated in the Fight BAC!™ program significantly improved knowledge of all four Fight BAC!™ food safety principles - cleaning, separate, cook and chill. Nearly 85% of the children who were in the Fight BAC!™ program, learned the best way to clean their hands before they touch foods.
- c. Smith Lever
- d. State Specific

Key Theme: Foodborne Illness, Foodborne Pathogen Protection, HACCP

State Performance Goal: 2-5

- a. Processing, further processing and value adding plants are major components of the poultry industry in Georgia. Over 30 plants are currently operating in Georgia producing more than 5 billion pounds of product annually representing more than \$2.5 billion each year to Georgia's economy. It is imperative that these plants operate with the highest level of efficiency while providing food safety and quality control to ensure profitability and compliance with government regulations. These plants are in need of educational and service related assistance in the areas of food safety, quality control, sanitation, government regulation, and waste water treatment.

Faculty in the Department of Poultry Science have developed educational and service related programs to assist poultry processors in the detection and reduction of Salmonella contamination in poultry products, methods for detecting and reducing spoilage, as well as procedures for the improved treatments of poultry plant waste water.

- b. The Salmonella detection and reduction program has assisted every processing plant in Georgia as well as plants outside the state meet USDA requirements for Salmonella reduction. In Georgia, this program directly assisted three processors that were facing eminent closure due to problems with microbiological contamination. Determining the cause and correcting the problem on site avoided shut downs and saved an estimated \$500,000 per day per plant. Similarly, programs related to waste water treatment and conservation have assisted processors in Georgia implement new procedures and technology resulting in savings estimated at more than \$80 million annually.
- c. Hatch Act, Smith Lever, State funds, Grant funds
- d. Integrated Research and Extension

Key Theme: Food Safety

State Performance Goal 2-1

- a. The Centers for Disease Control and Prevention (CDC) and the Food and Drug Administration (FDA) have estimated that there are as many as 33 million reported cases of food borne illnesses each year in the United States. Estimates of the economic costs of food borne illness vary from a low of nearly \$500 million to a high of \$7 billion a year. The consequences of food borne illness can be serious for many people. In spite of the serious consequences associated with food borne illness, few consumers have had any food handling education. This lack of education in rural low-income communities has implications both for consumers handling their own food at home and for their ability to assess the safety of food obtained in eating establishments. The benefits of implementing

a Food Safety Education Program for audiences with low-income and limited resources are that these families and individuals will improve their food handling practices, and in turn, reduce their risk for food borne illness at the same time reduce the economic costs associated with food borne illness.

A Food Safety Education Program for county-based employees to teach and educate their clientele was developed. Major components of the program are food preparation, preservation, storage and handling practices; cooking and storage methods; proper hygiene practices; cooking times and temperatures; food selection techniques; and understanding risks and responsible practices. Curriculums, exhibits, and various resources were written, designed, purchased and adopted.

- b. Campus and county-based employees reached a reported 1436 clientele. Programs were implemented in schools, churches, homes and other sites on food safety, food preparation, hand washing, thawing foods and stopping bacterial growth. Approximately 40% or 574 clientele increased their adoption of recommended food handling and food preservation practices to minimize the risks of food borne illness. These adoptions included cooking and storage methods, as well as cooking and holding temperatures. In addition, 75% or 1077 clientele improved their understanding of risks and responsible practices related to food and health. Over 65% or 933 adopted the use of proper hand washing practices. Overall clientele are making changes in their homes and lives because they are more aware and knowledgeable about food safety and preservation practices. Programs are helping clientele understand that keeping foods safe help them to be healthier.
- c. Smith Lever
- d. State Specific

Key Theme: Agricultural Waste Management

State Performance Goal: 2-6

- a. Water use needed to process a single bird for the poultry industry ranges from 5 to 10 gallons. At the current annual processing rate of more than 1 billion birds, Georgia's poultry industry must deal not only with the treatment of 5.5 - 11 billion gallons of wastewater, but also the use or disposal of the resulting by-products. As a result, the handling of poultry processing by-products has become a major environmental and financial concern for Georgia's poultry industry. It became obvious to the University of Georgia's Engineering Outreach Service that the broiler industry, both in the slaughter and further processing sectors, would benefit financially by maximizing the recovery of unadulterated screened solids. By increasing the volume of high-quality by-products recovered through physical screening, the broiler processing industry would see increased revenue through unadulterated by-product sales, and also a reduction in costs associated with the handling of adulterated solids. To accomplish the goal of better screen selection,

the Engineering Outreach Service teamed with researchers from the Poultry Science and Food Science & Technology departments to develop a research project aimed at producing a simplified model that could quickly and accurately select optimum screen sizes for individual poultry processing applications. The system is based on particle size analysis technology using laser diffraction. The LALLS (Low Angle Laser Light Scattering) system uses a high-powered laser to produce accurate profiles of the size of particles present in a liquid sample.

- b. A model of a typical Georgia slaughter plant was developed for use by the industry statewide. Based on the model, a typical poultry slaughter plant could be expected to remove an additional 35 percent of the particulate matter from their post secondary screened wastewater by installing a 100-micron tertiary screen. The model also predicted that a 50-micron screen would remove more than 50 percent of the remaining suspended particulate matter. At a current commodity value of \$75–150 per ton for primary unadulterated offal, the increased revenue to Georgia’s poultry processors would mean million of dollars as new, more efficient screens are purchased and installed.
- c. Hatch Act, Grant funds
- d. State Specific

Goal 3: A healthy, more well-nourished population

Research efforts and Extension programming in human health and human nutrition continue to affect the lives of Georgia citizens. This report documents recent impacts.

Greater than eighty percent of participants in the Extension's Walk-Weigh program made life changes that reduce their exposure to diet-related illnesses. Children who participate in the Food Fun and Reading Program significantly improve their food and nutrition knowledge.

Sixty three percent of teenage mothers who participated in Extension nutrition education programs indicated that they plan to eat enough nutritious foods to make sure they gain at least twenty-five to thirty-five pounds during the pregnancy.

Key Theme: Human Health

State Specific Goal: 3-1

- a. The leading causes of diet-related morbidity and mortality in the United States and in Georgia today include heart disease, cancer, stroke, and diabetes, ranked respectively from most prevalent to least prevalent. Other significant diet-related public health concerns include osteoporosis and obesity. Statistics show that a disproportionate burden of diet-related disease is borne by minority, low income, and educationally disadvantaged persons. These groups have higher rates of hypertension, stroke, diabetes, and other diseases than the general population. Most of these diseases also occur more frequently with advancing age. Diabetes is a major public health problem in Georgia. Over 422,000 adults (6.9% of the adult population) have diabetes and over half are undiagnosed. It is estimated that \$1 billion could be saved in medical care costs due to complications of diabetes if nutrition education were a routine part of diabetes management.

The University of Georgia Cooperative Extension Service offered a comprehensive diabetes education program. This includes intensive training for County Extension Agents in nutrition issues related to diabetes, a quarterly newsletter focusing on diabetes, the Right Bite Cooking School written by Extension Specialists and conducted by County Extension Agents, and in some counties a diabetes management program conducted locally by County Extension Agents and cooperating hospitals, health departments, or physicians. Walk-a-Weigh is a comprehensive social-learning based weight management curriculum written by University of Georgia Extension Specialists and conducted by County Extension Agents. Fitness is emphasized, and walking is an integral part of the program. Recipes which teach lesson concepts are demonstrated and sampled.

Over 21,200 educational contact hours with 11,086 participants were provided in diabetes education. Majority of the participants were senior adults. Almost 34% of the participants were people with diabetes. FACS agents organized and facilitated 123 Walk-a-Weigh weight management program series, 53 Right Bite Diabetes Cooking Schools, and 89

Diabetes Support Group Meetings in 2002. · Media was a major strategy for public diabetes education in Georgia: diabetes articles in newsletters reached over 130,000 people; radio spots were broadcast to a listening audience of over 1 million people; newspaper columns went to a circulation of over 1.4 million and television programs were targeted to over 2 million viewers; exhibits reached over 6900 people. · The Diabetes Life Lines Newsletter had a circulation of 18,975 in Georgia.

- b. Post test evaluation data confirmed that nearly 60% of the Georgians who attended the Right Bite Diabetes Cooking Schools started the habits of using artificial sweeteners in cooking, eating at least 3 vegetables and 2 fruits a day, using reduced or non-fat products, eating more fish and seafood, and using salt substitutes in cooking. These changes help participants achieve the recommended nutrition guidelines for diabetes. After completion of the Walk-a-Weigh extension program, 67% of the participants started the habit of doing exercise at least three times a week for 30 minutes at a time; 86% of the participants started to trim fat from meat as a measure to reduce fat intake; 81% of the participants started baking, broiling, or grilling rather than frying as a practice to cut fat intake; 87% of the participants started to read nutrition labels to help make food choices. These practice changes lead participants to achieve a healthy life style. Comparison of pre and post evaluation data confirmed that the Walk-a-Weigh participants considerably reduced their cholesterol levels and body weight by adopting healthy dietary habits and regular exercises. The body weight reduction was statistically significant at .001 level (2-tailed).
- c. Smith Lever, EFNEP funds, State funds
- d. State Specific

Key Theme: Human Nutrition

State Performance Goal: 3-2

- a. It is also important to recognize that hunger exists in Georgia. Almost 15% of the population is at or below the poverty level. As a result, many people lack the quantity and quality of food for adequate nutrition. There is a growing recognition that hunger and food security do not exist in isolation. Poverty and related problems that affect families and communities cause hunger. The societal conditions which sustain the problems of hunger and jeopardize food security are known globally. However, the relationships among the issues that endanger food security and create hunger in a community are often not understood. Hunger compromises the ability to learn because it reduces the ability of a child to concentrate. Undernutrition during pregnancy can result in low birth-weight infants who are more likely to require intensive medical care after birth and special education services and infants with neural tube defects resulting from insufficient folic acid. Nutrition education programs enable families and individuals to make food selection and preparation choices that are consistent with their lifestyle and cultural practices and enhance their health status. These programs enable families with limited

resources to get the most nutritional value for their food dollar. In the long-term, nutrition education programs benefit families and individuals, and therefore society, by improving overall health and well-being.

Under the Expanded Foods and Nutrition Education Program (EFNEP) and the Family Nutrition Program (FNP) following actions were taken: · Trained paraprofessionals in low-income communities to teach nutrition to hard-to-reach audiences using culturally-appropriate methods and materials. · Educated families on planning low cost nutritious meals in order to maximize the nutritional value of their diets and decrease the number of families who run out of food before the end of the month. · Taught limited resource clients how to modify their diets to decrease the risk of chronic diseases. · Provided food safety education for limited resource clients. · Provided nutrition education to teenage mothers in order to increase maternal weight gain and intake of crucial nutrients. · Provided food and nutrition education to school children.

In FY 2002, EFNEP reached a total of 10,679 individuals in 2,936 families. · More than 57,400 food stamp and food stamp-eligible Georgians completed a 6-12 hour nutrition class series covering topics such as food safety, meal planning, healthy food choices, nutritious snacks, food budgeting, and healthy cooking techniques. A total of 299 class series were held. · Nearly 145,100 Georgians were educated through 4,500 group presentations or one-on-one consultations under FNP and other food and nutrition extension programs. · More than 250 people attended the food buying training. Almost 78% of them were food stamp recipients.

- b. A total of 2,072 people completed the EFNEP nutrition education program in FY 2002. · After completing the EFNEP program, 88% of EFNEP participants had a positive change in the nutritional value of their diets; Georgians who graduated from EFNEP saved over \$11,000 per month on food; EFNEP participants' total fruit and vegetable consumption increased by 22%; 49% showed improvement in one or more food safety practices, such as thawing and storing foods properly; 69% improved one or more food resource management practices, including planning meals, using grocery lists, comparing prices, and not running out of food; 71% improved nutrition practices such as making healthy food choices, preparing foods without adding salt, reading nutrition labels, and eating breakfast. Among youth participants, 66% reported that they now eat a variety of foods as a result of participating in EFNEP. · Most of the Georgians in Food Buying training learned to buy nutritious foods with very limited resources. Nearly 63% said that they plan to use the unit price to compare food products; 46% indicated that they plan to make a grocery list and stick to it when shopping. Almost 80% indicated that they intend to use the Food Guide Pyramid to plan balanced meals. · Over 65% of the participants in meal planning extension program indicated they would choose more low-fat options and increase their consumption of fruits and vegetables and breads, cereals and grains - all strategies which affect their heart health and risks for cancer. · Nearly 63% of the teenage mothers who participated in nutrition education program indicated that they plan to eat enough nutritious foods to make sure they gain at least 25 to 35 pounds during the pregnancy. · The Children who participated in the Food Fun and Reading Program significantly improved their food and nutrition knowledge.

- c. Smith Lever, EFNEP, State funds, Grant funds
- d. State Specific

Key Theme: Human Health, Human Nutrition

State Performance Goal: 3-2

- a. Leading causes of diet-related morbidity and mortality in the U.S. today include hypertension, heart disease, cancer, stroke, diabetes, osteoporosis, and obesity. Research has shown strong and consistent patterns of relationship between diet quality such as rich in fruits and vegetables and lowered risk of a number of chronic diseases. The U.S. Dietary Guidelines and the Food Guide Pyramid, as well as other national disease prevention recommendations, advise individuals to consume five or more servings of fruits and vegetables each day. In addition to the positive reports on fruits and vegetables, many clinical and experimental studies support a role for dietary fiber, trace elements, vitamins, and other components of whole grains in reducing risk for chronic diseases such as cancer and coronary heart disease. As a result of the increase number of chronic diseases, nutrition education programs are needed. The primary benefit of implementing a Nutrition Education Program for clientele with chronic diseases is that the information and resources help to improve their quality of life, while reducing the economic costs associated with chronic diseases.

A Nutrition Education Program to address the chronic diseases was developed. Major components of the program are The Food Guide Pyramid, Hypertension Resources, Heart Disease Resources, Cancer Resources, Diabetes Resources, Obesity Resources, Exercise Resources and various nutrition, diet and health resources. Curriculums were adopted, exhibits were designed and purchased, resources were purchased, and publications were written and published.

The Nutrition Education Program: Implemented three (3) trainings for Extension county-based employees, implemented one (1) multi-state educational training, reached 2,872 clientele/ individuals/ families, made over 800 home visits, distributed over 20,000 publications (including 10,000 “Vitamins” educational calendars), and conducted approximately 24 campus and county-based programs/workshops.

- b. Campus and county-based employees reached a reported 2,872 clientele. Programs were implemented at schools, churches, homes and other sites on basic nutrition, vitamins, gardening, health care fraud, food guide pyramid, grocery store savings, commodity foods, health and fitness, diabetes, blood pressure, water and breast cancer. All of the programs were focused on improving nutrition and health. Approximately 60% or 1,723 clients improved their nutrition behavior to decrease their risk of chronic diseases. Overall clientele are changing their eating habits and exercising more, learning more about food preparation and meal planning, buying nutritious foods in season and with

coupons, using grocery lists and learning to buy the right foods, and they are saving money. Clientele stated that they want to be healthy and practice healthy lifestyles. The focus in the future will be on organizing more Youth Nutrition and Health Programs.

- c. Smith Lever
- d. Multistate Extension: GA, FL

Key Theme: Human Health

States Performance Goal 3-3

- a. The mosquito is responsible for the infection of several million people annually with vector borne agents of disease such as malaria, nematode and viral diseases around the world. A research program on the hormonal regulation of reproduction in female mosquitoes is ongoing to determine the structure and function of peptide hormones regulating mosquito reproduction.
- b. The outcome has been a greatly enhanced understanding of vector biology, particularly in mosquitoes and related species and several potentially important new tools to incorporate into mosquito management programs. A neurohormone that stimulates ovary steroidogenesis and egg maturation has been identified. One neuropeptide identified functions similarly to insulin in vertebrates and another inhibits host seeking behavior. The gene encoding this behavior has been characterized.
- c. Hatch Act, State funds
- d. State Specific

Goal 4: Greater Harmony Between Agriculture and the Environment

University faculty continue to work diligently in the area of agriculture and environmental harmony. Each year bring more pressure to increase understanding and to find new solutions. The work documented in this report highlights some of those accomplishments in agricultural waste management, soil quality, and sustainable agriculture.

Georgia has certified approximately 400 operators, accounting for nearly all swine, dairy and liquid waste managed poultry farms under the guidelines of the Animal Feeding Operations (AFO) and National Pollution Discharge Elimination System (NPDES) regulations of the EPA. Extension's educational programs enabled farmers to understand and come into compliance with these guidelines. Resources from sixteen hour training workshops to new software applications that assist in planning, our faculty have demonstrated major impact.

Also documented in goal one, increased soil quality through conservation tillage has been accomplished. In Georgia cotton production alone, no-till, a form of conservation tillage increased from 19% in 2000 to 34% in 2002.

The EASY pan system highlighted in this report, increased farmer's irrigation efficiency. The Georgia Farm*A*Syst program had impact working with farmers and rural residents to maintain water quality with irrigation and home wells.

Thru the work of CAES faculty, the Georgia Regional Development Centers are now utilizing target sampling and DNA technology to identify sources of river contamination at reduced cost to the state.

Key Theme: Soil Quality

State Performance Goal: 4-1

- a. Conservation tillage and adding organic matter through cover crops or organic amendments can increase soil organic matter and improve the soil while crops are being produced. Farmers need a better understanding of this relationship and the management practices to improve soil quality so that they can make the most efficient use of natural rainfall and minimize agricultural pollution. Four years ago, in partnership with the Natural Resources Conservation Service, UGA agricultural engineers began collecting data on soil quality in Georgia. The database was designed to document key components of soil quality such as infiltration rate, bulk density (a measure of soil compaction), soil organic matter, water stable aggregates (a measure of biological activity and resistance to crusting), and soil nutrients. They found conservation tillage fields allow more water to move into the soil where the crops can use it. The database information has been

consolidated into an easily understood format and used in 13 different training sessions over the past three years.

- b. They have reached more than 550 farmers or agricultural professionals in Georgia. This information has been part of an educational process that has contributed to a dramatic increase of the acres under conservation tillage. In cotton production alone, acres under no-till, a form of conservation tillage, have increased from 19 percent in 2000 to 34 percent in 2002. As farmers adopt conservation tillage practices, there should be substantial reductions in erosion and, consequently, better water quality. Improvements in soil quality should also increase water use efficiency.
- c. Hatch Act, Smith Lever, Grant funds, State funds
- d. Integrated Research and Extension

Key Theme: Agricultural Waste Management

State Performance Goal: 4-1

- a. Georgia has adopted swine and non-swine regulations as the method to address non-point source pollution from animal feeding operations. Animal Feeding Operation (AFO) and National Pollution Discharge Elimination System (NPDES) regulations are administered in Georgia by the Environmental Protection Division of the Georgia Department of Natural Resources (EPD). All producers above 300 AU's are required to have a certified operator and a Nutrient Management Plan as part of their permit. The Extension Service took on the task of developing a 14-16 hour training program for producers who operate animal waste management systems. Experts were recruited across the UGA College of Agricultural and Environmental Sciences to develop presentations, chapters for a course manual and a question bank from which the Georgia Department of Agriculture could develop and administer a certification exam. A comprehensive exam is administered for the entire training. Operators must make a 70 percent score for certification.
- b. To date, Georgia has certified approximately 400 operators, accounting for nearly all swine, dairy and liquid waste managed poultry farms under the requirement. The Georgia AFO/CAFO program has been implemented with little cost to the farmer through grants secured by the University of Georgia and GDA. Similar certification programs in other areas cost up to \$1,000 per course. This education program enabled farmers to understand the regulations they face, achieve compliance and consider new issues in environmental stewardship.
- c. Smith Lever, Grant funds, State funds
- d. State Specific

Key Theme: Agricultural Waste Management

State Performance Goal 4-1

- a. Regulations passed by the Georgia Environmental Protection Division now require all Confined Animal Feeding Operations (CAFO's) to develop and submit an acceptable Comprehensive Nutrient Management Plan by October 31, 2002. The plan is an extensive document that describes the measures each farm will use to assure their animal waste is handled in an environmentally responsible way. The requirement affects an estimated 25 poultry operations and 175 dairy operations in Georgia (swine operations had to complete their plans by last year). UGA agricultural engineers developed a software package to aid in the writing of these Comprehensive Nutrient Management Plans. The new software, which was developed initially for dairies, is a compiled Visual Basic program. It does not require additional software except for a word processing package for final printout, asks for input from the user only once, and remembers what is put in so that the information can be displayed in one or more locations in the final plan as needed. Most of the calculations are done internally with the results of one section automatically carried forward to the next section to reduce input errors and input time.
- b. This software program was used to create at least 75 percent of the plans that were developed for dairies in Georgia. Comments from plan writers have indicated that the software enabled many of them to complete the plans in time for the deadline. Plan quality and time spent in making revisions will also be dramatically reduced as a result of this effort.
- c. Smith Lever
- d. State Specific

Key Theme: Agricultural Waste Management, Human Health

State Performance Goal: 4-1

- a. Health effects associated with land application of biosolids are not tracked and as such, there have been no documented cases of illnesses. Self-reported illnesses by those living near land application sites have historically been discarded as anecdotal. While land application of biosolids continues, self-reported illnesses also have become more numerous. UGA's Biological and Agricultural Engineering Department has collaborated with other UGA faculty to conduct research on the possible linkage between illnesses of individuals living near biosolids land application sites and irritant chemicals emitted from the site.
- b. The first scientifically peer-reviewed journal article linking adverse health effects with irritant chemicals emitted from land application sites was published this year in a British medical journal and was co-authored by three UGA faculty and other outside

collaborators. This article has raised the level of debate on the subject to the national level.

- c. Hatch Act, State funds
- d. State Specific

Key Theme: Agricultural Waste Management

State Performance Goal: 4-1

- a. Low concentration volatile compound emissions are a major source of air pollution within many industries. High volume low concentration emissions from the pulp and paper industry, rendering industry, composting operations and waste-water treatment facilities contain a range of reduced sulfur compounds that are odorous, toxic at high concentrations, and can contribute to smog formation. Incineration, regenerative thermal oxidation and wet scrubbers are the current air pollution control technologies used to treat the reduced sulfur fraction in many emissions. Environmentally benign and cost effective air pollution control technology of reduced sulfur compounds is required for many agricultural and wood industries. Absorption processes using activated carbon are used in many cases to remove a wide range of volatile organic and inorganic compounds from gaseous emissions and has been used to buffer biofilters from volatile organic compounds perturbations, but is too expensive for most large-scale applications. So a UGA engineer theorized that coal and wood fly ash could act as a low temperature adsorbent/catalytic oxidizer of reduced sulfur compounds, given the potential presence of activated carbon and metal oxides in its matrix. If feasible, the engineers envision that the ash could be incorporated in or on an inert matrix and used in different reactor designs for reduced sulfur compound removal in the rendering industry or pulp and paper industry.
- b. The engineer's studies conclude that wood ash from local Georgia pulp mills was shown to catalytically oxidize and remove H₂S. Hydrogen sulfide is a common air pollutant in pulp mill emissions. The reactivity of the ash was similar to activated carbon (an expensive material) and could act as an inexpensive alternative for removal of H₂S from pulp mill emissions, wastewater emissions, and emissions from large-scale composting facilities. The end product of H₂S oxidization by the ash appears to be elemental sulfur, indicating the spent product may have value as a fertilizer.
- c. Hatch Act
- d. State Specific

Key Theme: Nutrient Management, Soil Quality, Sustainable Agriculture, Water Quality

State Performance Goal: 4-14

- a. Global warming due to increased concentration of carbon dioxide in the atmosphere from intensive tillage practices and reduced water quality due to nitrogen leaching from excessive use of nitrogen fertilizer in crop production are major concerns. Scientists at Fort Valley State University have been examining soil and crop management practices consisting of tillage, cover crops, and nitrogen fertilization rates that sequester atmospheric carbon and nitrogen, improve soil and water qualities, reduce nitrogen fertilizer use, and sustain crop production. Scientists also examined the effect of long-term productivity of rhizoma peanut (a legume perennial forage) on soil aggregation, carbon and nitrogen sequestration, microbial activities, and nitrogen mineralization.

Experiment 1 included three tillage practices (no-till, chisel till, and strip-till), four cover crops (rye, hairy vetch, rye+hairy vetch mixture, and winter weeds), and three nitrogen fertilization rates (0, 65, and 130 kg N/ha) arranged in split-plot design with three replications. Experiment 2 consisted of six treatments (three cover crops: rye, hairy vetch, and crimson clover; two nitrogen fertilization rates, 80 and 160 kg N/ha; and one control without cover crop or nitrogen rate) arranged in randomized block design with four replications. Experiment 3 consisted of two treatments (rhizoma peanut and perennial weeds) arranged in randomized block design with four replications. Cover crops were planted in October and sorghum in experiment 1 or bell pepper in experiment 2 were planted in May and April of the following year, respectively. Rhizoma peanut was planted in April 1990. Cover crop above and below-ground biomass were collected in April and sorghum and bell pepper yield were measured in August and September. Rhizoma peanut biomass was measured in July and October. All plant samples were analyzed for carbon and nitrogen concentrations. Soil samples from 0 to 120 cm depth were collected in April and November from all plots and analyzed for carbon and nitrogen concentrations.

- b. Cover crop above-ground biomass was not significantly influenced by tillage or nitrogen fertilization to summer crops but was greater in rye and rye+hairy vetch mixture than in hairy vetch, crimson clover, and winter weeds. With or without N fertilization, soil organic carbon and nitrogen contents at 0- to 20-cm depth were greater in no-till with hairy vetch than in strip-till with or without hairy vetch. Similarly, organic carbon and nitrogen contents were greater in rye, hairy vetch, crimson clover, and 160 kg N/ha than in the control. Potential carbon mineralization, potential nitrogen mineralization, and inorganic nitrogen were greater in strip-till than in chisel or no-till at 7.5 to 20.0 cm but were greater in no-till and chisel till than in strip till at 0 to 7.5 cm. Potential nitrogen mineralization and inorganic nitrogen were also greater with hairy vetch, crimson clover, and N rates than in the control. Whole-soil ammonium-nitrogen, particulate organic nitrogen, potential carbon mineralization and microbial biomass carbon were greater under rhizoma peanut than under weeds. At 0 to 15 cm, organic carbon and nitrogen concentration, microbial biomass carbon and nitrogen, and particulate organic carbon and nitrogen were greater in microaggregates (<0.25 mm) than in macroaggregates. Under both peanut and weeds, aggregation were greater under subsurface than in the surface soil.

- c. Hatch Act
- d. Multistate Research: GA, AL

Key Theme: Sustainable Agriculture

State Performance Goal: 4-15

- a. Established and emerging markets interested in environmentally friendly production systems that produce value added vegetables will sale these commodities at higher prices compared to conventionally produced vegetables. Developing alternate cultural practices would enhance Georgia's agricultural industry by reducing initial high investment and commercial nitrogen use. In turn, Georgia farmers would improve their income, better protect the environment, and insure farm land usage now and for the future.

In the 2001 growing season the ongoing vegetable rotation study continues with findings that indicate legume cover crops can be an effective N source in supporting plant growth and yield of bell pepper, while enhancing gas exchange similarly to commercial N rates. The following winter-spring fertility treatments were: 1) 0 N winter+fallow-0 N spring, 2) 0 N winter+abruzzo rye-0 N spring, 3) 0 N winter+hairy vetch-0 N spring, 4) 0 N winter+abruzzo rye&hairy vetch-0 N spring, 5) 0 N winter+fallow-90 kg N/ha spring, and 6) 0 N winter+abruzzo rye-90 kg N/ha spring, 7) 0 N winter+hairy vetch-90 kg N/ha spring, 8) 0 N winter+abruzzo rye&hairy vetch-90 kg N/ha spring, 9) 0 N winter+fallow-180 kg N/ha spring, 10) 0 N winter+abruzzo rye-180 kg N/ha spring, 11) 0 N winter+hairy vetch-180 kg N/ha spring, 12) 0 N winter+abruzzo rye&hairy vetch-180 kg N/ha spring. In 2002 tomato was grown after cover was incorporated in spring. The effect of cover crops on above ground biomass, fruit number, tomato yield and net photosynthesis (Pn) were compared with synthetic N rates. Highest above ground biomass (229.8 g/plant) was produced by hairy vetch+0 N. Total yield (96.4 Mg/ha) and fruit number (36/plant) were highest in hairy vetch+180 kg N/ha and lowest (59.5 Mg/ha & 21/plant) in abruzzo rye. Maximum Pn (14.3 micromolCO₂/m²/s) occurred at initial-fruiting with abruzzo rye&hairy vetch+90 kg N/ha influencing Pn the most. We planted cover crops again in fall 2002 to continue this study.

- b. The outcome of this study indicate that leguminous cover crops are an effective N source in supporting plant dry matter, total yield and net photosynthesis of bell pepper. Information from this program has been disseminated at an Agricultural Showcase, Expositions, National and International conventions, and publications in peer review journals. Future evaluation is ongoing for appropriate evaluation to suitably impact Georgia farmers.
- c. Hatch Act
- d. State Specific

Key Theme: Sustainable Agriculture

State Performance Goal: 4-15

- a. Established and emerging markets interested in environmentally friendly production systems that produce value added vegetables will sale these commodities at higher prices compared to conventionally produced vegetables. Developing alternate cultural practices would enhance Georgia's agricultural industry by reducing initial high investment and commercial nitrogen use. In turn, Georgia farmers would improve their income, better protect the environment, and insure farm land usage now and for the future.

In the 2001 growing season the ongoing vegetable rotation study continues with findings that indicate legume cover crops can be an effective N source in supporting plant growth and yield of bell pepper, while enhancing gas exchange similarly to commercial N rates. The following winter-spring fertility treatments were: 1) 0 N winter+fallow-0 N spring, 2) 0 N winter+abruzzo rye-0 N spring, 3) 0 N winter+hairy vetch-0 N spring, 4) 0 N winter+abruzzo rye&hairy vetch-0 N spring, 5) 0 N winter+fallow-90 kg N/ha spring, and 6) 0 N winter+abruzzo rye-90 kg N/ha spring, 7) 0 N winter+hairy vetch-90 kg N/ha spring, 8) 0 N winter+abruzzo rye&hairy vetch-90 kg N/ha spring, 9) 0 N winter+fallow-180 kg N/ha spring, 10) 0 N winter+abruzzo rye-180 kg N/ha spring, 11) 0 N winter+hairy vetch-180 kg N/ha spring, 12) 0 N winter+abruzzo rye&hairy vetch-180 kg N/ha spring. In 2002 tomato was grown after cover was incorporated in spring. The effect of cover crops on above ground biomass, fruit number, tomato yield and net photosynthesis (Pn) were compared with synthetic N rates. Highest above ground biomass (229.8 g/plant) was produced by hairy vetch+0 N. Total yield (96.4 Mg/ha) and fruit number (36/plant) were highest in hairy vetch+180 kg N/ha and lowest (59.5 Mg/ha & 21/plant) in abruzzo rye. Maximum Pn (14.3 micromolCO₂\m⁻²\s⁻¹) occurred at initial-fruiting with abruzzo rye&hairy vetch+90 kg N/ha influencing Pn the most. We planted cover crops again in fall 2002 to continue this study.

- b. The outcome of this study indicate that leguminous cover crops are an effective N source in supporting plant dry matter, fruit number, total yield and net photosynthesis of tomato. Future experimentation is ongoing for appropriate evaluation to suitably impact Georgia farmers.
- c. Hatch Act
- d. State Specific

Key Theme: Water Quality

State Specific Goal 4-2

- a. Irrigation scheduling remains as one of the most critical management factors in any agricultural operation. A system can be efficiently designed, but if water is not applied at the proper time and at the proper amount, water will be wasted or crop production will be poor. Irrigation scheduling technologies have been developed and improved upon for decades. Some advanced computer-based programs are available to help a farm decide when to irrigate and when to stop for specific crops. Unfortunately, many of the advanced technologies and traditional approaches are not being used. Most farmers do not use irrigation scheduling because the techniques are too complicated, the instrumentation requires too much maintenance, or it is too time consuming. An easy and reliable irrigation scheduling method has been needed that can be adapted to a variety of crops.

In 2001, the UGA "EASY" Pan Irrigation Scheduler was introduced. This scheduler uses a simple, but effective design, and is made from readily available parts (such as a wash tub, toilet bowl float, etc.). The EASY pan takes into account the water holding capacity of soil, the water used by the crop being grown, and water applied by sprinkler irrigation and rainfall. In addition, the indicator arm for the float system can be read at a distance (edge of the field) while the unit remains in the field that is being irrigated.

- b. Although the system is simple, tests have indicated reliable irrigation recommendations as compared to more sophisticated approaches (like computer-based models). Over 100 units are now in use across the southeast and as far away as North Dakota. A start-up business was initiated in South Georgia to manufacture and market the units (with at least 1.5 employees). Recent tests have improved the unit to allow a smaller 9 gallon tub to be used in place of the original 17 gallon tub. The pan can be seen at many county extension offices in the row crop production areas. The EASY Pan is expected to provide an opportunity for many farmers to better schedule their irrigations, and thus use water more efficiently. Many farmers, who are not currently using a scheduling method, are using this approach because it is easy to understand and apply. With experience, farmers will be more willing to accept more sophisticated irrigation scheduling approaches for overall improvements in water use efficiency and economic return.
- c. Hatch Act, Smith Lever, State funds
- d. Integrated Research and Extension

Key Theme: Water Quality

State Performance Goal: 4-2

- a. The majority of streams listed on the 2001 303(d) list in the Coastal Plain of Georgia are in violation of dissolved oxygen (DO) standards established by the Georgia Department of Natural Resources. The highest percentage of DO-impaired streams occurs in the southern Coastal Plain of Georgia, where 61 of 67, or 91 percent, of listed streams are in violation of the DO standard. In agricultural watersheds, low DO is generally attributed to agriculturally driven nonpoint source pollution, with potentially serious economic

consequences to agriculture. Some preliminary plans designed to bring streams into compliance require eliminating up to 40 percent of the agricultural activity in a watershed. UGA agricultural engineers initiated a research program to quantify DO levels in the Coastal Plain. Research in three watersheds indicates that low DO in Coastal Plain streams may be a natural condition for summer months. Consequently, it appears that the established State DO standard may not be applicable to Coastal Plain streams – particularly during the extended summer period.

- b. Partly in response to these findings, the Georgia Department of Natural Resources-Environmental Protection Division is proposing a new DO standard based on natural DO conditions. The engineers are partnering with EPD to initiate an extensive stream monitoring program that will establish the natural range of DO in the Coastal Plain of Georgia. Establishing appropriate DO standards will be instrumental in avoiding large and expensive land use management changes that might have minimal impact on improving DO conditions.
- c. Hatch Act, State funds, Grant funds
- d. State Specific

Key Theme: Water Quality

State Performance Goal: 4-2

- a. Farms are potential sources of water contamination because of pesticides, animal wastes and other materials. They also have wells for household use and irrigation. This combination of sources close to drinking water supplies and conduits to the surrounding environment creates a high potential risk for both on-site and off-site contamination and pollution. To encourage the use of farm practices which protect water quality, the Georgia Farm*A*Syst program works with farmers and rural residents to provide technical assistance, training, workshops, demonstrations, and self-assessment publications. The Georgia Farm*A*Syst is an interagency partnership that provides Georgia's farmers a voluntary means to become environmentally pro-active in managing their farms and ultimately protecting ground water and preventing pollution. This program, like the national program that it is modeled after, focuses on identifying potential sources of contamination, supplying information on corrective actions, and ultimately encouraging the farmer to form an action plan to address concerns.
- b. The Georgia Farm*A*Syst program has developed more than 20 assessments that focus on water quality, storage and handling practices, animal production, and land management. To date, more than 15,000 assessments have been distributed throughout Georgia, resulting in completion of more than 500 individual assessments. The program has been used at more than 60 meetings in 40 counties.
- c. Smith Lever. State funds

- d. Multistate Extension

Key Theme: Agricultural Waste Management, Nutrient Management

State Performance Goal: 4-6

- a. Georgia currently ranks as the number one broiler producing state, growing more than 1.25 billion broilers. Georgia also produces 13.0 million breeder hens, 12.0 million layers, and 12.0 million replacement pullets. Growth of Georgia's poultry industry has resulted in more than 2 million tons of poultry manure and used litter produced annually. Most all of this manure and used litter is applied to the land as an organic fertilizer and as a soil amendment. Poultry producers are, however, receiving increased scrutiny with regard to the appropriate application of poultry manures to protect the states' water resources. Proper utilization of poultry manures as a fertilizer is critical to the future of the poultry industry. The implementation of nutrient management plans by poultry producers can reduce the potential for negative impact on the environment and can maximize the economic value of this organic fertilizer.

Faculty in the Department of Poultry Science, the University of Georgia, have worked collaboratively with other faculty in the College of Agricultural and Environmental Sciences to develop a program of voluntary nutrient management plans for poultry producers. The goals were to have all poultry producers in Georgia trained in NMPs and utilizing NMPs even though the state did not require all producers to have NMPs. To meet these goals, training materials and educational programs were developed.

To date, more than 3,800 individuals representing 98% of the poultry operations in Georgia have received the voluntary NMP training. More than 70 training sessions and over 200 contact hours were required to implement the educational aspects of this program. Individuals receiving the training were provided an NMP notebook detailing the methods and procedures for the implementation of these plans. Individuals also received certificates indicating completion of the training process.

- b. Surveys in Georgia indicate that 75% of the poultry producers in Georgia are operating from an NMP. More than 5,000 litter samples have been submitted to the University of Georgia Services Lab over the past three years for nutrient analysis with more than 2500 submitted in the past 12 months. The proper utilization of poultry manure as an organic fertilizer as a replacement for commercial fertilizers through the use of NMPs has an estimated economic impact of \$70 million. The impact on improving the environment and allowing the continued development and viability of a critical agricultural industry would have to be in the billions of dollars.
- c. Smith Lever, State funds
- d. State Specific

Key Theme: Nutrient Management

State Performance Goal: 4-7

- a. Mitchell County ranks 9 in farm gate value and acres of turfgrass production in Georgia with \$3.3 million and 1,125 acres respectively. According to 2001 estimates, Georgia has 39,517 acres in turfgrass production, with an annual value greater than \$112 million. Statewide, turfgrass producers spend over \$1.5 million per year or \$40.00 per acre on fertilizer for crop establishment and maintenance. Also, Mitchell County has 227 poultry houses, which produce approximately 51,075 tons of waste per year. Poultry producers are constantly looking for methods of environmentally responsible disposal of these waste products. Farmers expressed an interest in using poultry litter, a readily available and low cost fertilizer source, for turfgrass sod production.

With direction from University of Georgia turfgrass specialists, Mitchell County agents proposed a study to investigate poultry litter as an alternative nutrient source for re-establishment of 'TifBlair' centipede grass sod fields. Treatments included an untreated control, 2 rates of poultry litter (1 and 2 ton per acre), and two rates of an ammoniacal based fertilizer (ammonium nitrate, ½ lbs per 1000ft² and 1 lbs per 1000ft²). Plots received fertilizer treatment the first of each month throughout the summer and were maintained typical production practices by the cooperating grower. This study, also, investigated the practice of incorporation of turf 'ribbons', the strips left in the field following harvest for establishment of the next crop. Therefore the study was a strip-plot design with main plots being fertilizer treatment and the sub-plots being tillage, four replications were used. Plots were evaluated every two weeks from March until first frost for visual cover and turfgrass color.

- b. There were significant differences in regrowth and color ($p < 0.05$) between tilled and untilled treatments. No differences in visual density and color were observed between poultry litter and ammonium nitrate treatments. Based on these findings, centipede grass regrowth was not improved with the use of poultry waste compared to traditional fertilizer programs. Additionally, soil samples taken at the conclusion of the study indicated increases phosphorus levels in litter treated plots. Previous research has shown high phosphorus levels to be detrimental to centipede grass. While, chicken litter is less expensive than chemical based fertilizers and in some cases a readily available material, it may not be an alternative nutrient source for centipede grass production. Further research is needed to determine the usefulness of litter in the production of other turfgrass species, such as Bermuda grass and zoysia grass, which are less susceptible to high phosphorus levels.
- c. Hatch Act, Smith Lever, State funds
- d. Integrated Research and Extension

Key Theme: Water Quality

State Performance Goal: 4-7

- a. People concerned about water quality are often interested in identifying sources of fecal contamination. For example, is the fecal contamination in a local river from humans or wild animals? With certain DNA-based methods, it is now possible to identify these sources; this is called bacterial source tracking. Most of these methods involve isolating specific fecal bacteria from the contaminated water and from a variety of different warm-blooded animals. The DNA "fingerprints" of the bacteria from the water match one or more of the host sources is taken, then the source is identified. The problem with this method was that the DNA of the specific fecal bacteria varied too much over time and geography to get a lot of matching.

Targeted sampling was developed to solve this problem. Targeted sampling has four steps. The first step is to sample the entire area of contaminated water, collecting between 50 and 100 water samples in one day. It is important to do this sampling when it is not raining, because runoff affects the results. Fecal contamination is plotted on a map and hotspots are identified. The second step is to talk with local citizens, concerned groups like Adopt-A-Stream, and state agencies, about these hotspots. If a specific area is identified, often these persons or agencies have a good idea where the fecal contamination is coming from. The third step is to combine this local knowledge with another sampling, only this time in the area around the hotspots. Numbers of fecal bacteria can be either high or low. Low counts are likely transient sources of fecal contamination; high counts are likely persistent sources. Transient sources can usually be ignored, but persistent sources are important. If a persistent source is something like a pipe, then there is no need for further sampling because the source is obvious. However, if the source is not obvious, then this requires the fourth step, bacterial source tracking. Here the potential host animal sources and the contaminated water are sampled in one day around the persistent source. Because the number of sources of fecal contamination is small and the sampling is done in one day in a limited area, it is a lot easier to get good DNA matching.

- b. Targeted sampling was tried on the Sapelo River on the Georgia Coast and it worked well. Almost half of the fecal contamination in this tidal river came from a failing private wastewater treatment facility. This facility is now fixed. Targeted sampling made the site easy to identify. For bacterial source tracking, the bacteria did not vary so much with regard to time and geography, and it was easy to get good DNA "fingerprint" matching. Targeted sampling is also a lot less expensive and time-consuming than the original method. Targeted sampling is now being adopted by several Georgia Regional Development Centers to identify sources of fecal contamination.
- c. Hatch Act, Smith Lever, State funds
- d. Integrated Research and Extension

Key Theme: Agricultural Waste Management

State Performance Goal: 4-7

- a. In highly polluted soils, excess metals such as cadmium, zinc, lead, copper, etc. could be dissolved and/or desorbed from the solid phase. This can lead to leaching of metals to groundwater and/or accumulation of metals in plant tissue affecting plant growth and quality.

Environmental soil chemists at the Savannah River Ecology Lab, in conjunction with few colleagues in Europe and Australia, have been instrumental in developing risk-based in-situ immobilization techniques to minimize mobility and bioavailability of metals to plants. This has been accomplished by adding rather abundant and inexpensive soil amendments (examples: rock phosphate, hydroxyapatite, alkaline composted biosolids, iron-rich waste by-products and alkaline coal fly ash) to substantially increase metal retention in soils. These amendments retain metals by adsorption, precipitation, complexation, and fixation in crystalline structure.

- b. When the amendments were added to polluted soil, the “available” pool decreased significantly while maintaining the total content of the metals at the same level. This indicates that metal partitioning between the aqueous and solid phases was redistributed towards the solid phase into less labile, more recalcitrant form, rendering the soil risk free. Therefore, this in-situ technique speeds up soil cleanup by enhancing natural biogeochemical processes that favor metal retention in just a matter of days rather than years. This technology is now getting wider acceptance in the United States and abroad in soil cleanup involving large tracts of land superficially polluted.
- c. Hatch Act
- d. State Specific

Key Theme: Water Quality

State Performance Goal: 4-7

- a. Golf courses often apply fertilizer nutrients once or twice a year at fairly high rates. Because the courses often have steep slopes and because we have high intensity rainfall in the Southeast, there is a potential for runoff of nitrate-nitrogen and phosphorus into surface waters that will degrade water quality. Samples taken at the outlet of a surface drain at a golf course in Atlanta confirmed that under certain circumstances, high amounts of these elements can appear in discharge water.

Twelve identical field plots equipped with simulated rainfall equipment and apparatus to measure volume and take samples of runoff water were used to examine the effects of fertilizer rate, source, and management practices on concentrations of nitrate-N and phosphorus in the runoff water. We compared adding simulated rainfall on the day we applied fertilizer versus applying a small irrigation to "water-in" the fertilizer and then apply the first simulated rainfall three days later.

- b. Phosphorus and nitrate nitrogen mass transported increased step-wise with rate increases for the first two runoff events. Watering-in and waiting three days greatly decreased the volume of runoff water and the amounts of phosphorus and nitrate nitrogen transported. Runoff volume was a function of soil moisture content before the simulated rainfall events. Total percent of phosphorus in runoff of that added was 13.8 % for without and 3.4 % with watering-in for the high rate (11 kg P/ha) and total nitrate-nitrogen was 1.5 % and 0.8 %, respectively. Results indicate that watering-in fertilizer with a small amount of irrigation after application is beneficial in decreasing runoff of fertilizer nutrients. Other best management practices are to limit fertilizer amounts applied in one treatment and to avoid application when soils is very moist or when heavy rain is expected.
- c. Hatch Act
- d. State Specific

Key Theme: Sustainable Agriculture

State Performance Goal: 4-7

- a. Water conservation is an on-going priority of state and local officials in Georgia. Effective turfgrass water conservation strategies must be science-based to be successful.

The "Turf Park" has been initiated in 2002 as a cooperative effort of CAES faculty and the turf industry to develop a site for research and education related to turfgrass water quantity and quality issues. The primary focus of the "Turf Water Research and Education Park" will be to enhance strategies for water conservation of turfgrass sites, namely by: development/use of drought resistant grasses; use of alternative irrigation water sources and dealing with any adverse constituents in the water; irrigation scheduling using the most state-of-science technology; excellence in irrigation system design; altering management practices to maximize water use-efficiency and to minimize adverse effects; continuing education; and monitoring of success. For each of these strategies to be effective requires the most cutting-edge science and technology. Park facilities include rainout shelters, Environtron, runoff test site; leaching assessment sites; state-of-the-science irrigation scheduling equipment for plant, soil, and climatic based irrigation scheduling; field/lab/greenhouse facilities; and considerable plant/soil/climate monitoring equipment. The "Turf Park" research and education team includes several disciplines and much of the research is multi-disciplinary in nature.

- b. The Turfgrass Water Research and Education Park will foster a strong, multi-disciplinary, science-based approach to deal with water conservation and quality issues for the citizens of Georgia; thereby, maximizing water-use efficiency and the effective use of alternative [to potable water] irrigation water sources. The multi-disciplinary approach will insure the "best" BMPs (Best Management Practices).
- c. Smith Lever, State funds
- d. State Specific

Key Theme: Forest Crops, Forest Resource Management

State Performance Goal: 4-8

- a. Bark beetles, particularly Southern pine beetles and Ips engraver beetles have been killing large numbers of high value pine trees in residential areas, parks and other areas such as seed orchards necessitating the development of successful control measures. An insecticidal control has been developed to identify insecticides with potential for long term protection of these trees.
- b. Two insecticides have been identified that can provide adequate prevention of Southern pine beetle attacks. These exhibit minimum bark residue and are currently efforts are underway by the manufacturers to register and market products with the synthetic pyrethroid bifenthrin as active ingredient.
- c. Hatch Act, State funds
- d. State Specific

Key Theme: Agricultural Waste Management

State Performance Goal: 4-9

- a. The continued exponential growth in human population has created a corresponding increase in generation of biosolids, end product of wastewater treatment plants. The annual production of biosolids in the United States is projected to increase sharply to 47 million tons within the next decade. Land application is becoming a major means for biosolids disposal because of its beneficial effects on agricultural productivity of soils. However, due to its close association with human activities, biosolids often serve as a sink for anthropogenic organic chemicals that cannot be degraded during the wastewater treatment processes. EPA currently has no regulations on the levels of organic chemicals in biosolids although land application and landfill of biosolids could have a high potential of continuously introducing organic contaminants into the water resource due to surface runoff and leaching. Wastewater treatment plants in the United States and world-wide are

in urgent need for cost-effective technologies for reduction of organic contaminants in biosolids. Aerobic bioprocess (composting) is a potential cost-effective alternative in reducing organic contaminants in biosolids.

The levels of a variety of organic chemicals were investigated in biosolids collected from 21 wastewater treatment plants, serving rural, industrial, and urban communities, across the State of Georgia. The potential for biosolids-associated organic chemicals to enter into the water environment through leaching is assessed. In collaboration with an agricultural engineer at UGA, a laboratory pilot-scale study is established followed by a commercial large-scale study to develop an aerobic bioprocess (composting) for enhancing degradation of organic chemicals in biosolids and to transfer the technology to users.

- b. A variety of anthropogenic organic chemicals were detected in biosolids from Georgia wastewater treatment plants. The levels of the detected anthropogenic organic chemicals in the biosolids ranged from parts per billion to parts per million. Nonylphenol, an endocrine disruptor, was detected up to 1000 parts per million in several biosolids from wastewater treatment plants servicing cities with heavy industry. A laboratory pilot-scale study is currently being conducted to develop an aerobic bioprocess to treat biosolids heavily contaminated with nonylphenol. The processes developed in this study will likely be effective to reduce other similar organic chemicals in biosolids. The knowledge gained will be shared with WWTP managers, decision makers, and the general public by web communication, reports, presentations, and workshops. The success of this research will not only have significant economic impact on wastewater treatment plants in the United States and world-wide but also have tremendous environmental impact.
- c. Hatch Act, State funds
- d. State Specific

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

Many internal and external problems impact the quality of life of Georgia citizens. Efforts in this area are a high priority for our faculty. The Georgia 4-H Program has continued to demonstrate large impact of the youth of Georgia. The leadership programs are some of the largest in the nation. Two successful leadership programs are documented in this report.

Family Resource Management goals are increasing important each year in Georgia. The Making Every Dollar Count Train the Trainer Program significantly increased their knowledge and skills in teaching money management and greatly multiplied our state's efforts in this area. The Surviving Tough Times Extension Program increased knowledge skills needed to manage unemployed periods.

Georgia Extension continues to be one of the largest single sources of the required community-based education for Georgia child care providers.

Key Theme: Family Resource Management

State Performance Goal: 5-1

- a. During the 12-month period ending Sept. 30, 2002, 1 of every 40 households filed for bankruptcy in Georgia. Georgia ranks the third highest in bankruptcy cases in the nation (American Bankruptcy Institute). The personal saving-rate for the United States is at the lowest level in history, suggesting that Georgians and other citizens are not saving adequately for future needs. Families need to know how to plan their finances, cope with lack of adequate income effectively, control cash flow, manage credit and debt wisely, insure adequately, contribute to savings/investments regularly, pay necessary taxes but no more, prepare to retire at current living level, and pass assets to heirs. Limited resource families, particularly, are faced with economic uncertainty, and it is often difficult for these families and individuals to make wise consumer choices in the marketplace and meet basic needs. Additionally, identity thefts and telemarketing frauds are becoming a real problem. Most of the time seniors are the victims of telemarketing frauds.

Under family resource management, following actions were taken: · Delivered the Making Every Dollar Count Train the Trainer Extension Program and trained paraprofessionals, community leaders, and volunteers to teach financial management in moderate to low-income communities. · Delivered the Personal Financial Choices Debt Reduction Education Program in order to help Georgians who are in debt. · 86 Financial Management programs were conducted to teach basic financial management skills. · 23 high school financial planning programs were conducted in order to develop financial management skills among youths. · A state-wide media campaign and 51 Fraud

Prevention workshops were conducted to make Georgians aware of potential identity thefts and telemarketing frauds. · Peer Financial Counseling Train the Trainer Program was conducted to provide financial management education to college students. · 19 consumer education programs were carried out to teach consumer skills necessary to make wise decisions at the competitive market place.

More than 270 financial management educational programs were held in 2002. · Nearly 16,000 hours of financial management education were provided to over 8,100 Georgians; Thirty percent of these participants were low-income. · 288 professionals, educators, community leaders, and volunteers received training in money management designed to increase their competence in teaching and advising their low-income clientele through 13 Making Every Dollar Count Train the Trainer Extension Workshops. · 72 Personal Financial Choices Extension Programs were conducted in six counties to help debtors and reached 437 individuals in 2002. · Media were a major strategy for public financial management education; articles in newsletters reached more than 73,000 people; radio spots were broadcast to a listening audience of more than 3 million and newspaper columns went to a circulation of almost 492,000; television programs were broadcast to more than 2 million viewers.

- b. Participating trainers in the Making Every Dollar Count Train the Trainer Program significantly increased their knowledge and skills in teaching money management. Each of these trainers reached about 56 clients per month. 69% of the participants indicated that they are going to tell their clients about the Earned Income Tax Credit. · By responding to three-month follow up evaluation, a trainer who completed the Making Every Dollar Count Train the Trainer program mentioned "I was able to help get a family involved with financial counseling services. A budget and debt payment plan was developed and implemented. Without this training, I don't think that would have been possible. Also, I've been able to share with others about services available to help them that many aren't aware of or they may be misguided in their thinking." · The participants in the Personal Financial Choices Debt Reduction Extension Program significantly improved their money management knowledge and skills. · After completing the Personal Financial Choices Debt Reduction Extension Program, 90% of the participants said that they are more likely to keep track of their spending; 82% of the participants said that they are more likely to reduce spending for one or more expenses; 78% of the participants said that they are more likely to start an emergency saving fund; 82% of the participants said that they are more likely to develop a written plan for spending; 93% of the participants said that they are more likely to get their financial records more organized; 95% of the participants said that they are more likely to complete their chapter 13 payment plan. The program participants' testimonies witness the success of this program. For example, one participant said, "I need to change the way I think about spending money. I need to look at spending money in a more detailed manner". · Almost 100% of the participants in the fraud prevention extension program learned to interrupt the telemarketer and hang up the telephone immediately.
- c. Smith Lever, State funds

d. State Specific

Key Theme: Jobs/Employment

State Performance Goal: 5-2

- a. Self-management skills are the foundation of employee marketability. They begin with setting personal goals which include the enhancement of one's appearance and health. Appropriate work apparel, grooming and hygiene, proper diet and exercise practices all contribute. While initial goals are being determined and achieved, progress can be made toward developing skills needed to competitively interview for and hold a job. In Georgia, more than one million persons live below the level of poverty. According to Georgia DHR, 130,409 persons received TANF every month in 2002. Georgia ranked 23rd in the U.S. in per capita income for 1999 at \$27,324 and has a higher poverty rate for both individuals (14.7%) and children (22.8%) than the U.S. overall (Source: U.S. Census).

County Extension Agents conducted group training programs to teach life skills for limited resources consumers. County educators collaborated with relevant agencies, organizations and individuals to provide workforce preparedness education and information. · 49 Work Force Preparedness Workshops and 38 Skill Building Workshops were conducted to develop management skills among the limited resource families. · The Surviving Tough Times Extension Program was delivered to address issues and problems faced by the client groups who lost their jobs due to slowing economy. · The Gateway Curriculum was used to teach workforce preparedness. · The Welcome to the State of Poverty Simulation Workshop was used to make service providers and community leaders aware of the problems and issues faced by the people with limited income.

More than 9,000 hours of work force preparedness education were provided to over 4,200 Georgians through 49 training workshops. Approximately 34% of the participants were low-income or at risk audiences. · Extension provided life skills education in almost 38 programs. · Eleven Surviving Tough Times Extension Programs were conducted reaching 157 individuals. · Nine Welcome to the State of Poverty simulation workshops were offered, reaching 371 community leaders, and decision makers to educate them on issues and problems associated with limited income families. · Provided work force preparedness education by media to thousands of Georgians; related articles in newsletters reached over 31,500 people; radio spots were broadcast to a listening audience of over 3,000 people; newspaper columns went to a circulation of almost 112,000 and television programs were targeted to almost 50,000 people.

- b. Almost 79% of the people who participated in the Surviving Tough Times Extension Program rated the program as very helpful for them to gain knowledge skills needed to manage unemployed periods. Nearly 51% of the participants in the program said that they learned to identify at least one way to reduce their spending. · More than 90 % of the community leaders and decision makers participating in the poverty simulation workshop

felt they had a better understanding of some of the obstacles faced by poverty-level families after the simulation and almost 75% felt more able to develop community plans of action. For instance, after participating in the program, a community leader said "This is a very good eye-opening training for the community. It gives you a true sense of frustration and a real picture of what it's like to be drowning financially."

- c. Smith Lever, State funds
- d. State Specific

Key Theme: Family Resource Management, Impact of Change on Rural Communities

State Performance Goal 5-2

- a. There are internal and external social problems impacting families, individuals and communities. Some of these problems are centered around ineffective parenting, communication skills and family life. Parents need to learn how to openly and effectively communicate and share values, attitudes, and knowledge with their children. Society increasingly recognizes the critical importance of effective parenting and communication. Unemployment, mobility, divorce, and absent parents, along with related social conditions, combine to aggravate parent-child relations. Adults play critical roles in the physical, emotional and mental development of children. Increasing numbers of youth are growing up without the basic types of support necessary to become capable and responsible adults. This support takes many different forms, including nurturing parenting, positive school experiences, supportive communities and opportunities to explore career and life options. Extension provides a unique approach to supporting youth and families at-risk through an overall positive youth development focus.

A Family Development/Life Program to address teen pregnancy prevention (youth taking charge), parent education and basic skills was implemented. Major components of the programs are curriculums and resources that were adopted from and supplied by both 1862 and 1890 institutions with similar outreach programs, such as the University of Arkansas at Pine Bluff, Washington State University and Oregon State University. Additional support curriculums and educational resources were purchased.

The Family Development/Life Programs at Fort Valley State University: Implemented three (3) trainings for Extension county-based employees, distributed nearly 6,000 publications, conducted approximately 12 campus and county-based workshops, reached 1,172 clientele/individuals, and made over 800 home visits.

- b. Campus and county-based employees reached a reported 1,172 clientele. Programs were implemented in schools, churches, homes and other sites with the focus on family development/life, getting families involved, parenting skills and youth taking charge with teenage pregnancy prevention. Approximately 65% or 762 clientele adopted one or more recommended practice, changed behavior and increased knowledge. Overall parents are

spending more time in their children's schools to check on the progress of their children, learning more about responsibility and how to share responsibility, sharing family expenditures with family members, learning to shop for good merchandise and bargains, and learning good parenting skills. Clientele stated that these programs are making a difference in their lives and they are reaching their goals.

- c. Smith Lever
- d. State Specific

Key Theme: Aging

State Performance Goal: 5-3

- a. Georgia's senior adult population will nearly triple by the year 2025, with the largest rate of increase among those over 85 years of age (US Census population projections). Many seniors will remain healthy and vital to much older ages resulting in opportunities for volunteering, nontraditional jobs and recreation; there will also be increased demand for specialized services in housing, education, health and nutrition. Seniors are seeking to remain independent as long as possible and frequently choose personal care homes for assisted living as it becomes necessary.

The University of Georgia Cooperative Extension Service offered a variety of educational programs to meet the needs of growing older population in Georgia. This includes intensive training programs on nutrition and health issues, managing resources, housing and preventing frauds. County educators collaborated with relevant agencies, organizations and individuals in providing educational programs to senior citizens.

- b. Programming provided more than 30,000 hours of nutrition and food safety education to more than 18,700 senior citizens in 2002. · Provided more than 4,600 hours of diabetes education to more than 4,000 seniors. · Provided more than 6,000 hours of housing, financial management, and consumer education to more than 3,200 seniors. · Provided nearly 1,100 hours of DHR certification required continuing education to more than 500 personal care home providers, seeking to insure improved safety and quality of life for residents.

Nearly 63% of the participants indicated that they intend to adopt a regular exercise schedule. · After training, most of the senior citizens who participated in the Diabetes Cooking School extension programs adopted healthy dietary behaviors or practices. For example, 50% seniors started to use artificial sweeteners to prepare desserts; 86% seniors started to use reduced fat margarine; 76% seniors started to eat at least three vegetables a day; and 81% seniors started to use low fat or non-fat dairy products. · Almost 85% of the participants in fraud prevention extension programs were seniors and they learned to be very cautious when conducting business over the telephone with unknown entities.

- c. Smith Lever, State funds
- d. State Specific

Key Theme: Child Care/Dependent Care

State Performance Goal: 5-4

- a. Child care is the third highest household expense for most families of young children (after shelter and food). According to DHR, the cost of care ranges from \$68 to more than \$100 per week per child. Child care that is affordable, accessible, convenient, and of high quality is not available to many Georgia parents needing it. Most child care in Georgia and nationwide is only of marginal or poor quality. High staff turnover, poor quality environments, and lack of training and experience in child care staff contribute to low quality care. According to the Center for the Child Care Workforce, the average hourly wage of a child care worker is \$6.69, compared to \$8.42 for a pre school teacher, and \$26.82 for a kindergarten teacher. Many parents seek the least expensive child care, not understanding the benefits of high-quality early care and education.

County educators collaborated with relevant agencies, organizations and individuals in order to provide child care training programs locally. Faculty provided technical expertise in child development to Extension agents and other relevant agencies. County Extension educators were trained and updated in child care issues and recommended child care practices yearly. Training was offered in use of specific curricula, such as the Early Brain Development. Early Childhood Institute was conducted in order to improve child care providers' knowledge and skills. Extension collaborated with numerous other organizations, including child care resources and referral agencies, technical agencies, and the Advancing Careers through Education and Training initiative to ensure that high-quality community-based training is available for child care providers. Extension was a partner in grant projects to support professional development for child care providers.

- b. Extension is one of the largest single sources of the required community-based education for Georgia child care providers. Extension provided nearly 47,900 educational contact hours to more than 16,400 child care providers in 2002. Extension provides this training at approximately 1/4th the cost of utilizing consultants and other agencies. · Over 34 child care providers received over 68 hours of training through child care self-study courses. · Media efforts have been undertaken to increase awareness: Newsletter articles have reached more than 310,000 clients; radio spots have been broadcast to a listening audience of 1.6 million; newspaper columns have gone to a circulation of almost 2.8 million, and television has targeted 311,000 viewers. · Over 2,500 Child Development publications have been distributed.

Nearly 93% of the child care providers who participated in the Guidance and Discipline extension program considerably improved their knowledge. · Majority of the child care providers who participated in the Dare to be Messy training program indicated that they

intend to adopt appropriate child development activities. For example, 75% of the participants indicated that they plan to try out some of the sensory recipes they made in the class; 53% of the participants indicated that they plan to avoid projects that can be completed in only one way. After participating in the Early Brain Development program, child care providers made a commitment to adopt selected practices to enhance early brain development. More than 71% of child care providers planned to expose children to a foreign language.

- c. Smith Lever, State funds
- d. State Specific

Key Theme: Leadership Training and Development, Youth Development/4-H

State Performance Goal: 5-6

- a. Performing arts is an area that youth have a high level of interest in very large numbers. Often youth do not have ample opportunities to present their talent and develop presentation skills. Research validates that often younger students have very limited opportunities to show case their talent. Performing arts experiences can enhance self esteem and improve communication skills.

4-H as part of the College of Agricultural and Environmental Sciences / Cooperative Extension Service provided performing arts opportunities at the elementary, middle and high school age levels at local, district, state, and national forums. These opportunities included project achievement in 4 different performance areas and 18 different locations to three different age groups. 4-H also held auditions and cast a statewide performing arts group to represent 4-H and develop life skills in a group of students. In addition to the state wide program, talent presentations and performances are part of area and regional fairs and talent shows.

- b. 812 youth participated in district competition in performing arts projects. 110 youth participated in preparation and presentation of auditions for the State wide performing arts group, Clovers and Company. 4-H members presented talent presentations at eight other state and national forums. Approximately 130 youth used 4-H performing arts as their base for presentations at area and state fairs.

4-H Clovers and Co. is regarded as one of the premier performing groups in Georgia and was invited to perform at five national meetings. The audience response to Clovers and Co. has been enthusiastic and positive on all occasions. When asked to describe their experiences in the 4-H performing arts program, 97% of the youth expressed that the experience in 4-H performing arts had enhanced their skills and raised their confidence level. There was a retention rate of 100% of youth involved in Clovers and Co. staying involved in 4-H as they changed grades in school.

- c. Smith Lever, State funds
- d. State Specific

Key Theme: Children, Youth, and Families at Risk, Youth Development/4-H

State Performance Goal: 5-7

- A Youth need opportunities to provide service and increase their understanding of issues relative to individuals who are at risk. Youth need projects that enable them to take a personal part in improving the quality of life for their peers who have limited resources or extraordinary challenges. Service learning is an integral part of youth development active citizens

Curriculum was developed for use at the local level by state and national 4-H staff. Counties incorporated workforce preparation into their lesson plans. Statewide Forum for high school aged students addressed career exploration and workforce preparation. A task force was formed early in 2002 to plan a statewide Junior Conference for the Fall of 2002, which formulated a plan to address 4-H project development and service learning at the Fall Junior Conference for seventh and eighth grade youth.

- b. 746 youth and adults participated in statewide Fall Forum developing skills that would enhance their ability to select a course of study and career. 1,059 youth attended conference and engaged in helping others by way of several projects. More than two tons of pop tops (more than 6 million tops) were collected but the youth and donated to the Ronald McDonald project. The middle school students assembled 200 kits for parents of new born babies. The youth also prepared 300 art project for use in urban hospitals.

Through 4-H Fall Forum, participants gained skills in workforce preparation that enabled them to serve as mentors to other youth in local programming throughout the state. More than 1,000 youth gained an appreciation for service work and citizenship efforts. Thousands of dollars were raised to help families of critically ill children. More than 200 new mothers received tangible support from 4-H members in the form of the new born kits. More than 1,000 youth increased their awareness of citizenship and gained coping skills and an appreciation for youth and families at risk.

- c. Smith Lever, State funds
- d. State Specific

Key Theme: Children, Youth, and Families at Risk

State Performance Goal: 5-7

- a. Increasing numbers of youth are growing up without the basic types of support necessary to become capable and responsible adults. This support takes many different forms, including nurturing parenting, positive school experiences, supportive communities and opportunities to explore career and life options. Extension provides a unique approach to supporting youth and families at-risk through an overall positive youth development focus, in addition to targeting specific at-risk groups and behaviors.

In Georgia, three community-based CYFAR projects provided focused intervention for three different groups of at-risk children, youth, and their families. The Building Academic and Social Skills (B.A.S.S.) program, in rural Bulloch County, provided after-school care and enrichment activities designed to strengthen academic success and social skills in elementary-age children living in an isolated community in southeast Georgia. The B.A.S.S. project also strived to support the Eldora community by providing information, learning opportunities, and activities for community members. The Learning for success program, in Cobb County, supported the academic growth of elementary-school children at risk of school failure through one-on-one tutoring, enrichment activities, parent education, and encouraging parent involvement in children's learning. The Youth Collaboration Project (YCP) at Moody Air Force Base implemented to build developmental assets in pre-teens and teens and to increase parental involvement in youth programs through life skills education, enrichment programs, 4-H programs, and Boys/Girls Clubs. Youth in the YCP are children of active-duty, civilian D.O.D., and retired military personnel at Moody Air Force Base.

- b. Almost 50% of all Family and Consumer Sciences educational programs in 2001 were conducted with audiences estimated to be at risk (low-income, illegal activity, or lack of school success). · Learning for Success (LFS) program served 33 elementary school children at three tutoring locations namely Belmont Hills, Sanders, and Argyle in Cobb County during the 2001-2002 school year. In average, the children participated in 33 tutoring sessions during the school year.

In Bulloch County, BASS program made a considerable impact on at risk children by building their social skills and helping them to avoid problem behaviors. The parents' involvement in their children's school related activities considerably improved during the program year. The following success story heard from a teacher about a child in the program tells the impact of the BASS program. "This child had let his grades slip, and was developing an ambivalent attitude. He was causing problems at school, as well as at home. According to his mother, the program has helped build his self-esteem and improve his grades. He became a student who would get involved in discussions in class and would volunteer to help the teacher. He is no longer so easily swayed by his peers. His mother reports being very pleased with the change in her son." · Comparison of the report card grades for the first six-week with the last-six week period of the school year confirmed that participating children in the Learning for Success program in Cobb County considerably improved their academic skills in math, health, science, and social studies. According to after school tutors' assessment, 94% of the children became more enthused and self-directed in learning. Almost 93% of the children improved in completing homework. Nearly 91% of the children improved their organizational and

study skills. · At Moody Air Force Base, dependent children of armed forces personnel developed positive decision-making and conflict resolution skills.

- c. Smith Lever, State funds
- d. State Specific

Key Theme: Leadership Training and Development, Youth Development/4-H

State Performance Goal: 5-8

- a. Development of leadership skills continues to serve as a cornerstone of the 4-H educational program. Through the mission of assisting youth in acquiring knowledge, developing life skills and forming attitudes, 4-H program activities strive to not only teach leadership, but also provide opportunities for youth to put these skills into practice.

Programs planned on the county, district, and state level have provided youth with skills necessary for developing leadership skills. Georgia Officers Training Officers in depth training for district and state officers at the junior and senior level. Additionally, agents have been offered publications and classes for training county officers. Certified Teen Leader-All a'Bout Camp (ABC) provides 11th grade students with training in the areas of teamwork, 4-H camping, mentoring skills and promotion. 4-H Counselor Training offers nearly 100 hours of training in job specific skills, first aid, mentoring, building relationships & partnerships, leadership with campers and ages and stages of development. Junior/Senior Project Achievement includes a portion of the 4-H Portfolio reflecting youth's leadership skills in their project areas, as well as in general.

- b. At the county level, leadership is a cornerstone of 4-H involvement. Youth are involved in planning and implementing programs, in project club leadership, as committee chairs and as officers. Georgia Officer Training provides training for 40 junior, 41 senior and 9 state 4-H officers. The skills developed are practices at more than 36 district and state wide events. In turn, each of these officers are also required to contribute to their local 4-H program, making these efforts magnified. 44 youth completed the Certified Teen Leader All a'Bout Camp program with 21 working as two-week long residents and 15 working as week long nonresidents in the Georgia 4-H Camping program. Their service at four 4H camps in Georgia enhanced the camping program for more than 9,000 campers. The potential for long term impact is great as ABC's work with youth in leadership settings. Currently, 50% of the camp counselors in the Georgia 4-H program are graduates of the ABC program. 85 college aged youth participate in the nearly 100 hours of training for camp counselors and in turn work throughout the summer in the camping program at five 4-H centers. Their work with more than 9,000 youth enables each to practice and develop the skills from their training sessions.

- c. Smith Lever, State funds
- d. State Specific

Stakeholder Input Process

The University of Georgia College of Agricultural and Environmental Sciences (CAES) in cooperation with College of Family and Consumer Sciences and the Warnell School of Forestry, have many opportunities to collect stakeholder input.

The College of Agricultural and Environment Sciences established a liaison program about six years ago. There are approximately 200 organization and industries to which a faculty member (tenured or non-tenured) is assigned as a liaison. The faculty member may serve as a resource person, as a board member, attend board meetings or meet individually with members in order to learn what is happening in that organizations and/or industry. The CAES Dean meets with these liaisons once a year for a report, but also ask for input if there are important issues surfacing which need to be considered for action.

The county faculty in the field are very active in gathering input of the college. They do this is a variety of ways; advisory committees, being active with organizations and industries in their county, one-on-one input with clientele and by monitoring phone calls and office visit content for any trends. Every county is required to have an advisory committee in place and to meet with that committee at least twice a year. The membership of the committee must be reflective of the local population and knowledgeable of community issues appropriate for the University to address. County programs must develop county issues for the purpose of developing local Extension programs that have impact. This process offers a great deal of stakeholder input into the state program planning process. This is the best source of information from our end users.

Each CAES department also have individual methods for collecting input. Some departments have advisory committees, other are active in the industry's major organizations and other collect data from individual contact with industry representatives..

The College of Agricultural and Environment Sciences has an overall advisory council. The College of Agricultural and Environment Sciences Advisory Council was created in 1996 by consolidating the State Extension Advisory Council and the Georgia Agricultural Experiment Stations Research Advisory Board. This was done to reflect changes in the college and to help our stakeholders understand the equal importance of all functions of the College (teaching, research, and extension). The council seeks stakeholder counsel and advice to ensure that the programs of the College are responsive to the needs of Georgia residents. The Council members work closely with College faculty, staff and administrators in reviewing ongoing programs and identifying and planning high priority future programs.

The CAES Dean also meets with a coalition of approximately 50 agricultural commodity groups and agribusinesses know as the "Ag Round Table". The group meets quarterly with the Dean to provide discussion and input for the College.

Finally, the CAES Dean meets quarterly with key leadership within the state, including Georgia's Secretary of Agriculture, the Georgia Farm Bureau President and other key agricultural leaders.

Stakeholder input processes for The Fort Valley State University Research and Extension Programs employ diverse methodologies which allow for input from end users, including county advisory committees and individual clients, peers and other agricultural professionals, partners and cooperating agencies, including community-based organizations, and university administrators. The College of Agriculture, Home Economics and Allied is currently finalizing the establishment of a college-wide advisory board for teaching, research and extension programs.

Annually, county-based professionals and para-professionals complete and submit survey instruments used to measure clientele needs for programs and services offered at the local level by the Extension Program. Concurrently, 1890 program clients are included on county-wide advisory boards which provide for development of individual county plans of work. Evaluations of programs conducted are also used to measure value of ongoing programs.

Agricultural researchers and extension specialists also use feedback gained from clients and others attending workshop and similar events to gather input on current and planned programs. At the same time, these agricultural professionals use peer-to-peer contacts, professional meetings, media reports and other data to gauge emerging issues and evaluate their relative value to identified needs of clientele. Active partnerships with community-based organizations also provide useful perspectives on issues and opportunities which may be integrated into research and extension programs.

University administrators also provide valuable input for program development and implementation as both research and extension programs are evaluated in terms of their relationship to the overall university mission. A major current focus is engaging the total university in the Land-Grant process.

Program Review Process

There have been no significant changes in the review processes described in the Plans of Work submitted for Research and Extension programs of the University of Georgia or Fort Valley State University.

Evaluation of the Success of Multi and Joint Activities

The University of Georgia continues to make progress on its integrated research and extension programming. A very large percentage of the documented accomplishments in this report credit an integrated effort.

All of the state level faculty of the University of Georgia are administratively housed within an academic department. A large percentage of these faculty hold a joint research and extension appoint. This structure encourages a high level of integrated work.

The last few years have seen a great increase in county faculty becoming involved in integrated activities. Several integrated accomplishments in this report involve county faculty. This trend continues to increase yearly.

The University of Georgia has increased its participation in Multistate efforts during this program cycle. Recent budget cuts continue to increase the need for multistate collaboration. Not always evident in a report of accomplishments are the many activities in which Georgia utilizes the out-of-state expertise in subject areas not well supported by current Georgia faculty.

There are many examples of multistate accomplishments within this report. They are documented as multistate and identify the states involved. The following are five examples of multistate efforts that are found in this report.

- The absence of a UGA forage extension specialist coupled with the recent requirements for farm nutrient balance plans created the need for a pasture fertility training for county extension personnel in Georgia. An extensive two week multi-state in-service training was designed to deliver information to county extension personnel via the internet. Dr. Bob Lippert at Clemson University coordinated and “hosted” the training and cooperating states were Georgia, Alabama, South Carolina and North Carolina
- The UGA Small Grain Breeding Team’s regional program has resulted in the release of two broadly adapted cultivars. Two new small grain cultivars, AGS 2485 wheat and Horizon 474 oats, were released in 2002. These releases offer producers high yielding cultivars with excellent test weight and disease and insect resistance. This team has worked with Georgia, Florida, and Alabama
- Limited resources mandate that states cooperate as efficiently as possible to meet the needs of common clientele. Such is the case with the small fruits industries in the Southeast and their participation in the Southern Region Small Fruit Consortium. The long term mission of the Consortium is envisioned to involve collaborative efforts at various sites across the region between small fruit growers and grower organizations, industries and service organizations allied with and/or serving small fruit growers, agricultural extension programs and research stations working together to enhance the development of the small fruit industries in the region. Participating states are Georgia, South Carolina, North Carolina, and Tennessee.

- A multi-state group of soybean pathologists and breeders organized a Soybean Pathogen Germplasm Conservation System that would provide long-term maintenance and distribution of soybean pathogens. This group, lead by a University of Georgia scientist, obtained over \$2 million from four agencies to establish this System as a proof of concept project and model for other major commodities.
- Varroa Mites pose a serious threat to the Bee industry in North America. Without effective control strategies, there is serious risk to GA's beekeeping industry. An IPM program has been developed which for the first time has established an economic threshold for varroa mites that can be used in IPM programs for varroa mite control in bees. A combination of modified hive floors, apiary isolation, and use of resistant bee stock was used in a 3 state study for varroa mite management.

The following three attachments document actual expenditures for the University of Georgia for FY2002.

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

**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 University of Georgia, College of Agricultural and Environmental Sciences
State Georgia

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
Goal 1	789,592	782,796	777,351		
Goal 2	66,095	65,517	65,062		
Goal 3	9,772	9,690	9,623		
Goal 4	190,100	188,404	187,093		
Goal 5	55,230	54,727	54,345		
Total	1,110,789	1,101,134	1,093,474		

 Director

 Date

**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 University of Georgia, College of Agricultural and Environmental Sciences
State Georgia

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
Goal 1	569,247	564,280	560,355		
Goal 2	154,232	152,854	151,791		
Goal 3	0	0	0		
Goal 4	3,821	3,815	3,788		
Goal 5	127,947	126,827	125,945		
Total	855,247	847,776	841,879		

Director

Date

**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 University of Georgia, College of Agricultural and Environmental Sciences
State Georgia

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
Goal 1	789,592	782,796	777,351		
Goal 2	66,095	65,517	65,062		
Goal 3	9,772	9,690	9,623		
Goal 4	190,100	188,404	187,093		
Goal 5	55,230	54,727	54,345		
Total	1,110,789	1,101,134	1,093,474		

 Director

 Date

Report prepared by
Gregory C. Price

Please direct questions concerning this report to:

Gregory C. Price
Program Development and Accountability
321 Hoke Smith Building
The University of Georgia
Athens, GA 30602

gprice@uga.edu
706.583.0072 voice
706.583.0431 fax

End of Report – Final Page
Georgia Report of Accomplishments
FY2002