2005

ENVIRONMENTAL REPORT

The University of Georgia

College of Agricultural and Environmental Sciences

CONTENTS

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Director's Statement

Robert N. Shulstad

We are blessed in Georgia with an abundant and safe food supply. Recent surveys show that Georgians like their food home grown and they also believe preserving farmland is compatible with environmental protection.

Agriculture, the state's number one industry, accounted for $10 billion in farm gate sales and agricultural agribusiness generated $52 billion of Georgia GDP in 2003. Georgia farmers help fill the nation's grocery carts.

To succeed, Georgia farming must be economically viable and environmentally responsible. Fifty years ago a farm of several hundred acres planted in row crops could sustain a family. Today, it takes approximately 1,000 acres because farming has become a capital-intensive business. *See graph, Georgia Farming: 1945-2002, on page 5.*

Competing on a global scale is a challenge for Georgia's farmers. Environmental rules plus U.S. labor requirements combine to make it difficult for American farmers to remain competitive. Add to that Georgia's hot humid weather that breeds pests of all kinds and the yearly fluctuations in rainfall that make dryland farming a risky venture. It's no wonder banks only lend money to farmers who have costly irrigation systems. In addition, the soil is poor in nutrients and requires the addition of amendments.

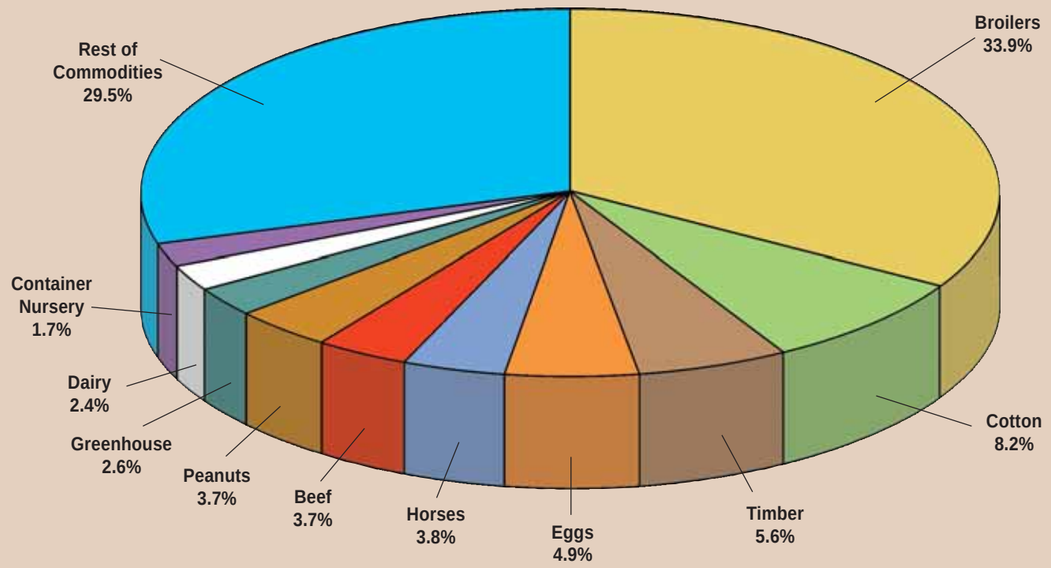
Our farmers must carefully balance many variables–water, fertilizer and pesticides, to name a few–to fill our grocery stores with food, our malls with clothing, and our manufacturers with wood and other raw materials. Farmers want to be responsible and protect the environment. Their livelihood isn't the only thing at stake. Their heritage and their families' future are also on the line.

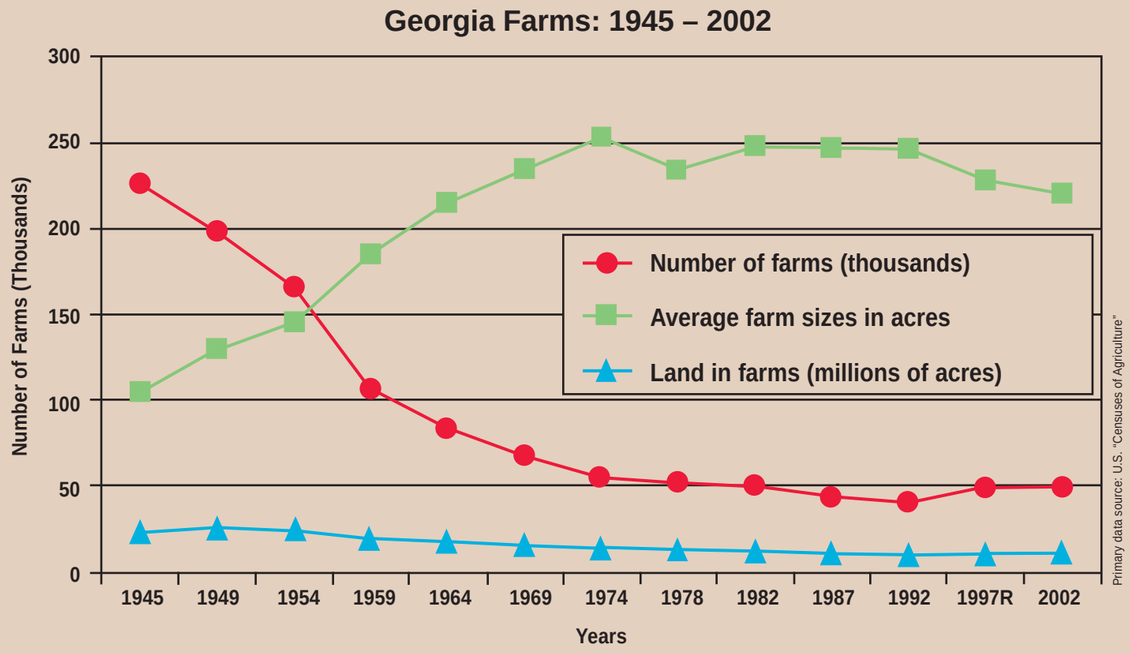
Today, pesticide management is much safer than in the 1970s with farmers reducing pesticide use through integrated pest management, beneficial insects and pest-resistant crop varieties. They cannot afford to pollute their surface or ground

The state agricultural production was ranked 12th nationally in 2003. Nationwide, individual Georgia crops rank as follows:

#1 Peanuts, pecans, broilers and chicken eggs
#2 Peaches
#3 Cotton

Georgia Top Ten Agricultural Commoditites: 2003





water since it is often their drinking water too.

A five-year UGA study funded by the Georgia Environmental Protection Division shows farmers actually use less irrigation than was previously believed. Ongoing research and water conservation efforts are helping fine-tune irrigation, reduce nutrient and pesticide runoff from farmland, and detect sources of fecal contamination.

We take the adage, "waste not want not," seriously. Agricultural engineers are piloting a project to convert agricultural waste into bio-oil and fertilizer. This has the potential to reduce the use of nonrenewable fuel in Georgia. As an added environmental advantage, the by-product of this process sequesters carbon and reduces greenhouse gases.

Obviously, farmers aren't the only people who benefit from such research and extension programs. Golf course superintendents, military environmental managers, local government officials, homeowners and landscapers are among those who access the latest UGA research information through a variety of outreach mechanisms including the Cooperative Extension Service and its publications available at http://pubs.caes.uga.edu/caespubs/pubs.html.

New public and private partnerships are springing up to combine expertise and resources that avoid duplication and extend research findings to wider audiences, from the military to the conservation community. The Atlanta Regional Commission hosts workshops where our extension agents speak about rain gardens, integrated pest management and xeriscape. Extension specialists work with the Georgia Municipal Association and the Georgia Association of County Commissioners to assist local governments meet new water regulations. And the ongoing partnership with the Georgia Pollution Prevention Assistance Division supports several outreach programs including the statewide water conservation workshops for farmers.

Today's youth will be an important partner in the future of Georgia agriculture. UGA's Young Scholars program gives high school students an opportunity to spend a summer working with scientists in areas such as stem-cell research and environmental horticulture. An international component allows students to study the rain forest in Costa Rica or learn about collaboration between UGA and Ghanaian scientists.

To maintain a safe, abundant food supply, Georgia farmers and university programs must continue to develop new initiatives to meet emerging needs. As Georgia's landgrant university, UGA is very proud of its extensive work in safeguarding the state's natural resources.

Water

Georgia's exploding population growth coupled with a five-year drought makes water an even more precious resource. Water conservation is a high priority for citizens and state and local governments. Stormwater runoff is the state's major source of water-quality problems. UGA scientists have mobilized to assist farmers, businesses, homeowners and others to protect and conserve water resources while extension specialists provide training and technical assistance.

Georgia Irrigation Study Offers Surprises by Brad Haire

Even during periods of extreme drought, farmers use less water than was previously believed according to a recent UGA study. The five-year study funded by the Georgia Environmental Protection Division (EPD) also showed great variation in the amount of irrigation water used. Over the past 30 years, the EPD issued 20,000 withdrawal permits to farmers but required no meters. State officials had no way of knowing how much water farmers used to irrigate their crops. The "water wars" between Alabama, Georgia and Florida forced the states to look at this issue and find ways to share the surface and ground waters that flow between them.

Agriculture, the state's largest industry, is heavily dependent on reliable water sources. Georgia EPD officials commissioned UGA scientists to conduct a pilot study to estimate the amount of water farmers need to stay profitable.

This five-year study involved two voluntary programs:

Monthly Program – Meters were installed on 800 irrigation wells to monitor monthly water use throughout the growing season, taking into consideration crop needs and rainfall conditions.

Automated Program – Wells irrigating 180 fields in the Dougherty Plain were outfitted with automated monitoring devices. These farmers had groundwater withdrawal permits. This system allowed scientists to learn when farmers irrigate during the month, the number of continuous hours they irrigate, and how many systems they operate simultaneously. This information shows how withdrawals impact groundwater levels and the Flint River flows.

Georgia farmers attend a workshop showcasing water conservation techiques.

Kerry Harrison

A concentrated effort was made to look at water use in the Dougherty Plain. “That’s where much of Georgia’s irrigation takes place,” said Jim Hook, a professor with the UGA College of Agricultural and Environmental Sciences. It is also where the state issued a moratorium on new permits due to low flows in the Flint River during the drought.

The initial study began in 1999 and ended in March 2004. But the Georgia Environmental Protection Division funded it for another year.

“We can compare data taken during four years of drought conditions (from 1999 to 2002) in the state and one year of good rainfall (in 2003),” said Hook, who worked on the study.

In the mid-1990s, the Natural Resources Conservation Service figured Georgia farmers would need to apply 18 acre-inches of water in a dry growing season to give a crop optimal yields. (One acre-inch of water is about 27,000 gallons, or the amount in a typical swimming pool.) But that’s not what Georgia farmers do, according to the study. The 2002 growing season was a severe drought in Georgia. The corn farmers monitored that year in southwest Georgia applied, on average, 13 inches of water to their crop. Farmers in coastal Georgia applied 7 inches that year. About 20 percent of those studied applied 5 inches or less, 45 percent applied 5 to 11 inches and 35 percent applied more than 11 inches.

“How much water farmers apply can’t be tied to one number,” Harrison said. “These are averages. The study tells us that irrigation management styles can vary widely for the same crop.” The 2003 growing season wasn’t a drought year. Corn farmers that year applied, on average, about half the water they did in 2002.

“In the real world, farmers weigh the cost of applying water to how much return they get from increasing yields,” Harrison said. It costs about $4 to apply one acre-inch of water.

Farmers use less water than was previously believed, according to a recent UGA study.

For more information on the Ag Water Pumping Program, visit www.agwaterpumping.net

Brad Haire is a news editor with the University of Georgia College of Agricultural and Environmental Sciences.

Survey results:

- **The average age of a Georgia irrigation system is 13 years. Eighty percent of systems in the study have had newer, more efficient water nozzles put on them.**
- **Farmers apply about the same amount of water to vegetable crops – like sweet corn, tomatoes and peppers – as they do to peanuts, cotton and other row crops. But they often grow two vegetable crops in one year.**
- **Farmers applied irrigation most often on Thursday. They irrigated the least on Sunday.**

Farmers Learn Water Conservation

by Gary L. Hawkins

Farmers are learning to make every drop count when they irrigate their crops. Water levels in the Flint River, an irrigation source, dropped considerably during the last drought. The Georgia Environmental Protection Division responded by declaring a moratorium on permitting new wells in the Flint River Basin, a center for Georgia agriculture. A contentious battle among Alabama, Florida and Georgia over how to share the region’s water prompted Georgia lawmakers to pass a bill requiring that meters be installed on all wells to monitor water use for irrigation.

“Water is the lifeblood of agriculture,” said Carol Couch, Georgia Environmental Protection Division (EPD) director, speaking with south Georgia farmers. Couch toured the Flint River Basin and met with UGA scientists at the Stripling Irrigation Research Park and with farmers on their land to listen and learn about the problem first hand.

To assist farmers, UGA biological and agricultural engineers on the Tifton campus developed a series of workshops entitled “Agricultural Water Conservation: A Look at Water Metering, Pollution Prevention, Irrigation and Water Saving Methods.” The workshops are a multi-agency effort by the University of Georgia, the Georgia Soil and Water Conservation Commission, Flint River Policy Center and Natural Resource Conservation Service (NRCS) to provide cutting edge research to farmers to help them reduce water use.

Seven workshops were held across the southern half of Georgia to give cooperative extension agents, NRCS

"Water is the lifeblood of agriculture." *— Carol Couch, Georgia Environmental Protection director*

photos by Brad Haire

Calvin Perry, CAES water expert and engineer, explains variable-rate irrigation to Carol Couch, EPD director.

Variable-rate irrigations system at the C.M. Stripling Irrigation Research Park.

The program covered:

1) **the policy behind water meters;**
2) **hydrology and the positive impacts of water conservation;**
3) **water conservation through management and maintenance;**
4) **water use data from the Ag Water Pumping Program;**
5) **general information on the water metering program; and**
6) **state and federal irrigation cost share programs.**

personnel, farmers and general citizens information on issues related to water conservation and metering in Georgia.

Overall, the workshops were well attended by extension service agents, federal agency personnel, farmers, county agencies, irrigation dealers and general citizens. Participants commented that the information presented was timely, needed and provided a new and different look at water conservation in Georgia.

"From a regional planner's perspective, the Agricultural Water Conservation workshops were very informative on the importance of an agricultural metering program to the State of Georgia. We have a better understanding of how much water we use and how effectively we use it," said Emily Perry an Environmental Planner for South Georgia Regional Development Center in Valdosta. "The workshop also covered a number of practices that could be used to conserve water as well as the funding available through cost share programs."

There are plans to continue the workshop series in north Georgia in early 2005. The contents will change slightly to reflect the difference in water use in north verses south Georgia.

For more information, contact Gary L. Hawkins, biological and agricultural engineer at ghawkins@tifton.uga.edu or 229-386-3377.

Water Pollution Detective

by Cat Holmes

Fecal contamination threatens the quality of water and the health of people all over Georgia. Water contaminated with fecal matter can contain illness-producing bacteria like salmonella and viruses such as hepatitis A. Major sources include malfunctioning septic drainfields, broken and leaking sewer lines, agricultural animal and pet waste in runoff, and wildlife droppings. The maximum amount of contamination that a water body can have without violating state water quality standards is called the Total Maximum Daily Load (TMDL). Fecal matter is a major contributor to TMDLs for Georgia watersheds.

Peter Hartel, a scientist in the University of Georgia College of Agricultural and Environmental Sciences, has worked as an environmental water detective for the past six years trying to pinpoint sources of fecal contamination in Georgia's streams, rivers and lakes. More recently, he developed a quick, inexpensive, and accurate method called target sampling to identify sources of fecal contamination. It uses shoe leather and common sense. Targeted sampling requires a person to walk a stream or waterway and to sample every tributary, every pipe, and anything that looks suspicious. Then hotspots of fecal contamination are identified. "It's akin to the children's game of hot and cold," said Hartel. "You keep sampling until you find hotspots. Then you look around. Are there cows in the water? A broken sewer pipe?" "If you actually go out and walk the waterways and determine where the fecal hotspots are, then you generally uncover [the problem] quickly and easily," Hartel said. Targeted sampling also greatly

"When we find a fecal hotspot with detergent brighteners, we know it isn't the deer doing their laundry."

— Peter Hartel, water quality scientist

enhances the accuracy of bacterial source tracking, which includes a number of different methods (DNA to antibiotic resistance) to identify specific warm-blooded animal species responsible for the fecal contamination. "For example, if I know from my hotspot that there's only a dog park and septic drainfield nearby, then I only have to sample the dog park, the septic field and the water source. Then I match the bacteria in the water to the bacteria from the dog park and the bacteria from the septic drainfield to determine how much the dogs or the septic drainfield is contributing to the overall fecal contamination in the water."

Chemical and DNA-based tests for bacterial source tracking are typically 65-85 percent accurate; when the same tests are combined with targeted sampling, they are 95-99 percent accurate.

With help from the Marine Extension Service in Brunswick, Hartel tried combining targeted sampling with a bacterial source tracking method, fluorometry, to verify human sources of fecal contamination on St. Simons Island. Fluorometry identifies optical brighteners, typically found in laundry detergents and dishwashing liquid, in water. "Because the coast has a high water table, failing septic drainfields are a common problem," Hartel said. "If we find a fecal hotspot with optical brighteners, we know what the problem is. It sure isn't the deer doing their laundry." The Marine Extension Service was able to find failing septic tanks in just a few days. "I wanted to find a method to identify sources of fecal contamination that's fast and cheap," he said. "Starting with a method like targeted sampling really helps. And the beautiful part is that it's common sense."

For more information on microbial source tracking, visit: http://www.cropsoil.uga.edu/mst/

Cat Holmes is a former news editors with the UGA College of Agricultural and Environmental Sciences.

Robert Newcomb

Peter Hartel determines the source of bacteria found in a stream sample.

Golf Courses Conserve Water

by Susan Varlamoff

When water restrictions became mandatory in Georgia, golf courses began conservation measures to maintain their greens and fairways. Responding to the need, members of the UGA Turfgrass Team developed a unique "blended learning" program to help golf course superintendents write and implement site-specific water conservation plans. "This training program is the most comprehensive in the nation, maybe even the world," said Clint Waltz, a crop and soil scientist. "Georgia has approximately 450 golf courses and no two sites are the same."

Coastal golf course grasses with their longer growing season, need different water and management practices than grasses growing at north Georgia golf courses. For example, a coastal course may grow seashore paspalum that can be irrigated with brackish water and even some salt water. This is not an option for other turfgrass species. But courses throughout the state can practice other conservation measures such as irrigating with treated, reclaimed waste water.

"These are just a couple of techniques being employed by golf course superintendents to improve water use efficiency," Waltz said.

Careful thought was given to crafting a curriculum that would take into account different soils and grasses, weather conditions and water sources available. The Golf Course Superintendents Association of America (GCSAA) worked with UGA scientists to develop and market a three–module course to its members. Within two weeks of launching the program in December 2004, superintendents from 20 states and 7 countries had registered.

"This training program is the most comprehensive in the nation, maybe even in the world."
—Clint Waltz, Crop and Soil Scientist

Golf Course Water Conservation Program

Module 1–Efficient Water Management (on-line course)

The participant learns introductory scientific information about water and its relationship to the atmosphere, soil and turfgrass plant. The on-line instruction offers the learner the luxury of time to proceed at their own pace and review materials as they choose. The course is available at www.gcsaa.org/learn/online/water.asp.

Module 2–BMPs for Turfgrass Water Conservation (workshop)

The national GCSAA meeting hosted the first workshop to assist golf course superintendents plan site specific BMPs for water conservation acceptable to elected officials, regulatory agents, water managers and the general public. Facilitators guided the participants through the process with the aid of a 97 page hard- and electronic-copy format workbook, which contains practices and their scientific justifications.

Module 3 – List-serv and Conference Call

For 60 days following the workshop, the instructors made themselves available via a voluntary list-serv to help the participants develop their water conservation plans. Ninety days after the workshop, a voluntary conference call obtained feedback from the industry about the program and how to improve it.

Clint Waltz

Standard Golf Club in Atlanta uses riparian zones to protect water quality.

Robert Carrow, a crop and soil scientist working on the Griffin Campus, conducts extensive research on water quality and water quantity issues related to maintaining turgrass. An important emphasis is placed on water-efficient irrigation scheduling methods that allow for site-specific irrigation, especially on a large complex site with many "micro-climates," such as golf courses. Many BMPs for golf course water conservation are standards used in the turfgrass industry. Examples include:

- Choose a turfgrass suited to the site and preferably one that is drought tolerant. For example, bermudagrass may be a good choice for many Georgia courses while seashore paspalum may be a better alternative in coastal areas.
- Classify the diverse microclimates and map them for irrigation design.
- Maintain the grass through proper mowing and fertilization. Excess fertilizer encourages growth, which requires increased water.
- Determine how best to use soil moisture sensors and climatic sensors in microclimates to monitor when and how much to irrigate.

To date, 71 students received the training from 26 U.S. states and 10 countries. People from as far as Canada, Australia, Barbados, France, Germany, Portugal and Spain have participated in some aspect of the training.

"The diversity of participants indicates the universal interest among golf course superintendents to conserve water," said Clint Waltz.

Plans include the continued development of educational resources on water conservation for all segments of the turfgrass industry.

"By improving water use awareness and identifying specific steps or practices that can be implemented easily, the first step to water conservation is taken," commented Waltz. "Coupling this approach with sound science is the direction we are going."

For more information, visit www.TurfgrassWater.com and www.GeorgiaTurf.com

Susan Varlamoff is a program coordinator for the Office of Environmental Sciences and editor of the *Environmental Report*.

Blimp Helps Fine Tune Irrigation

by Brad Haire

Using a blimp fitted with cameras, University of Georgia researchers are looking at a system cotton farmers can use to water their crops more efficiently. “Plants reflect light in unique ways,” said Glen Ritchie, a research coordinator with the UGA College of Agricultural and Environmental Sciences.

Since the 1960s, scientists have known that how a plant reflects light can say a lot about its health. “This knowledge can be used to properly schedule irrigation, too,” Ritchie said. You just have to get a camera high enough to take a good picture of the field.

Blimphotos

A 15-foot helium blimp hovers about 300 feet over a 5-acre cotton field at the UGA’s C.M. Stripling Irrigation Research Park in Camilla, Ga.

“You have to get permission from your local air traffic controller if you get much higher,” Ritchie said. The blimp can get as high as 1,000 feet.

At 300 feet, the cameras can take a picture of about an acre of land, an area about the size of a football field. Two people can control the blimp using two ropes attached to it. They can cover the 5-acre field in about 10 minutes.

Farmers can also pay to have a satellite or hire a pilot to take pictures of whole fields. But a satellite can only take a picture when it is passing overhead, he said. And it can be limited by cloud coverage. Airplanes work well but are also limited by cloudy days. And to schedule irrigation, he said, images would need to be taken of a field more often than satellites or airplanes can provide.

Ritchie downloads his images to a computer. Software combines and analyzes the images and compiles the data into spreadsheets that can be used to make irrigation decisions.

Ritchie hopes to establish benchmarks, or triggers, with the data. This could give a farmer a window of a day or more to begin irrigating his crop.

Before damage

Farmers irrigate to keep plants healthy for high yields. When plants don’t get enough water, leaves curl and begin to wilt. “Damage has already been done at this point,” said Craig Bednarz, a cotton physiologist with the UGA CAES.

“Any water applied after wilt occurs would first have to restore the plant to its pre-wilt stage,” he said. Only after this could the plant begin to use the water to increase yields.

“What we want to do is to tell when the plant may be going into water stress before it begins to show the visible signs,” Bednarz said.

“Proper irrigation can increase yields by as much as 300 pounds per acre,” he said.

This research project is funded by the Georgia Cotton Commission. The same system could be used to schedule irrigation for other crops, such as peanuts and vegetables.

For more information, contact Craig Bednarz at cbednarz@tifton.uga.edu or 229-391-2531.

Brad Haire is a news editor with the UGA College of Agricultural and Environmental Sciences.

Brad Haire

Land

UGA scientists want to help conserve agricultural land and ensure that it's not polluting the surrounding environment. A recent survey showed Georgians want to preserve agricultural land more than any other type of land. Extensive research shows how conservation buffers prevent nutrients and fertilizer from escaping agricultural fields. Organic farming is booming while new value is found for an old cover crop. Here is a closer look at some projects undertaken by College of Agricultural and Environmental Sciences specialists.

Georgians Want to Preserve Farms

by Brad Haire

Georgians living in urban areas like having fertile farmland nearby reports a University of Georgia study. And the best news of all – they are willing to pay for its preservation.

As metro Atlanta and other urban areas rapidly develop in Georgia, state and county governments and local land trusts are working to protect farmland through agricultural conservation (or PACE) programs. However, public and private funds are very limited.

Whether it's pastoral views, wildlife habitat, agritourism or the provision of local fresh food supplies such as pick-your-own operations, little is known about public preferences for farmland preservation. John Bergstrom, a College of Agricultural and Environmental Sciences economist, conducted a survey funded by the U.S. Department of Agriculture to determine what attributes of farmland people value most. This information can serve as a guide to agricultural land conservation. In general, the Georgia citizens who were surveyed value preserving farmland over other types of land. Below is the hierarchy of priorities.

Georgia citizens value preserving farmland over other types of land.

1. Farmland
2. Forestland
3. Lake Frontage
4. River Frontage
5. Ocean Frontage
6. Wetlands
7. Rangeland
8. Mountains
9. Undeveloped land in cities

Farmers are good environmental stewards

The PACE survey showed that most Georgians believe the protection of farmland is consistent and compatible to environmental protection. They agree the family farm must be preserved and farmers of small farms are better stewards of the land than farmers with larger acreage. The majority surveyed feel farmers help protect water quality on lakes, rivers and streams and provide good wildlife habitat.

"The importance of preserving prime farmland used to grow food is consistent with citizens' general desires to protect the valuable, natural resources of farms and maintain local, fresh food supplies," said Bergstrom.

"The priority to conserve farmland near urban areas reflects the relative scarcity of farms in population centers and Georgians' concerns about losing green space and fresh produce," he said. "It confirms about 20 years of research."

Georgians' willingness to pay

The survey provided respondents three options to pay for farmland preservation. Their willingness to participate is listed below.

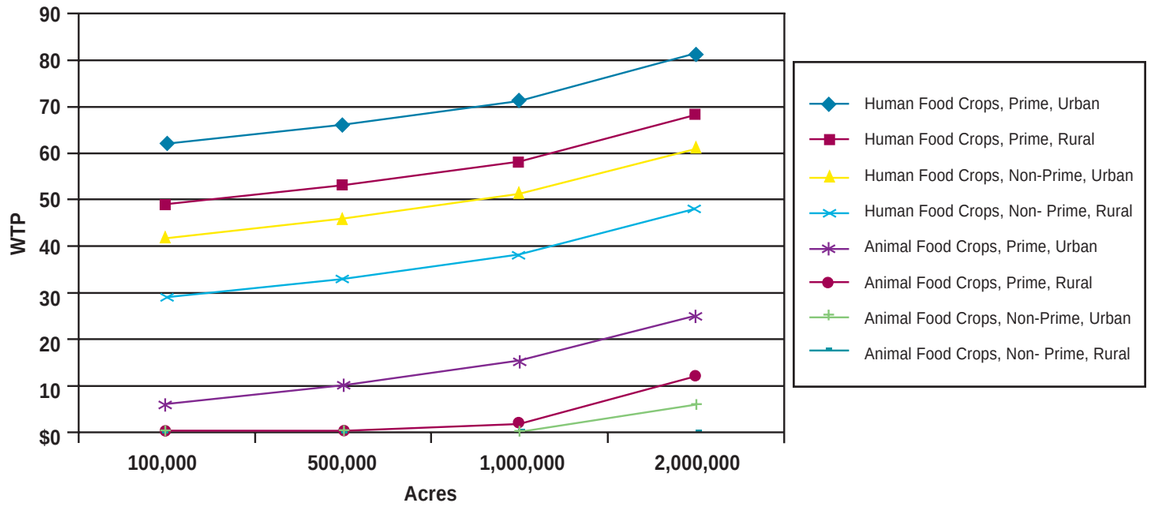
- a tax referendum – 53%
- a license plate – 39%
- joining a farmland protection organization – 32%

For the full report on Public Preference and Values for Purchase of Agricultural Conservation Easement Programs in Georgia, visit http://www.agecon.uga.edu/%7Ecaed/centerreports.htm

Brad Haire is a news editor with the UGA College of Agricultural and Environmental Sciences.

Willingness to Pay per Household for Conservation Easements in Georgia

Source: USDA–NRI Conservation Easement Program Survey, 2002



Sales of organic fruits and vegetable are 12 times what they were a decade ago.

Organic Farming – a Growing Trend

by Brooke Hatfield

Carol Williamson

Sales of organic fruits and vegetables are 12 times what they were a decade ago. Organic farming is on the rise and it could change the way U.S. farmers tend their soil. “With an organic farm, we have a whole-farm approach,” said Luanne Lohr, associate professor of agricultural and applied economics with the University of Georgia.

“You don’t choose one practice and apply it,” she said. “You have to come up with a combination of things you can do that work for your particular farm ecology.”

Organic farming is defined as an ecology-conscious system that strives to minimize the use of synthetic fertilizers, pesticides and other chemicals. For a vegetable crop to be “certified organic” a state or private certification organization accredited by the U.S. Department of Agriculture must vouch for it.

According to the USDA, sales of organic fruits and vegetables increased from $181 million in 1990 to $2.2 billion in 2000. Sales of organic livestock and milk are also increasing. Lohr said this is due partly to consumer support, citing a 20-percent annual growth in retail sales for each of the past 12 years.

“Many people choose to go organic for health reasons,” Lohr said. But the benefits of fruits and vegetables grown without synthetic chemicals could extend beyond the consumer. “One can expect to have better overall farmer health with reduced exposure to chemicals,” Lohr said.

Organic farming can help the environment. “ (With conventional farming) there are greater water-quality concerns, both for drinking water and for (water used in) recreation,” she said. As organic farming expands its foothold in agriculture, more limits are being placed on chemicals used on all farms.

“The Environmental Protection Agency is now reviewing all organophosphate insecticides,” Lohr said. “Many uses are becoming more restrictive, particularly in fruits and vegetables that will be consumed raw.”

Insect Management

Organic farmers understand insect management better than others because they are interested in reducing chemical pesticide use. More selective use of farm chemicals and greater reliance on natural processes reduces farm worker health risks and decreases production costs.

Although many nonchemical options for plant protection exist, most have not been widely adopted, even when they have been shown to be more cost-effective than chemical use. Georgia farmers spent $178 million on pesticides in 2001, excluding application costs. Tens of thousands of pounds of insecticides are applied each year, with two to five applications per season of as many as seven insecticides on vegetable and fruit crops in the state.

A UGA economist devised a model to explain which insect management methods organic farmers prefer. The summary statistics from the research sample of 1,027 organic farmers indicate the adoption rate of 11 management techniques.

Top three insect control strategies are:

- crop rotations
- development of beneficial insect habitat
- *Bacillus thuringiensis* (a microbial insecticide) treatments

The study concluded that a broader range of alternative insect management practices would be adopted by organic and conventional farmers if reliable information were available. In Georgia, a reduction of insecticide use would save farmers tens of thousands of dollars in costs, reduce farm worker and consumer exposures to carcinogenic chemicals, and reduce risk to water quality.

Starting a farm

Getting an organic farm up and running can take more time than starting a regular farm. “Choosing an organic method requires some practice,” Lohr said. “It requires a slow pace to get established. It requires that the farmer know a lot about his own property and farm ecology. Most farmers know that information, but maybe they aren’t applying it yet.”

“Organic farmers tend to share information very freely and are more likely to network,” Lohr said. “About 98 percent of organic farmers get information from other farmers about practices to try on their own farms.”

For more information on organic farming in Georgia, visit, http://www.georgiaorganics.org/

Brooke Hatfield is a student writer with the UGA College of Agricultural and Environmental Sciences.

Buffer zones adjacent to agricultural fields can reduce nutrients from reaching lakes and rivers.

Streamside Buffers Retain Agricultural Pollutants

by Sharon Durham

Nutrient Removal

Reforested riparian buffers remove 60 percent of the nitrogen and 65 percent of the phosphorus from agricultural runoff according to a study conducted by UGA scientists in Tifton, Georgia and cooperators from Agricultural Research Service. A 9-year study looked at whether restored conservation buffer zones adjacent to agricultural fields can reduce nutrients that reach surface waters like lakes and rivers.

Surface runoff and subsurface flow of water from farmland on which animal waste has been applied can contribute significant levels of nitrogen and phosphorus to receiving waters unless appropriate management techniques are used. Riparian buffer zones are areas of vegetation that soak up water and nutrients from the soil. Buffer zones also help reduce soil erosion along downward slopes due to rain or irrigation, both of which can cause surface runoff.

Biological and agricultural engineer George Vellidis of the University of Georgia and ecologist Richard Lowrance of the ARS Southeast Watershed Research Unit, restored a buffer system next to an agricultural field on which manure was applied. It contained three zones. Zone 3 is a grassy edge that sits next to the field, Zone 2 is a managed forest adjacent to the grass and Zone 1 is a permanent forest along the stream.

Generally, young forests have higher nutrient uptake rates because the rapidly growing plants require it. On the other hand, mature forests create forest soils through leaf litter and shallow roots, which increase biomass on the forest floor. All these factors are keys to reducing the movement of nutrients to surface waters.

During the study, the amount of water and concentrations of nutrients (nitrogen and phosphorus) in water entering and leaving the riparian wetland were monitored. Though conservation buffers are being used to improve water quality through U.S. Department of Agriculture cost-share programs, few studies have looked at the effects of restored conservation buffers on water quality.

"Buffer zones are not a magic bullet, but a system to mitigate nutrient flow to soil and water," says Vellidis. "This is the first study showing that forested riparian areas can be effective in retaining phosphorus."

Pesticide Removal

In another study headed by Lowrance and Vellidis, herbicide runoff was examined in a similar grass-forested buffer system. During the three year study, they found the three zone riparian buffer was effective in reducing atrazine and alachlor from entering shallow groundwater and surface runoff. These herbicides are used for broadleaf weed control. In contrast to the results with nitrogen and phosphorus, the grass filter strip received higher amounts of herbicide and provided a higher removal rate. So the entire buffer system (grass plus forest) is effective at reducing herbicide concentrations to below detectable levels and in substantially reducing nutrient amounts.

Through the years, it became clear that trees and forests must be part of the conservation buffer system if nitrogen and phosphorus and other pollutants are going to be removed.

"For the Southeast we are now suggesting that restored conservation buffers that include a managed forest buffer can actually out-perform a mature forest," says Lowrance.

More information about buffer research is available in Agricultural Research Magazine at: www.ars.usda.gov/is/AR/archive/dec03/buffer1203.htm

Sharon Durham, Information Staff, works for Agricultural Research Service, U.S. Department of Agriculture.

Peggy Creb

Farmland bordered by a buffer system with 3 zones reduces nitrogen and phosphorus runoff by 60 percent.

"Every dollar saved in maintenance and operational costs is another dollar that can be used in research," *concluded the Awards Jury for the Georgia Chapter of American Institute of Architects.*

A Pioneer in Sustainable Architecture

by Susan Varlamoff

Dagmar Epsten

The National Environmentally Sound Production Agriculture Laboratory, Tifton, Ga., combines sustainable design, energy conservation with preservation of the local ecology.

Before sustainable building practices were environmentally fashionable, the UGA Board of Regents saw an opportunity to be avant garde. In 1995, the Coastal Plain Experiment Station in Tifton requested that the Epsten Group, Inc., a sustainable design consultant, design a building to reflect the laboratory's mission for environmentally sound practices. The building was to include laboratories, offices, meeting and visitor areas, and greenhouses.

The result is the National Environmentally Sound Production Agriculture Laboratory (NESPAL) which combines practical applications of sustainable design, energy conservation, and ecological impact with state-of-the-art technology. The project serves as a prototype for future facilities and received an Honor Award for Excellence in Architecture from the Georgia Chapter of American Institute of Architects, Sustainable Design Award Program. It took into consideration site preservation, energy, waste, building materials, and indoor air quality.

The Awards Jury stated, "Where most project entries focused on one or two issues of sustainability, this project addressed holistically the five."

"We helped with the site design and building layout, minimizing impact on the agricultural site and the adjacent wetland. We took into consideration the predominant wind orientation and solar gain through the building shape," said Dagmar Epsten, project director. "In addition, we explored ways to optimize water use and to select building materials specified for their energy performance, recycled or renewable material content and indoor air quality performance. One of the challenges was to optimize the building's energy performance while exhausting plenty of air through the laboratory hoods." Designing an energy efficient building for south Georgia's searing sun was a formidable undertaking.

Sustainable features:

Site: **Preserving water and eco-system quality**

- The building minimizes ecological impact on existing pond and wetlands.
- The design minimizes runoff from drives and parking areas.

Energy: Conservation and Creation

- Site design and floor plan take advantage of solar orientation and predominant winds.
- White metal roofing was chosen for energy saving characteristics.
- Envelope design includes window shading and daylighting through overhangs and light shelves.
- Laboratory lights are controlled by motion sensors that shut off the lights after a preset period of time, if the space is left unoccupied.
- The greenhouse environments are linked to computers that control automatic shading devices, ventilation equipment and moisture supplies.
- Photovoltaic cells on entry tower provide partial electrical power used in the facility.

Waste: Reducing Construction and/or Operation Costs

- Greywater collected from the greenhouse supplements irrigation to surrounding fields and research plots.

Materials: Recycled and Reused

- Carpeting contains shredded plastic soft drink bottles.
- Finishes, such as ceiling panels and floors, use renewable and recycled materials.

Indoor Air Quality

- A flow tracking system monitors the exhaust system and the laboratory fume hoods to adjust the air supply to all the laboratories.

"The project made it very clear that sustainable design produces economic benefits which, in turn, allow more financial resources to be applied toward research.....' Every dollar saved in maintenance and operational costs is another dollar that can be used in research," concluded the Awards Jury for the Georgia Chapter of American Institute of Architects.

For more information, visit www.egrouparchitects.com

With growing concern over chemical inputs, researchers are looking anew at velvet beans.

New Uses for an Old Crop

by Gwen Roland

For much of two centuries, farmers grew velvet beans to control weeds and build up organic matter in the soil in their fields. Now, UGA scientists are taking a second look at this old favorite.

"When my grandfather was diagnosed with Parkinson's disease, I told him I was researching the plant from which a drug to treat it is made," said Nicole Martini, a UGA horticulture graduate student. "A few months later," she said, "he showed me his medicine bottle and said, 'Look, here's your plant'."

Velvet beans' pharmaceutical use is fairly new in the United States. But people elsewhere have used it to treat ailments from depression to snakebite. The medicinal properties come from a high concentration of L-dopa, a precursor of dopamine. This may be why most insects avoid it. Doctors use L-dopa to treat Parkinson's disease.

Velvet beans were a favorite cover crop in the South for more than 150 years. "Weeds don't like velvet beans," Martini said. "And they contribute tons of biomass per acre." They provided forage for livestock. They controlled weeds. They added nitrogen and biomass to the soil. But they disappeared from the rural landscape in the mid-1950s, though, when better roads and low-cost farm chemicals enabled farmers to plant the same crops year after year.

With growing concern over chemical inputs, researchers are looking anew at velvet beans. Martini's experiments in Georgia focus on biomass and weed control. She uses the Georgia Bush variety bred by UGA researcher Sharad Phatak.

At the UGA campus in Tifton, Ga., she and other scientists study velvet beans' benefits. "Just 120 days after planting, velvet beans produced 65.6 tons of fresh biomass per hectare, about 50 percent more biomass than Sunn Hemp," she said. This supported the theory that velvet beans can improve the organic matter content and fertility of soils in Georgia, she said.

Tony Bateman

UGA horticulturist Sharad Phatak checks a velvet bean plant. This farm favorite may make a comeback as a weed destroyer and a human disease fighter.

"We also found that a solution prepared using velvet bean residue in water reduced growth of crab grass, sicklepod and pigweed," she said. "It didn't eliminate them, but it did reduce them."

From the data, she concludes that through a combination of the added biomass, the quick growth that shades out weeds and the allelopathic effect, a farmer would see fewer weeds if he used velvet beans as a summer cover crop before planting fall vegetables. Adding those traits to the current potential to sell beans to drug companies could mean a major comeback for velvet beans.

The velvet bean study was funded by a grant from the Southern Region Sustainable Agriculture Research and Education Program.

For information visit: http://www.griffin.uga.edu/sare

Gwen Roland is a news editor with the UGA Southern Region Sustainable Agriculture Research and Education Program.

Air

Global warming affects citizens around the world. The amounts of carbon dioxide and other air pollutants from vehicle and industrial emissions concern regulatory and public health officials. UGA scientists are helping find solutions, such as alternative, carbon-dioxide-free fuels. They also are documenting the effects of environmental stress on plant life and finding ways to reduce pesticide drift to nearby fields and land.

Bio-refinery Reduces Greenhouse Gases

by Cat Holmes

The cataclysmic weather portrayed in *The Day After Tomorrow* is pure Hollywood drama, but the overwhelming consensus among scientists who study the atmosphere is that global warming is real. It's primarily caused by a build-up of greenhouse gases, mostly the result of burning fossil fuels like coal and oil.

UGA scientists are developing a bio-refinery that is an environmentally sound alternative to crude oil refineries. The bio-refinery processes biomass such as agricultural waste and biofuel crops to produce fuel and other value-added products.

"Obtaining our energy through a bio-refinery using the technologies we are pursuing instead of depending on fossil fuels doesn't just reduce carbon dioxide emissions," said K.C. Das, a bioconversion engineer for UGA's College of Agricultural and Environmental Sciences, "it actually sequesters carbon."

That means a potential source of carbon dioxide is transformed into a form of carbon that's harmless. "It could remain in the soil for a long time, away from the atmosphere where it would contribute to global warming," Das said.

The researchers began with a simple idea: The chemical difference between hydrocarbons, such as coal and oil, and carbohydrates, found in plants, are chemically made up of the same substances. "We realize that all we're missing is a process that can mimic nature's conversion of biomass to fossil fuel," Das said.

Pyrolysis, an old technique that manufactures charcoal, can do this.

Agricultural waste is a renewable resource that can be processed to produce bio-fuel.

Pyrolysis transforms biomass and agricultural waste products into a fuel and chemical feedstock called bio-oil. One byproduct of pyrolysis is hydrogen, a much cleaner fuel and a substance used to make ammonia fertilizer.

Unfortunately, current manufacture of ammonia/nitrogen fertilizer is based on hydrogen produced from natural gas (a non- renewable resource) creating large amounts of greenhouse gases. Agricultural waste is a renewable resource and emits no greenhouse gases.

"You basically take peanut hulls and heat them to 450-500 degrees Celsius," Das explained. "In the absence of oxygen, the cellulose pyrolizes and forms oil. It looks a lot like engine oil, but it's a little more viscous."

One of the most exciting aspects of the technology is that it also generates carbon char, a solid form of carbon. Unlike carbon dioxide, the similar byproduct of crude oil refineries and a major environmental problem, the char is harmless and even beneficial.

Eprida, a private company and

A bio-refinery processing agricultural waste to fuel.

Paul Efland

partner with the UGA team, is commercializing a technology that turns char into a slow-release nitrogen fertilizer while using the carbon dioxide generated within the pyrolysis process. Studies show that char in this form restores soil fertility and increases crop yields.

"Char is unique because it is relatively stable – it just stays there in the soil," Das said.

"With fossil fuels, carbon that has been in the soil for millions of years is used up in a few years, producing large amounts of carbon dioxide that end up in the atmosphere. This pyrolysis technology actually sequesters the carbon while adding ammonia to the char so that we can put it back in the soil as a fertilizer."

Since the bio-refinery uses agricultural waste like peanut hulls, poultry litter and other byproducts, the technology also turns an environmental obstacle into an environmental advantage.

While the technology is very promising, there are still challenges on which to work. A major challenge is that bio-oil is unstable and reactive, which makes it more difficult to store, transport, and work with.

"There are around 300 compounds in bio-oil," Das said. Engines must be modified or the fuel must be modified to work in existing engines.

Finally, the UGA team of scientists are also working to make the process more efficient, which will make it more economical. "It is a complex process," Das said. "The typical process in industrial manufacturing today makes a product from raw materials and throws away the byproducts as 'trash.' The difference in a bio-refinery is that everything is used for something else, everything has value."

For more information about the biorefinery, e-mail K.C. Das at kdas@engr.uga.edu

Cat Holmes is a former news editor with the UGA Agricultural and Environmental Sciences.

Jay Bauer

Sleeping Plant's 'Breath' Can Indicate its Health

by Susan Varlamoff

By measuring the nighttime respiration rate of plants, UGA scientists hope farmers can detect environmental stresses in their fields.

Stresses like low soil moisture, high or low air temperatures, weeds, insects and diseases can reduce plants' growth, yields and quality. They can hurt a plant before it shows any signs of problems.

During the recent drought, the lack of rain greatly damaged plants. Finding a way to know when soil moisture levels become low before the damage occurs is an important reason for this research.

"We are essentially looking for a correlation between environmental stress and high nighttime CO_2 respiration rates," said Anandakumar Karipot, an assistant research scientist with the UGA College of Agricultural and Environmental Sciences.

Karipot, Professor Monique Leclerc and Postdoctoral Associate Gengsheng Zhang are working on this project through the UGA Laboratory for Environmental Physics on the Griffin campus. John Beasley, agronomist and professor of crop and soil sciences on the UGA Tifton campus, and U.S. Department of Agriculture physiologist Diane Rowland are also members of the research team.

Environmental stresses typically reduce the transpiration rate or the amount of water vapor given off by the plant. Lower transpiration rates increase plant temperatures. They also increase nighttime respiration rates that produce carbon dioxide.

When the plant expends energy to respire faster, it can't produce as much food for itself (photosynthesis). This reduces its growth, yield and quality.

"It is similar to a human being: if you can't perspire, your body overheats and your respiration rate increases," Beasley said. "When a peanut plant is stressed, it can't produce the pod or fruit."

The scientists are measuring carbon dioxide fluxes above a peanut field at the UGA Southwest Georgia Research and Education Center in Plains, Ga. The sensors, known as an Eddy covariance system, include a fast response, sonic gauge that measures the wind speed in three directions and an infrared gas

analyzer that determines carbon dioxide concentration fluctuations. Together, these sensors provide information about uptake of carbon dioxide by plants.

They also record supporting measurements of soil temperature, soil water content and solar and earth radiation. The scientists collect data from planting until harvest. This helps them study variations in carbon dioxide fluxes and their relation to water stress at different stages of plant growth.

There is no photosynthesis at night. During this time, plants respire and release carbon dioxide. So the variations in nighttime carbon dioxide levels will indicate environmental stress.

"It is important that the peanut field we chose for this study is fairly large, flat and uniform with similar soil properties," Karipot said.

"This ensures that similar conditions exist throughout the field, and the carbon dioxide variations are representative of the peanut crop."

A weather-monitoring station also measures wind speed and direction, rainfall, air temperature and humidity, and solar radiation in the field. This information will help scientists understand the microclimatic influence on plant growth and yield. It will help them better interpret the CO_2 respiration data.

"We would like to extend our research next year to two fields," Karipot said, "one with irrigation and one without irrigation, and see the difference in respiration rates of the crops with and without water stress."

This research could be developed into a tool to warn farmers of water stress in their fields and help them manage their irrigation better.

For more information regarding this project, contact Anandakumar Karipot at akaripot@gaes.griffin.peachnet.edu or Monique Y. Leclerc at mleclerc@griffin.uga.edu

The field studies showed the new air induction spray nozzles reduced misapplication of chemicals by 60 percent to 80 percent.

A pesticide applicator with low-drift spray nozzles.

Reducing Pesticide Spray Drift

A major problem in the application of pesticides on crops is spray drift. It can contaminate nearby water bodies and also damage non-target crops or vegetation in an adjacent field.

One of the causes of spray drift is small droplets created by the nozzle. UGA agricultural engineer Paul Sumner conducted a field study to demonstrate the effects of using low-drift (air induction) chemical spray nozzles and conventional flat-fan nozzles. The field studies showed the new air induction spray nozzles reduced misapplication of chemicals by 60 percent to 80 percent over standard flat-fan nozzles. A 32 percent reduction was seen when using wide range or extended range flat-fan nozzles over standard flat-fan.

Information about reducing pesticide drift was presented to growers and applicators at chemical application meetings. Fifty percent of those attending indicated they would change the nozzle type for applying herbicides.

"Growers have come to realize they have to change the way they spray pesticides to maintain their ability to produce food and fiber safely," said Paul Sumner.

For more information, visit http://www.tifton.uga.edu/spray/ or contact your local county extension agent available at https://secure.caes.uga.edu/personnel/countylisting.cfm

Education & Extension

As environmental protection becomes increasingly important to Georgians, the nation and the world, UGA educational and extension programs are shifting to help meet changing needs. New educational programs include an agricultural technology major and opportunities for high school students to study in the rain forests of Costa Rica or the jungles of Ghana. To counter diminishing resources, the Cooperative Extension Service has formed partnerships with public and private organizations to spread scientific expertise into Georgia communities and assist local governments and citizens meet a variety of needs.

Agriscience and Environmental Systems Major

In the past 20 years, agriculture has adopted many new technologies to keep pace with a global economy and protect the environment. New technologies include precision agriculture to reduce fertilizer, pesticide and water use, biological control of insects; and computer and digital applications to agricultural problems. The UGA College of Agricultural and Environmental Sciences (CAES) has taken on the challenge of training students for this emerging and interdisciplinary field.

"Students will be able to live and learn in southwest Georgia, one of the world's largest agricultural classrooms," — *David Bridges, assistant dean for the Tifton campus*

The Agriscience and Environmental Systems (AES) major integrates current research and outreach activities of the college with an innovative teaching program. Based on the Tifton Campus where much of this research takes place, students take courses from faculty who develop these new technologies. A student is eligible to pursue the AES major after successfully completing two years at Abraham Baldwin Agricultural College (ABAC) and transferring to the UGA Tifton Campus. This partnership allows students to obtain a four year degree in south Georgia.

Currently, there are no programs in the southeastern United States that offer broad-based, interdisciplinary education in emerging environmental technology for agriculture. Potential employers were surveyed, and 95 percent indicated they would hire a good student from the program for a variety of jobs ranging from sales and marketing to research and management.

About 80 percent of the students in the ABAC college transfer program expressed interest in the new program. And of the more than 900 south Georgia high school biology students who returned a survey, more than 35 percent expressed interest.

The major will enable students around the Southeast to study the latest in agricultural sciences and technologies. "Students will be able to live and learn in southwest Georgia, one of the world's largest agricultural classrooms," said David Bridges, assistant dean for the Tifton campus.

For more information, visit www.tifton.uga.edu/

The partnership offers an innovative blend of technical assistance and educational programming in best management practices, waste minimization techniques, beneficial reuse, and sustainable production practices.

Pollution Prevention for Georgia's Farmers

by Tina Pagan

As resources become scarcer, it becomes increasingly important to leverage funding with existing organizations to accomplish goals. The Agricultural Pollution Prevention (AgP^2) program, a partnership started in 1994, provides educational and technical support to farmers. It addresses emerging environmental issues such as land application of biosolids, animal waste management, and water conservation in farming. The Program is funded through the Pollution Prevention Assistance Division (P^2AD) of the Georgia Department of Natural Resources.

P^2AD enlisted the Cooperative Extension Service to reach the agricultural community because of its established relationship with farmers since 1914. This partnership has benefitted farmers and Georgians by providing technical assistance through voluntary pollution prevention programs. Reducing water use in farming and preventing pollution from confined animal feeding lots to nearby surface waters are two of several critical areas being addressed. The partnership gives the agricultural community an opportunity to incorporate environmental stewardship into their operations and become part of a comprehensive state-wide pollution prevention effort.

The partnership offers an innovative blend of technical assistance and educational programming in best management practices, waste minimization techniques, beneficial reuse, and sustainable production practices. This information is disseminated at conferences, workshops and trade shows and through the development of publications, software, slide shows, and demonstration projects. The program offers on-farm assessments to identify potential environmental impacts, and provides opportunities to address those impacts in ways that are efficient and profitable.

This vital partnership provides the opportunity to reach more Georgia's farmers by joining with other organizations for a common goal.

Dot Paul

No-till farming helps prevent soil and water erosion and protects nearby water sources from sediment.

For more information on the AgP^2 program, visit www.agp2.org

Tina Pagan is a Program Specialist for Farm*A*Syst working in the Department of Biological and Agricultural Engineering.

Jeff Vanuga

Concrete water crossing for livestock. Buffers and fencing for livestock exclusion prevent pollution of streams.

Research and Education Garden

by Wayne Gardner

If you're searching for the perfect turfgrass for your home landscape, always dreamed of adding a water feature to your garden, or want to learn more about nonchemical pest control, the UGA Research and Education Garden in Griffin, Ga. is definitely the place for you. At the garden you can see, and feel, more than 10 different turfgrass varieties, a working water garden and mini landscapes treated both with and without chemicals.

Located just 45 minutes south of Atlanta on the UGA Griffin Campus, the Research and Education Garden is a 65 acre site that promotes gardening as a way to connect with and protect nature. The focal point of the garden is a Demonstration Area of 15 theme gardens. It includes a turf area with 11 different grass types, a butterfly garden showcasing plants that support the full life cycle of the butterfly, and a rock garden containing exotic plants tucked into various ecological niches.

In addition, there are 20 research plots scattered throughout the property. They provide information to help professional landscapers supply the public with healthy plants and the means to maintain them without degrading the environment. Current projects include:

- **Landscape Management Project –** A 10-year effort to reduce urban pesticide use in landscapes. Initially funded by the Georgia Pollution Prevention Assistance Division.
- **Biologically-based turfgrass pest management –** for residential and commercial applications.
- **Evaluation of crepe myrtles for resistance to insects –** for urban landscapes.
- **Selection of plants adapted to southern landscapes –** require less fertilizer and pesticides.

photos by Dianne Brooks

Dr. Alfredo Martinez, UGA Extension Specialist, instructs class members on pest suppression and disease management .

More than 6,000 Georgians visited the garden in 2003-04. They learned about garden design, plant selection, best management practices for enhancing plant health, integrated pest management, and ways to reduce water, pesticides and fertilizers in gardening. The very popular *Lunch and Learn* and *Garden Workshop* series drew gardeners from Dublin to Marietta. On Sundays throughout the summer, the Friends of the Garden host a variety of activities such as "Make your own Mother's Day basket" and the very popular plant sale. Master Gardeners, teachers, homeowners, landowners, school groups, 4-H'ers, and community and civic groups flock to attend these events.

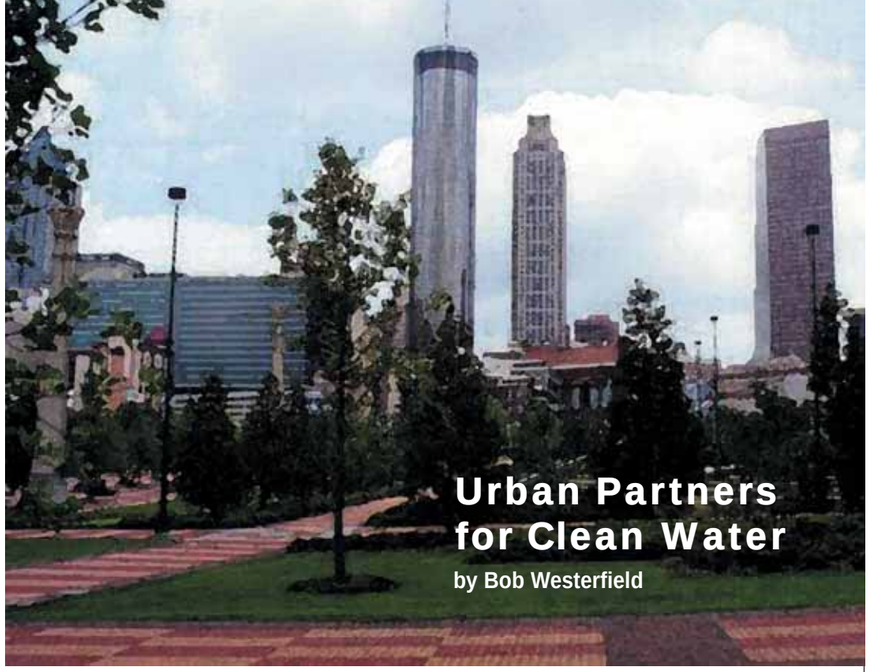
"The Research and Education Garden has become one of our treasures," said Helen Grayson, former president of the Friends group and founding garden member. "Homeowners come to learn what plants and turf would improve their property and gardeners come to discover new plants and which combinations work well together. And youth come to learn how plants grow and to see bugs and butterflies at work."

As part of its educational mission, the garden currently administers the state-wide Georgia Certified Landscape Program (GCLP) endorsed by the Georgia Green Industry Association, the Georgia Turfgrass Association, and the Metro-Atlanta Landscape and Turf Association. To become certified, a participant must identify approximately 400 plants, many of which grow in the Research and Education Garden.

John Strickland of StricklandScapes acknowledges that the garden's administration of the GCLP is critical to enhancing the professionalism of landscape managment in Georgia. He recently noted, "For the employer, what better way to train your most valuable commodity. For the employee, what better way to expand your chosen profession, and for the client, what better way to qualify a worthy contractor."

For information, visit www.griffin.peachnet/garden

Wayne Gardner is an entomologist and faculty leader of the Research and Education Garden.



Urban Partners for Clean Water

by Bob Westerfield

One solution to metro Atlanta's stormwater pollution is the University of Georgia Cooperative Extension Service. The Clean Water Campaign, conceived by the Atlanta Regional Commission, enlisted the help of county agents to educate urban homeowners about conserving water and protecting it from pollutants.

Eight hundred miles of streams in the 10 county metro area violate water quality standards. And 98 percent of the Atlanta region's drinking water comes from surface water. From 1990 - 2000, Georgia was the fastest growing state east of the Mississippi. Fifty percent of the population is concentrated in the Atlanta metro area. Therefore, water quality and water quantity rank high on local governments' environmental agendas.

The Clean Water Campaign sets program priorities each month and establishes workshops around these priorities. An important area of interest is gardening to protect the environment. County extension agents and Master Gardeners teach topics such as Xeriscape, rain gardens, integrated pest management, tree planting and composting in 15 metro counties.

Never realizing the keen interest in the subject, the Gwinnett County Extension Office reserved a room for 80 people to learn "How to Have an Environmentally Friendly Landscape." The room filled with a standing room only crowd. A bigger room was secured for the following night and County Extension Agent Robert Brannen taught 150 avid gardeners ways to reduce fertilizer, pesticide and water use in planting and maintaining their landscapes.

"Another evening, not even a snow storm could keep 100 interested homeowners from learning how to install a rain garden in their yards," Brannen said. Rain gardens collect stormwater runoff from a landscape that may contain pollutants. The runoff irrigates plants and prevents contaminants from entering storm drains and surface water.

In all, 940 homeowners attended 28 programs conducted by the Georgia Cooperative Extension Service. The success of the workshops confirms a 1999 Georgia gardening survey that states that 72 percent of respondents wanted more information on pest resistant plants and 69 percent wanted to know about alternatives to pesticides.

For more information about the Clean Water Campaign, visit www.cleanwatercampaign.com

Bob Westerfield is an Extension Horticulturist and liaison to the Clean Water Campaign.

Georgia WaterNET

by Deborah Borden

Georgia's economy, environment and quality of life are being compromised due to a lack of clean and abundant water. Population growth and recurring drought have increased competition for water, a diminishing resource. Even scientists within the College of Agricultural and Environmental Sciences felt the effects of the recent drought. The City of Griffin asked the Experiment Station to discontinue the greenhouse experiments to save water for drinking.

Local governments in Georgia are well aware of this issue since they are required to meet new federal and state environmental regulations focused on protecting water resources and stormwater management. However, most city and county governments lack the technical, financial and human resources needed to address these mandates.

Recognizing the problem, a team of UGA scientists and extension/outreach personnel initiated Georgia WaterNET (Nonpoint Education Team), a comprehensive educational and technical assistance program for individuals and organizations that play an important role in achieving water mandates. Clients include local governments, environmental professionals, developers, the military, extension agents, educational institutions and the public.

The Georgia WaterNET program is based on the Nonpoint Education for Municipal Officials (NEMO) model, developed in the early 1990s by the University of Connecticut. Delivery methods and educational materials are continually being honed to address Georgia-specific watershed and stormwater issues. Georgia WaterNET also collaborates with agencies that

County Extension agents can serve as first line defenders of clean and abundant water for their communities.

address water issues across the state such as the Department of Community Affairs and the Georgia Pollution Prevention Assistance Division to eliminate duplication of efforts and promote cooperation. To provide Georgians with the best possible assistance, the team also works with other southeastern universities through the USDA-CSREES Southern Regional Water Quality Program sharing the latest research information, techniques and experiences.

First Line Defenders

Training county extension agents on strategies taught by the Georgia WaterNET program was the first step in helping local governments address water issues. County agents are uniquely positioned to do the job. They know their communities, the land, the water and the people. They are educated professionals who are skilled in communicating technical information through the media and directly to the general public. With an understanding of stormwater regulations and best management practices, they can provide invaluable educational and technical assistance to local governments on water quality and water quantity issues throughout the state. County extension agents can serve as first line defenders of clean and abundant water for their communities.

Thus far, the program has trained 80 county extension agents. In one case, an agent worked with the local water utility to send out 35,000 educational brochures to all the water customers in the county.

Last February in Griffin, Georgia, more than 50 local government personnel and county extension agents from across the state attended a workshop funded by the Georgia Space Grant and Sea Grant Programs and supported by agencies and organizations including Georgia Department of Community Affairs, Georgia Municipal Association, Association County Commissioners of Georgia, the City of Griffin, and Spalding County. This workshop provided watershed planning and stormwater management resources to local governments. It also gave officials an opportunity to discuss and share their concerns about handling current water regulations.

Matthew Tanner

Hillary Smith Tanner, a WaterNET team member, is looking for benthic macroinvertebrates living on the bottom of rocks in the creek.

Many participants felt they could directly apply the information given in the workshop to help provide solutions to local water quality concerns. Participant surveys indicated an overwhelming need for more education and assistance related to the workshop topics. In addition, the Georgia WaterNET team responded to a number of one-on-one technical assistance requests resulting from the workshop related to National Pollutant Discharge Elimination System and Total Maximum Daily Load requirements, watershed planning and management, low impact development technologies, and stormwater best management practice (BMP) design.

Georgia WaterNET has provided training to more than180 environmental professionals and military installations on the technical design of stormwater BMPs, low impact development, and natural stream channel design. Technical workshops have and will continue to be held across the state to provide professionals with emerging watershed and stormwater methods and technologies.

In 2005, Georgia WaterNET plans to conduct a second stormwater/ watershed management workshop for local governments in Gwinnett County and a low impact development seminar for coastal developers. Georgia WaterNET will:

- Host a workshop series for local governments and others,
- Conduct pilot projects,
- Develop educational and website materials, and
- Provide ongoing technical assistance.

For additional information on the Georgia WaterNET Program, upcoming workshops, and technical/educational resources, contact Deborah Borden, Water Resources Outreach Engineer, 706-542-6099 or dborden@engr.uga.edu

Photos by Dennis Rowley

Andrew Villaveces (left), a 2003 student, checks the efficacy of bacteria associated with chickens in the Poultry Science Department.

Chris Rucker (above left), a 2004 student, learns about operating on a horse in the School of Veterinary Medicine.

Farah Mahbub (above right), a 2003 student, is working on crop modeling using DSSAT program for the Biological and Agricultural Engineering Department.

Young Scholars

by Susan Varlamoff

While many high school students spend their summers working in fast food restaurants, vacationing or visiting with friends, young scholars have a different agenda. They prefer to study with UGA scientists in fields such as stem cell research and plant pathology, and even assist in animal surgery.

Since the summer of 2000, high school students participating in the Young Scholars Program study under faculty mentors from UGA's Athens, Griffin or Tifton Campuses. For six weeks, the students work in areas such as food science, veterinary medicine, horticulture, crop and soil science, and embryonic stem cells. The program is open to all high school students who have completed their freshman year of math and science and show an aptitude for these subjects.

"This is one of the few programs that allows a young person to see what a scientist does from day to day and promotes research as a career option," said Steven Stice, a scientist who conducts stem cell research. "The people in my laboratory and I have gained from the experience by seeing and sharing in the excitement and energy of these students."

"The mission of the program is two-fold," according to Donald McLellan, CAES Diversity Relations director who oversees the program. "First we want to educate students on the true mission of the College of Agricultural and Environmental Sciences, which is food safety, security and environmental protection. Secondly, we want to expose students who, for whatever reason, have not fully realized their potential, but teachers have indicated that these are clearly bright students who have not been challenged."

Young scholars commit to working with their assigned mentors full-time for six weeks. They receive a salary for their work. In addition, the students must prepare a final presentation that they deliver at a closing ceremony that describes the nature of their projects.

Initially, Pat Clifton, program coordinator of the Athens Campus, and Marilyn Johnson, program coordinator of the Griffin Campus, worked hard to promote the program in high schools to recruit students. Now, the program has become so competitive that both campuses cannot accommodate all interested applicants. It also has expanded into the Franklin College of Arts and Sciences and the College of Veterinary Medicine.

Patrick Williams, 2003 student, and Dr. Paul Thomas of the Horticulture Department study ornamental flowers.

Kelli Clifton and Jack Varner, 2002 students, studying the effects of afflatoxins on poultry with Dr. Wyatt in the Poultry Science Department.

Dr. Ivery Clifton, Associate Dean, and Dr. Gerald Arkin, Assistant Dean, pose with Young Scholar students at the University of Ghana.

International Study to Costa Rica and Ghana

Due to the strong interest in the Internship Program, an international component has been added to the Young Scholars Program to give students an opportunity to explore other cultures and expand their understanding of global research. Junior and senior high school students who have successfully completed the Internship Program may apply to study in Costa Rica and Ghana. In Costa Rica, the students divide their time between two research stations and home stays with local families living near the Monteverde Cloud Forest. They tour the country learning about the language and culture and study ecosystems of the cloud forest, rain forest and marine habitats. The students also visit family farms, arts and crafts cooperatives, and other small industries such as coffee roasters. (See story on back cover.)

Third year students have an opportunity to travel to Ghana, a country where several UGA scientists are actively working in areas of food science and safety. In Ghana, students learn the challenges of living in a third world country where malnutrition and disease are rampant. "Our young people have never seen this kind of poverty so this is a real eye opener," said Pat Clifton.

The students saw first hand the results of UGA food scientist Robert Phillips' work in reducing malnutrition. Phillips developed a high-protein weaning food from crops indigenous to the region. Since nearly every village has a mill, mothers were able to grind cow peas, peanuts, and corn to make porridge for their toddlers. Hospital cribs that were once full of starving children are now empty.

Aflatoxin is a highly toxic substance that contaminates crops such as peanuts, corn, rice and cotton when they are improperly stored. Produced by mold, this compound is a leading cause of liver cancer in developing countries. In most of west Africa, like Ghana, approximately 95 percent of the people show high levels of aflatoxin in their blood. UGA scientist Tim Williams conducts research to reduce the toxin in humans.

Young scholars listened to a lecture at the University of Ghana School of Nutrition about the project.

In Gampala, students saw how children raise hens to pay their school tuition. This program is part of the Poverty Alleviation Project that Salibo Some established in his native Burkina Faso after earning his Ph.D. in food science at the University of Georgia. Participating village children receive several hens to raise. When they increase the brood to 20, they may use them to pay tuition at the elementary school. Since the average per capita income in Gampala is $73, large families cannot afford to pay school tuition without this program.

Photos by Pat Clifton

2004 Young Scholars' students with rural farm family in Burkina Faso.

Heifer Project International in Burkina Faso.

Nicholas Dials, 2004 a young scholar, observed that "farmers need help and greater resources while their children simply need food." He hopes to return after completing his education and to help the people of Ghana.

"It is so gratifying when parents tell me how we have made a difference in the lives of their children," comments Donald McLellan. "Recently, at the closing ceremony, a parent said, 'You have managed to accomplish something in 6 weeks what we couldn't do in 17 years.' "

"I just want students in the Young Scholars' Program to have a vision of all they can become and to be greater stewards of the earth," he added.

For more information, visit http://academics.caes.uga.edu/programs/youngscholars/ or contact Donald McLellan at dmclella@uga.edu

Susan Varlamoff is the program coordinator for the Office of Environmental Sciences.

Study Abroad in Costa Rica

by Dan Rahn

Attending a 6 a.m. lecture on plant pathology was unusual, but what followed was nothing short of extreme education for 16 students in a UGA study-abroad class last summer. At a nearby banana plantation, the students wrestled with the lecture topic firsthand, detailing the damage done by black sigatoka, a fungal leaf spot disease that's threatening banana crops worldwide.

As they puzzled through their assignments, they contended with intermittent rains and steamy tropical heat while warding off biting bugs and keeping a wary eye out for the snakes that slither through the leaf litter underfoot.

From there, they studied the ecosystem from which the banana fields had been carved, trudging through the tropical rain forest's muddy trails and carefully noting its biodiversity. When the exhausting schedule wound down, the students had completed another 15-hour day of learning. The next grueling day would start with breakfast at 6 a.m.

"The students have as many contact hours in these 18 days as they normally would in a semester," said Wayne Parrott, a UGA professor of crop and soil sciences who coordinated and taught the course, "Agriculture and Ecology in Tropical America," along with UGA horticulture professor Mark Rieger.

For two and a half weeks the students slogged through Costa Rica's luxuriant rain forests, probed its misty cloud forests and verdant dry forests, hiked its imposing volcanoes, combed its beaches and examined its ample agriculture.

They saw fields of bananas, pineapples and other tropical fruits; coffee, cocoa, flowers, ferns; row crops of onions, potatoes, cabbage; and beef cattle and crops from cassava to rubber to sugarcane to timber. They waded through jungles and hiked mountain trails. Through it all, the students battled blisters, exhaustion, injuries and illness. It's intense education, but it's fun.

The Costa Rica class is one of five study-abroad courses offered through the UGA College of Agricultural and Environmental Sciences. It's one of more than 80 offered by UGA in more than 40 countries. A diverse group of undergraduates from ecology, anthropology, religion, engineering and political science attend.

"The class was more intensive than I thought it would be," said Jason Check, one of two non-UGA students in the course that provided the last three credit hours he needed to graduate from Georgia Tech.

The course design makes it much like 16 simultaneous directed individual studies. Students get the course credit in their choice of crop and soil sciences, horticulture, anthropology, ecology or geography.

"You have to learn in that kind of setting," said Roth Friar, a third-year horticulture major from Athens. "We were being taught in all the different ecosystems we visited. You just couldn't do that in a classroom."

The Costa Rica study-abroad course shows students up close a tiny country with 1,500 animal species and 4 percent of the world's known plant species. You can't really imagine that without being there.

For more information about ecotourism or study abroad in Costa Rica, visit http://www.uga.edu/about UGA/compete-ecolodge.html
Photos: http://www.uga.edu/tropag

Dan Rahn is a news editor with the UGA College of Agricultural and Environmental Sciences. He received a silver award from the Association for Communications Excellence for the longer article from which this article is drawn.

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