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**From Grow to Go
for a New
Bioeconomy**

A focus on agriculture and
natural resources programs at
the University of Tennessee
Institute of Agriculture

THE UNIVERSITY of TENNESSEE

from the vice president



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Exciting developments are underway at the Institute of Agriculture regarding the Tennessee Biofuels Initiative. This new institute-led initiative is a research and business model that has the potential to position the state as a leader in the nation's efforts to replace petroleum-based products with those generated from renewable cellulose-based materials. Goals of this "proof of concept" project include increased energy independence from fossil fuel, economic development,

and environmental sustainability. The project is a top priority for UT this year and is a collaborative effort for us with Oak Ridge National Laboratory.

Estimates of some of the potential benefits from commercial implementation of the model include 4,000 new jobs in rural Tennessee counties; \$400 million dollars in new state and local taxes; satellite processing plants creating an additional 3,000 new jobs and \$1 billion in revenue from chemical co-products useful in other manufacturing processes;

\$100 million in new farm revenue to about 20,000 of the state's producers; and 1 billion gallons of Grassoline annually at a potential wholesale price of \$1.20 per gallon: a level of production that would displace approximately 30 percent of Tennessee's present petroleum-based consumption.

Everyone benefits in this plan. The bio-based economy will result in cleaner, renewable energy while reducing our dependence on foreign oil. Principal feedstocks for the cellulosic ethanol are switchgrass and woody biomass, and Tennessee has an ideal climate for production of the feedstock commodities. The state's extensive transportation system will also contribute to the development of commercial facilities.

This is truly an instance where UT is inventing a vitally important **SOLUTION** that benefits us all.

Joe
Joseph A. DiPietro
UT Vice President for Agriculture

IT'S ONE THING TO FIND

SOLUTIONS

AND ANOTHER TO INVENT THEM.

Learn more at <http://agriculture.tennessee.edu/>.

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U.S. Rep. Zack Wamp emphasized the importance of UT's participation in the homeland security effort through the new Center for Agriculture and Food Security and Preparedness in the College of Veterinary Medicine.

Vet Med Center Targets Terrorism

UT's College of Veterinary Medicine has created the Center for Agriculture and Food Security and Preparedness (CAFSP). The new center will serve as a focal point for several key initiatives that will assist the nation in its efforts to protect agriculture and the food supply from terrorist threats. Agriculture and the food supply are part of the nation's critical infrastructure and have been identified as a key sector that is vulnerable to terrorist threats.

CAFSP will house the college's national training program that is being developed for the U.S. Department of Homeland

Security (DHS) on agriculture and food vulnerability assessment. Development of this outreach training program is being funded by a \$2 million grant the college received from DHS. The training program will provide industry and government officials at the state, county, and local levels across the country with tools to prevent and deter terrorist acts that target the agricultural and food sector.

Wiser Youth, Safer Food

Through a three-year, \$587,000 USDA National Integrated Food Safety Initiative Grant, seventh graders in 10 Tennessee counties are learning food safety lessons in the classroom. This UT Extension-led pro-

gram engages youth in fun, challenging, and innovative learning across math, science, social studies, and language arts curriculum.

"We piloted the program in Cocke and Scott Counties last fall and in Randolph County in North Carolina," says Dr. Janie Burney, coordinator for the Extension component. "Response was highly favorable. We heard that students were teaching their parents lessons on food safety, and that those lessons were being put into action."

The integrated curriculum is directly coordinated with state education standards and draws upon the expertise of UT's Department of Food Safety and Technology, Department of Family and Consumer Sciences and the Institute for Assessment and Evaluation. Among the subjects students learn are geography—where foodborne illnesses occur—critical learning skills as they formulate scientific hypotheses, and lab skills as they grow and count bacteria in petri dishes. Burney plans to extend the activities outside the classroom through Extension's 4-H Youth Development Program.



Winning turf students, from left, Tyler Middlesteadt, Lucas Freshour, Stuart Morris, and Adam Thoms, the graduate teaching assistant who coached the team. Not pictured is Will Jellicorse.

Ag Policy Wiz

Ask Drew Petty an agricultural policy question and expect an informed answer. Petty, a December Agricultural Economics graduate, placed second in the National Discussion Meet at the American Farm Bureau's annual convention. He is the first UT Knoxville graduate to represent Tennessee in the collegiate event since 1991.

Adviser Dr. Ernie Bazen, who competed at the national level when he was a student, is already on the lookout for a contender for next year's event.

Drew Petty, right, prepared for two-and-a-half months for the meet, with help from coach Ernie Bazen.



Sports Turf Standouts

Department of Plant Sciences students swept their competition at the Sports Turf Managers Association's annual conference and exhibition. Adam Thoms won the outstanding graduate student scholarship. Will Jellicorse won the outstanding undergraduate student scholarship, and Tyler Mittlesteadt was one of three winners of another undergraduate student scholarship.

If that was not enough, the UT undergraduate team captured the first place trophy in the Student Challenge Undergraduate Competition, beating out Iowa State and Penn State, as well as 27 other teams. Students took a two-hour exam that consisted of turfgrass, insect, weed, and disease identification, sports turf and budgeting-related case studies, pesticides application and calibration, irrigation and sports turf playability questions.



Roadmap to a Vibrant New Economy

The Tennessee Biofuels Initiative

A revolution for rural economies, and a renaissance for agriculture. That's how the Tennessee Biofuels Initiative is described by leaders of the university and by Tennessee Governor Phil Bredesen.

This new Institute of Agriculture-led initiative offers a roadmap for Tennessee to grow renewable biomass crops that provide the raw materials for in-state biorefineries. Their primary product will be cellulosic ethanol, which could provide about one-third of the fuel for the nation's vehicles while at the same time driving a new biobased economy, one in which Tennessee is uniquely positioned to lead.

Why should the state and nation invest in technologies to process cellulosic ethanol (which is derived from plant biomass) as opposed to corn-based ethanol? It comes down to costs. Economists predict intense competition between food and energy markets for corn, and current contract prices for corn production are bearing out their concerns. Agronomists add that the yearly inputs needed to grow corn, such as seed, make it a more expensive crop to produce than potential biomass crops. What is more, models developed by UT agricultural economists have found the Southeast, particularly Tennessee, ideally suited to produce biomass.

Institute researchers, working in collaboration with colleagues at the Oak Ridge National Laboratory, are engaged in optimizing cellulosic conversion processes, as well as improving the agronomic traits of switchgrass and other biofuel stocks such as woody biomass. "We know we can grow and produce the stocks," says Dr. Tim Rials, director

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In Henry County, Extension Agent Ken Goddard, second from right, inspects a stand of switchgrass with producers Tim Brannon, Don Cox, and Tony Brannon.





Dr. Janice Zale is optimizing switchgrass for both cellulosic and ornamental purposes.

Producing a Better Switchgrass

UT monocot specialist Dr. Janice Zale has launched a breeding and biotechnology program for switchgrass.

Zale, an assistant professor in Plant Sciences, is looking for switchgrass genotypes that are adapted to Tennessee growing conditions. She is also overseeing the work of graduate student Stephen Foulk, who is working on switchgrass transformation, testing new marker genes. Zale's lab is developing a new, highly embryonic switchgrass line capable of yielding 16,000 pounds per acre. In greenhouse and field tests, Zale is looking to find traits that will signify whether a certain genotype can be converted into cellulosic ethanol easily. "So we're on the hunt for these types of important traits." Her educated guess is that she'll find a lot of

genetic variability for traits associated with cellulosic ethanol production—something no one else in the U.S. is believed to be researching at the moment. Zale will be investigating how easily that cellulose is degraded, specifically how easily the cell walls are degraded into their glucose monomers for ethanol production.

Her breeding program is aided by nurseryman Robert Wilson of Gum Tree Farm Nursery in Hermitage, who has selected naturally growing switchgrass in the state. She hopes to collaborate further with him and with UT Gardens Director Dr. Sue Hamilton in selecting ornamental switchgrass for home gardeners, while she pursues other lines optimized for agronomic, cellulosic production. **UT**

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of UT's Forest Products Center and director of the Southeastern Center of the federal Sun Grant Initiative. "It's now a question of doing the research to improve the conversion and chemical breakdown processes, and that work is underway."

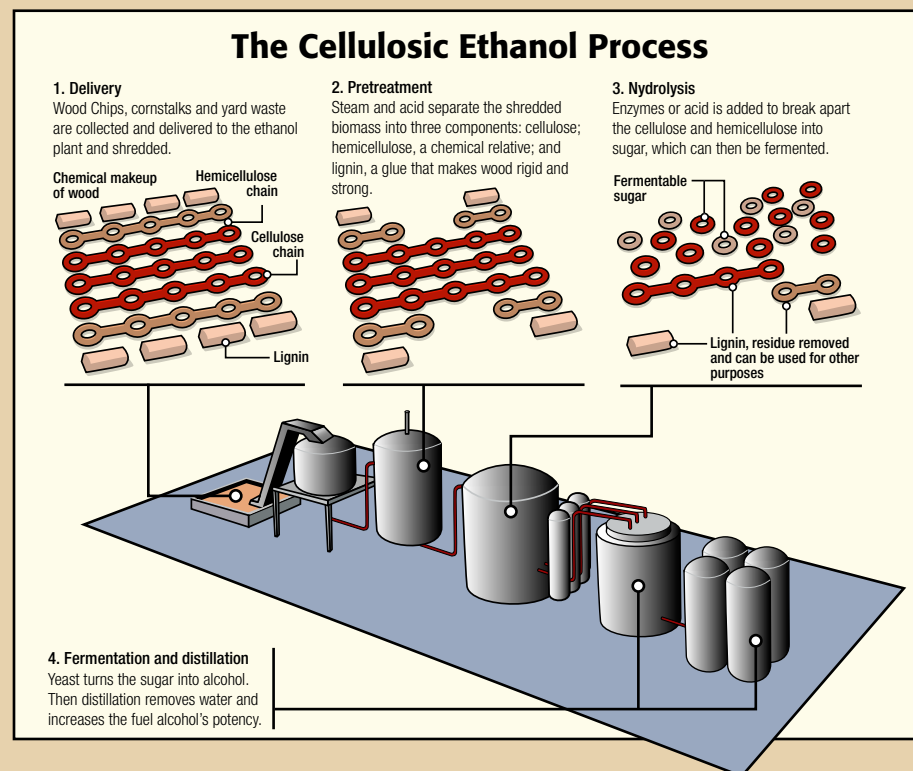
Dr. Joe DiPietro, vice president for agriculture, sees the tremendous positive economic potential the initiative has for the state. "If we are successful, it will provide a dynamic, sustainable bioeconomy for Tennessee. In real terms, it's what we're good at...that is providing solutions to real tough problems that benefit our future. There's no doubt in my mind that carrying out the Tennessee Biofuels Initiative is a chance of a lifetime for us—one that will change tomorrow for all Tennesseans."

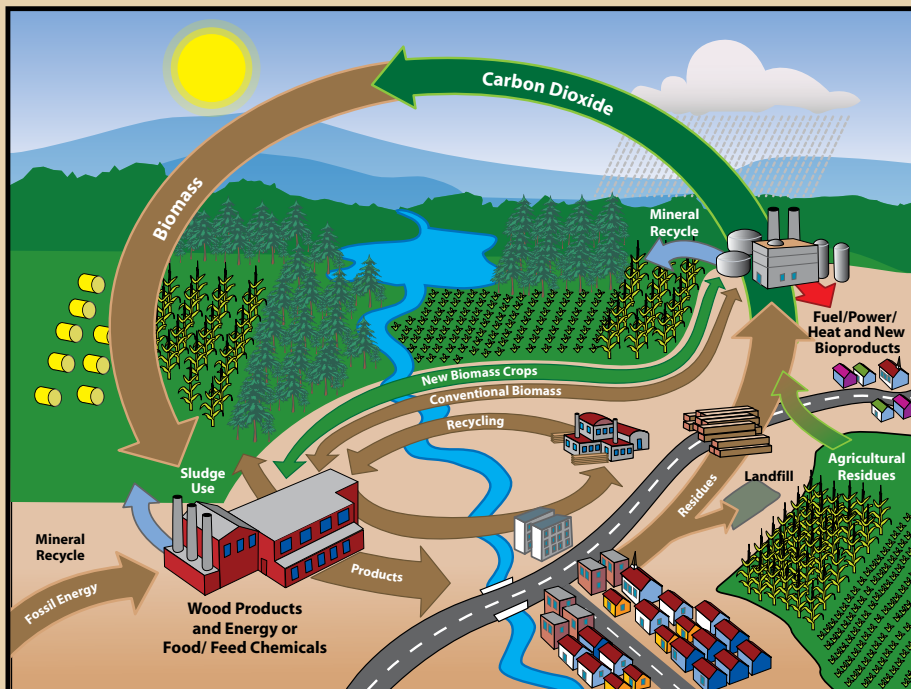


The initiative, which has the support of Tennessee Farm Bureau leaders, has also received a strong endorsement by Governor Bredeesen. His proposed 2007-2008 budget to the Tennessee General Assembly includes support for alternative fuels research, including \$40 million to build a pilot biorefinery to be located near Knoxville.

This plant, a key component of the initiative, would produce 5 million gallons of cellulosic ethanol under the name "Grassoline." Scientists from the Institute and ORNL would use the 1/10th-scale facility to learn more economical methods for converting switchgrass and woody biomass on a larger scale.

With continued improvements in production technology, it is ex-





In a robust bioeconomy, agricultural feedstocks join with municipal residues as energy sources, while sludges are used to feed agricultural crops.

Image adapted from the US Department of Energy.

pected that government and private partners would invest in multiple commercial-scale biorefineries to be located across the state. Biorefineries owned and operated by local farmer cooperatives could retain an additional \$10 million to their local communities. Potential benefits from the commercial implementation of the business model include:

- 4,000 new jobs in rural Tennessee counties
- \$400 million in new state and local tax revenues annually
- Satellite plants creating an additional 3,000 jobs and \$1 billion in annual revenue from chemi-

cal co-products useful in other manufacturing processes

- \$100 million annually in new farm revenue to about 20,000 of the state's producers
- 1 billion gallons of Grassoline annually at the potential wholesale price of \$1.20 per gallon. This level of production would displace approximately 30 percent of Tennessee's current petroleum-based consumption.

As plans for the pilot plant move ahead, the Institute is constructing a smaller-scale biomass conversion center that will be located at the Forest Products Center in Knoxville

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Needed: Long-term Economical Production

Dr. Zong-Ming (Max) Cheng is another UT plant scientist looking to increase the efficiency of biomass production. For a viable cellulosic ethanol industry, farmers must be able to supply sufficient quantities of biomass. "Sustainable production of economical feedstocks can increase farmers' income and alleviate the cost for bioenergy production," Cheng says.

Several feedstock crops are being tested, but Cheng's target "crop" is poplar trees. Poplars have been grown as short-rotation trees by the forest industry for producing high-quality paper, and the U.S. Department of Energy has identified them as one of the leading bioenergy crops.

The Institute's biotechnology labs serve as the hub for Cheng's work, which is aimed at genetically engineering "super" trees that grow fast and can tolerate drought while thriving in marginal soils. Among his tasks are isolating and selecting traits to enhance the tree's crown ar-



Dr. Max Chang sees biomass promise in fast-growing poplar trees.

chitecture and length of growing season. Both can influence growth rate. The more efficient the photosynthetic process and the longer the growing season, the faster the trees will go from biomass in the field to biofuel from the refinery.

Cheng says the region's climate and soils would support poplars grown in short-rotation, which means the super poplars could grow to 30 feet tall and be ready for harvest within 6 to 10 years. **UT**



Potential in Towering Corn

Dr. Dennis West, a professor with the UT Department of Plant Sciences, is a tall man. Yet, at heights approaching 14 feet, his newest research interest dwarfs him.

West is working to develop a corn-like cultivar that would be better suited for production as an energy crop rather than for serving on the dinner table. The promising candidate is a hybrid of teosinte, a perennial relative of corn that grows wild in Mexico.

An agronomist who uses traditional breeding techniques, West is intrigued by the biological

limitations of supply and demand. He has devoted his career to carefully crossing plant genetic traits with the goal of increasing the amount of grain certain cultivars can produce. Because the demand for biomass sources is projected to be high, enhancing the yields of biomass crops is a critical link in maintaining a steady supply of feedstock for biorefineries. West has therefore focused his research skills on developing crops that can meet the demand. Colleague Dr. Janice Zale, also of the Department of Plant Sciences, is conducting microscopy and micropropagation studies to facilitate teosinte's development into a new crop for Tennessee farmers.

In addition to the potential sheer mass of the new teosinte hybrid, West says the plant has many characteristics that make it attractive as a biomass crop. For example, it thrives under marginal conditions. It also sprouts new shoots annually from rhizomes in the ground. This latter trait would spare farmers the time and expense of replanting fields each spring.

After two seasons of production, the jury is still out about the biomass potential of teosinte. Still, if West's instincts prove on target and the hybrid breeds true, fields of 14-foot teosinte plants may one day produce tons of fodder for biorefineries across the state and region. **UT**

Dr. Dennis West with a towering teosinte plant.



Continued from p. 7

and is expected to be operational by early summer. The center will take up to 1,000 square feet of space and give UT researchers the ability to take biomass, convert it to ethanol, and analyze the usefulness of other chemicals output in the process. Following the current model of the petrochemical industry, which processes fuel as well as a myriad of additional chemicals useful in products ranging from synthetic fabrics to adhesives, the researchers want to derive fuel and other chemical products out of biomass to develop a biobased economy.

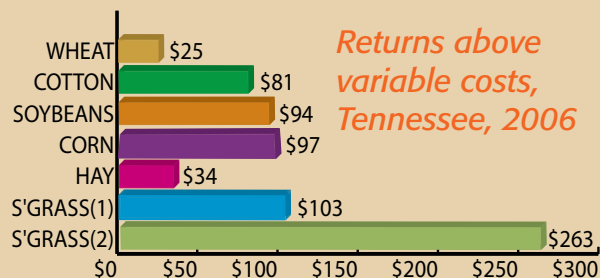
While switchgrass is viewed as foremost among cellulosic stocks, researchers are also investigating other sources of cellulose. Dr. Zong-Ming (Max) Cheng is optimizing traits of poplar trees for biomass production. Dr. Dennis West is breeding new corn varieties, and Dr. Neal Stewart is exploring, as a sideline, the potentials of the South American copaifera tree, which produces a resin that can be used

as diesel fuel. The Institute hopes to be part of other related bioenergy development as part of a five-year \$125 million grant being offered by the U.S. Department of Energy. ORNL, UT, the Samuel Roberts Noble Foundation and others have formed a consortium to examine bioenergy production at the level of basic chemical science and genomics research. DOE is expected to award the grant later this year.

"We've been ramping up for this for some time now," says Dr. Thomas Klindt, interim dean of the Tennessee Agricultural Experiment Station. "The work really started more than a decade ago with our joint research with Oak Ridge National Lab on switchgrass as a feedstock. And then it started more generally about six years ago when we began working with five other land grant universities around the country to become the Sun Grant Center. At that point we started really thinking about all of the issues that would have to come to the forefront for us

to help create an industry that would make us more energy independent, reduce the carbon load, and all the good things that can come out of renewable energy."

What needs to improve are the research processes that convert the cellulose into energy. "We can make lignocellulosic ethanol today," says agricultural economist Dr. Kelly Tiller. "It's proven at



At current yields (6 tons/acre) and \$40/ton, switchgrass competes with corn, cotton, and soybeans for acreage. With yield improvements to 10 tons/acre, returns could more than double that of traditional row crops. Source: UT Extension Crop Budgets, February 2006.





Native to Tennessee, switchgrass grows well on marginal land as well as in dedicated fields. UT researchers are working to boost its yield significantly.

the laboratory scale, although production costs at present are \$3.00 a gallon, which is more than double the corn-to-ethanol cost.” That’s where UT’s research comes into play, and it is occurring at a pivotal moment in time. At present there are no commercial facilities operating in the U.S. And making cellulosic ethanol economically feasible is a major part of President George W. Bush’s Biofuels Initiative. The Department of Energy projects cellulosic ethanol at \$1.07 a gallon by 2012. “We have a lot of the pieces in place already. What we need is a fully funded biofuels initiative that will allow us to put all these pieces together,” Tiller said recently during a statement to the state Senate Commerce, Labor and Agriculture Committee. “The expectation that

cellulosic ethanol is the key to a future where we generate our own renewable fuels cleanly and sustainably and independently is good news for Tennessee,” she testified.

“I’ve never seen an issue with such a broad base of public and political support,” says Buddy Mitchell, associate vice president for agricultural development and government relations. “Everyone realizes that we simply must solve the problem of our dependence on foreign oil. Now our big challenge is to find the financial resources to implement this plan and spread it across the state and nation. I cannot imagine a better investment for the state and nation.” **UT**—Margot Emery and Patricia Clark McDaniels



Solving Logistical Issues

Processing and transportation are two major obstacles to the economical production of cellulosic ethanol. These problems must be solved to propel the fledgling biofuels industry from a national research effort into the big league of commerce.

Dr. Neal Stewart, a well-known author and plant geneticist in the Department of Plant Sciences, says biotechnology will play a major role in solving the problems. Stewart holds the university’s Racheff Chair of Excellence in Plant Molecular Genetics. He maintains that genetic improvements to biomass crops may solve some of the processing issues and reduce the volume of products needing transport. Reduced volumes mean lower transportation costs, which would attract more commercial interest in biomass production and utilization.

Ethanol production requires separating—some call it digesting—biomass materials into their component parts. “You have to take the plant matter and break it down to get the fermentable sugars that produce ethanol and other byproducts,” Stewart explains.

Stewart and others in his lab are working to engineer a switchgrass that will produce enzymes to jump start the digestion process. “If we can genetically engineer a grass that will solve part of the processing problem when it’s harvested—



Biotechnology is expected to be pivotal in resolving issues of processing and transporting cellulosic ethanol feedstocks.

insert a gene for an enzyme that will cause the plant to begin breaking down the minute the blade chops the stalk—we could reduce the volume of material to be transported,” he said. “We’d be two steps closer to industrial feasibility of cellulosic ethanol.”

Stewart has yet to solve this problem, yet the facilities of the Institute’s Plant Biotechnology Building are facilitating his work and the efforts of other scientists trying to genetically engineer desirable traits into other feedstock crops. **UT**

Best Practices for Field Production

The Institute is no newcomer to bioenergy research. Dr. Don Tyler, a soil scientist and crop production specialist, and his partners in UTIA's Bio-based Energy Analysis Group (<http://beag.ag.utk.edu/>) have been studying switchgrass for the U.S. Department of Energy. Tyler, Dr. Larry Steckel—a weed scientist—along with agricultural economists Drs. Roland Roberts, Marie Walsh, Burton English and Milan Research and Education Center Director Blake Brown are working to develop best management practices for growing switchgrass for fuel. Over 32 acres of switchgrass are planted at the Milan Research and Education Center under this project.

Instrumental in developing state and national bio-energy policies have been the studies conducted by agricultural economists Burton English, Dr. Daniel De La Torre Ugarte and Kim Jensen. These studies conducted for the 25X25 workgroup, the Governors Ethanol Coalition, the U.S. Department of Energy, and the U.S. Department of Agriculture have been used to demonstrate that agriculture can play a vital role in allowing the nation to move towards renewable energy creating a situation where farm income increases, rural development occurs, greenhouse gas emissions decline, and national security improves. These objectives will be achieved in part by converting biomass crops,

particularly switchgrass and woody perennials into ethanol and electricity.

Besides the switchgrass production research on UT Experiment Station facilities, companion research was begun on farmers' fields when Ken Goddard, Extension agent in Henry County, Drs. Clark Garland, Delton Gerloff, and Burton English used DOE grant funds to contract with five Tennessee farmers to produce 91 acres of switchgrass. The farmers were directed to follow UT-recom-



Don Tyler observes switchgrass at Milan.

mended practices, and their production data are being carefully scrutinized. Among the goals of the "On The Farm" program is to determine what income levels from switchgrass production would be needed to replace the income normally generated by corn or soybean production.

The farm production program is funded through 2008.

Switchgrass grown by the farmers is being used for emissions tests at a Gadsden, Alabama, power plant and it is being converted to bio-oil in another experiment. These experiments will be helpful when converting biomass to energy.

At the 2006 Milan No-Till Field Day, the scientists and farmers presented the results of their work to date. All evidence supports the belief that the South, especially Tennessee, could play a pivotal role in meeting national renewable energy production needs. **UT**

In Rural Pond Creek,

Better Water Quality

Persuasion, education, and detective work. All three have come into play in the Pond Creek Watershed, where UT environmental scientists are working to improve water quality. The watershed drains 23,579 acres in Loudon, McMinn, and Monroe counties and was chosen for the pilot project based on initial water sampling that found water quality impaired due to high sediment loads and bacteria.

In a grant-funded effort with support from the Tennessee Valley Authority, Environmental Protection Agency and Tennessee Department of Agriculture that began in 2003, UT is working to lead change. Cost-share programs with the Natural Resources Conservation Service have helped offset the expense of new waste systems. Newsletters, conversations, and calendars have highlighted best management practices and encouraged community partnership.

"Some of the biggest problems in the watershed are just now getting solved: human and animal waste systems, including a super-sized septic being installed at a business," says Extension Area Specialist Lena



Beth Carmichael. "After three big projects are done, it may be enough difference that we can see change (in water quality)." Persuading repair of failing home septic systems remains a challenge, though, as does the tough economic circumstances of leased farms and of full-time dairy operators in the area.

Dr. Forbes Walker, associate professor of environmental soil science, is now planning another water quality improvement effort, this time involving the Oostanula Creek Watershed, which includes urban Athens in McMinn County.

Noting that these watersheds exemplify the region that stretches from north Georgia to New York State, Walker says, "the aim is that we want a roadmap for the types of things we need to be doing in the future, the practices we want to be putting on the ground to improve water quality." **UT**—Margot Emery

More on the Pond Creek project can be found at <http://pondcreek.ag.utk.edu/>.



At Issue:

Veterinary Care in Rural Tennessee

Producers, veterinarians, legislators, government agencies are concerned. Is the state experiencing a shortage of veterinary care for its large-animal and food-animal industries? How would such a shortage affect our economy?

On February 20, Vice President for Agriculture Dr. Joe DiPietro and Dr. Michael Blackwell, dean of the College of Veterinary Medicine, presented to the State House Agriculture Committee the results of the UT Institute of Agriculture's (UTIA) analyses of the state's situation with regard to the availability of veterinary services. The studies were conducted at the request of the legislative body. Teams of researchers from the UT College of Veterinary Medicine (UTCVM) and from the Department of Agricultural Economics surveyed state veterinary practitioners and livestock producers, and public

forums solicited input from interested parties in each of the state's grand divisions.

As with most instances where science, economics, and societal needs collide, the issue is complicated.

While many areas of the state are not currently experiencing a shortage of veterinary services, others seemingly are. Eighteen percent of producers surveyed indicated they had problems obtaining veterinary services during the past year, with the most common complaint being a delay in getting a veterinarian to visit the farm. Large/mixed animal veterinarian services exist where larger numbers of cattle are located; however, 27 counties in Tennessee have two or fewer veterinarians. In a state where animal-based agriculture represents fully half of the state's \$2.5 billion annual agriculture-based revenues, access to adequate veterinary care is vital to the state's economy.

Of the state's 51,000 livestock producers, those who reported a problem obtaining veterinary services estimated their average financial loss due to a lack of services at \$1,965 per producer. One study projected these financial losses to exceed \$10 million across the state.

Veterinarians and others recognized the availability of adequate veterinary care as essential to maintaining the safety and wholesomeness of food-animal products and to minimizing the public's risk of contracting food borne illness. Public health concerns are also

central in the relationship between the need for an adequate number of veterinarians and monitoring potential zoonotic disease outbreaks. Finally, the health status of companion animals in rural areas is another issue. The state's equine population now numbers more than 210,000 animals, valued on average at \$2,700 each.

Among the concerns expressed at the public forums was how to increase the number of veterinary students choosing to practice large animal and food animal medicine. Students expressed worries about financial security as they face the tremendous responsibility of repaying student loan debts averaging \$80,000.

On average, rural-based practices do not generate the same economic returns as small-animal, urban practices, and veterinarians operating rural practices often face longer periods of indebtedness.

On a positive note, the studies clarified the impact of having a veterinary college in the state. "We have data that indicate the UT College of Veterinary Medicine has trained more than 50 percent of the veterinarians practicing in Tennessee. We are most excited to learn that over



Dr. Patricia Castro, left, and fourth-year student Lindsey Petty prepare to anesthetize a calf before orthopedic surgeons fuse a joint.



Senior Jenn Camelli conducts a routine physical of newborn lambs.

half—54 percent—of the veterinarians in rural Tennessee communities were trained by UTCVM," Blackwell said. "This proves we are doing some things right."

While the studies affirm the economic and societal need for veterinarians to practice in rural areas, they are not conclusive as to what actions would ensure all the state's livestock producers adequate access to veterinary care. Solutions range from letting the market for veterinarian services dictate the demand, to increasing UTCVM enrollment and instituting state-sponsored educational debt forgiveness.

"It's now up to our state lawmakers to sort out what kind of legislation, if any, is needed to help ensure the vitality of the state's animal-based industries," said UTIA's DiPietro. "The Institute stands ready to help in any way we can. It's fundamental to our role as a land-grant institution."

The collection of studies is available online at <http://www.agriculture.utk.edu/news/ruralvetstudy/introduction.htm> **UT**

—Patricia Clark McDaniels

Cancer Consortium

Benefiting Dogs and Humans

Last spring, Bogart was having trouble getting around his Kentucky home. At 77 human years (11 in the canine world), the Labrador retriever was no spring chicken. Owner Dan Davis thought it was an arthritis flare-up. It wasn't. Bogart was diagnosed with osteosarcoma in his shoulder blade, an aggressive type of bone cancer that becomes increasingly painful as it grows. He was referred to the UT College of Veterinary Medicine (UTCVM) for radiation therapy to reduce the pain. Veterinary oncologist Dr. Jeff Phillips suggested amputation instead. "While the owner had concerns about amputation, our or-

thopedic surgeons thought Bogart would do fine in spite of a history of osteoarthritis," says Dr. Phillips. After Davis received a second opinion at the University of Colorado College of Veterinary Medicine confirming Dr. Phillips's suggested course of treatment, Bogart's front left leg was removed. He received follow-up chemotherapy treatments at UTCVM. "Published case reports indicate osteosarcoma in the scapula (shoulder blade) is associated with a very grave prognosis. The average dog lives about two months in spite of what you do," says Dr. Phillips. "Why go through it? To buy time."



Diagnosis by Dr. Jeff Phillips has helped lengthen Bogart's life.

"Since he was in a lot of pain, it was either amputate or say good-bye," says Davis. "I had him and Chancey, my other lab, since they were puppies and am joined at the hip with both of them. I wasn't ready to say goodbye to Bo-bo."

In spite of being on the best-tolerated chemo drug, Bogart suffered complications: zero white cells, low platelets, and clinical bleeding. "Going through it I asked myself 'Am I doing the right thing?'" says Davis. Following a stay in the intensive care unit, Bogart made a dramatic turnaround and recently celebrated his 12th birthday. According to Davis, he looks five years younger.

Bogart, who exceeded expectations, is just one of the success stories at UTCVM. In addition to conducting intramural studies and providing state-of-the-art veterinary oncological services, the college is also involved in a nationwide effort to study therapeutic agents that may be used to treat humans. Thanks to the efforts of UTCVM's Drs. Amy LeBlanc and Robert Wang, the college is one of 12 veterinary institutes nationwide to be part of the Comparative Oncology Trials Consortium formed by the Comparative Oncology Program at the National

Cancer Institute's Center for Cancer Research. UTCVM along with three other veterinary colleges recently participated in the first phase of a pre-clinical study on dogs already diagnosed with cancer. They are studying the effectiveness of Tumor Necrosis Factor, a novel agent that kills tumor cells. Phase two is currently underway. "In the first phase, consortium members established the appropriate dose and treatment protocol and characterized the toxicity. Now we will study the agent in a larger group of client-owned dogs with a variety of naturally occurring tumor-types and more advanced disease," says Dr. Phillips.

Spontaneously occurring cancers in dogs are very similar to those in humans, allowing consortium members to study the effect drugs designed for human medicine have on cancer. Dr. Phillips says most dog owners are willing to try something new that may benefit their dogs. "If there is interesting activity in dogs, the idea is that it may be worthwhile to try in humans. Veterinarians have known about the usefulness of something like this consortium for years. It's just taken a while for the human establishment to realize it and fund it."

UT –Sandra Harbison

Cancer research in UTCVM holds promise of aiding dogs and dog owners, such as Dan Davis pictured with Bogart and Chancey.

Bogart recently celebrated his 12th birthday.



Problem Weeds

Arrival of Resistant Weeds is Headache for Producers

In the production fields of West Tennessee, a perfect storm is brewing—perfect, that is, if you're a weed scientist. For producers, it's a headache that some can ill afford. On one front is the spread of glyphosate-resistant horseweed, growing as green plumes in corn, cotton, and soybean fields. Looming as another threat is glyphosate-resistant Palmer pigweed, a plant the scientists say will be an even bigger challenge for producers to control. Effective, economical controls are lacking, and few are on the horizon, yet it's UT's role to develop, and inform producers about, cost-effective management strategies they can utilize.

When Roundup Ready® crops became prevalent in the late 1990s, row-crop producers thought their weed headaches were solved for good. All

that changed in the past few years. "We are still struggling with weeds," says Dr. Bob Hayes, director of the West Tennessee Research and Education Center in Jackson. "And it is only through continued research funding that we are able to maintain a winning position and continue to practice no-tillage. It is through no-tillage that we are able to remain competitive in the world market and reap the environmental benefits of cleaner air and water."

Weed scientist Dr. Tom Mueller, a professor in the Department of Plant Sciences, says while horseweed was among the first plants to show resistance to glyphosate, several other weeds are "real close" to being problems.

"They've been confirmed in other states, and confirmed in other countries. We're conducting some ongoing research right now in our greenhouse looking at weeds that we think are glyphosate resistant, but we don't yet have all the data."

When resistant horseweed became a serious threat in producers' fields in 2002, 2003, 2004 and 2005, some growers resorted to disking with cold steel to combat the problem, resulting in a drop in no-till acreage. "Now the no-till acreage figures are back up

at 60 percent in cotton and 77 percent in soybeans," says Extension Weed Specialist Dr. Larry Steckel. "I think the growers are feeling comfortable with our recommendations on control strategies."

Dire reports are coming in from Georgia and North Carolina, where growers cannot control Palmer amaranth even with 12x applications of Roundup®, yet in Tennessee the plants are different, Mueller says. "One of our central research focuses is based on the site of action differences that we're seeing. The good news for Tennessee producers is that we're seeing a different biotype entirely, one that's easier to control at lower Roundup® rates."

Because Roundup® has been such a success, other herbicide options have fallen by the wayside. "Roundup® is what atrazine was to the corn market back 15 to 20 years ago and what Treflan® was to soybeans and cotton," Hayes says. "It's basically replaced the biggies. If we happen to lose its effectiveness because of weed resistance, then we're going to be back to where we were 15 to 20 years ago, except we're not even going to have the tools we had then."

Because of that, Steckel and Mueller are reaching back to herbicides that were around 10 to 20 years

*The UT
Agricultural
Experiment
Station is a leader
in looking at
new chemistries
that target weed
resistance*



Larry Steckel in a field prior to burn-down, with horseweed in abundance.

ago to try to control the weeds. "It really falls to university folks to do this because there's no incentive to chemical companies to do things with herbicides that are off patent," Steckel says. "And to keep looking at that older chemistry is really our only fallback right now."

Mueller notes that the chemical companies are preparing new systems and numbered compounds. "Many of these herbicides are being developed specifically for glyphosate-resistant weeds. For that reason, the UT Agricultural Experiment Station is a leader in the nation in looking at these new chemistries. We've got the glyphosate-resistant weeds in the fields in West Tennessee, and we've got the research and Extension capabilities to evaluate the performance of the new systems and compounds." **UT**

—Margot Emery

Horseweed that escaped both tillage and a burndown application competes with cotton in Lauderdale County.





On the Trail of a Killer

A destructive group of plant pathogens called *Phytophthora* has long been the scourge of farmers, costing the agriculture, forestry, and nursery industries billions of dollars each year. The name of these fungus-like organisms literally means “plant destroyer,” and most fungicides have proven ineffective in controlling them. That could change in the coming years thanks to some ground-breaking work by an international team of scientists, including UT researchers.

They’ve decoded the DNA for two of the *Phytophthora* pathogens – namely that of *P. sojae*, which causes root and stem rot in soybeans, and *P. ramorum*, which is associated with sudden oak death and has devastated the nursery industry and oak tree stands along parts of the West Coast. This genome sequence data opens the door to better understanding the mechanisms that make these two species, as well as the more than 80 other *Phytophthora* species, including potato blight, so deadly.

Sudden oak death is of particular concern in Tennessee because studies have shown that “the eastern half of the state is an ideal climate with lots of susceptible hosts,” says Dr. Kurt Lamour, a molecular epidemiologist in UT’s Department of Entomology and Plant Pathology. “We’re on the front lines of trying to keep it out of Tennessee, because between hardwoods and tourism, the economic impact would be devastating if it came in and wiped out all the rhododendrons, oaks, and other trees and woody shrubs that it attacks.”

Lamour, Alon Savidor, a UT graduate student, and Hayes McDonald of Oak Ridge National Laboratory were among the co-authors of a paper published in the prestigious journal *Science* last fall comparing the genome sequences of the two *Phytophthora* species.

Scientists are now using these genetic fingerprints to identify and track the movement of soybean root rot and sudden oak death as they progressively invade different regions. Knowing the pattern of the pathogens’ spread could help scientists develop strategies for combating them in the field, Savidor notes.

Additionally, comparisons of the sequence data show that more than 40% of the genes in each of the two species are undergoing rapid change. This gives them “a tremendous number of tools for subverting a plant’s defense system, making it very hard to breed for resistance

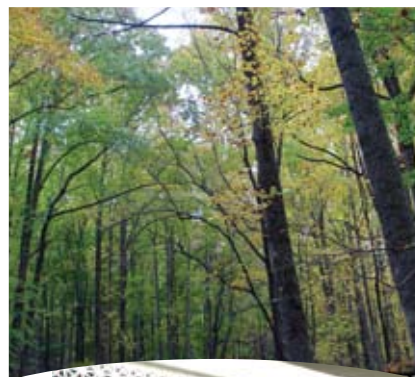
to *Phytophthora*,” Lamour explains. “You might kill a few strains, but it overcomes that because there’s a lot of variation in the population.”

Lamour’s group is now trying to figure out just what it is that these organisms are doing that allows them to so effectively overcome a plant’s defense. By identifying different genes and proteins involved in the infection process, they’re hoping to find weak points on the

pathogen side that could be targeted for control, as well as areas in plant defense systems that could be bolstered. Ultimately, the researchers want to understand the biology well enough to develop strategies for combating these pathogens in the field.

“We’ve got a long road ahead of us,” Lamour admits, “but the sequence data allows us to make progress at a pace that was impossible before.” **UT**

– Kris Christen



Alon Savidor, left, and mentor Dr. Kurt Lamour



Unlocking the secrets of soil microbes to degrade widely used herbicides and other industrial chemicals

Magic Beads

Just one gram of fertile soil can contain more than 10,000 different bacterial species. Some of them are especially good at breaking down problematic industrial and chemical wastes. If scientists could pinpoint the organisms involved and how they accomplish this degradation, we might be able to harness them into doing their work more efficiently and discover some novel bioproducts and useful enzymes along the way.

One of the tools that UT microbiologists are employing to isolate such organisms comes in the form of little black grains about the size of BB pellets. They don't look like much, but Dr. Mark Radosevich of the Department of Biosystems Engineering and Soil Science calls them "magic beads."

Made of a mixture of powdered activated carbon and a polymer, the beads soak up and adsorb organic chemicals very readily. Radosevich and his group have been baiting them with atrazine — one of the most widely used herbicides and a ubiquitous environmental contaminant — and burying them in soils where the chemical has been applied to see which microorganisms colonize the beads. With this approach, they've been able to cultivate a wider diversity of atrazine-degrading bacteria than currently exists, practically doubling the collection of bacteria known to metabolize this chemical from about two dozen to nearly 50. The next step is to hone in on the particular genes

They don't look like much, but Radosevich calls them 'magic beads'

responsible for the metabolism and find out what triggers this process.

"We think this is going to be an excellent way of discovering new microorganisms," Radosevich says, "and what's exciting is that these are rare organisms that we don't know anything about, and they could be organisms that produce beneficial products."

Traditionally, scientists have tried to isolate atrazine-eating organisms by cultivating soil samples in the laboratory through a selective enrichment process. The idea is that

only the organisms that can metabolize a particular chemical as a source of carbon and energy will grow, and those that can't will die off and disappear.

Radosevich's theory, however, is that "this approach has led to the isolation of things that just grow easily in the lab" in a liquid, fully aerobic environment. "None of those things simulate the soil environment at all," which is extremely porous with lots of surface area for microbes to attach to and varying amounts of moisture, he says. Consequently, the ones isolated previously "may not be the most ecologically relevant in the soil," he adds. The beads, on the other hand, have a distribution of pore sizes that very closely approximate the soil environment.

Radosevich was introduced to the beads by Dr. David White, director of UT's Center for Biomarker Analysis until his recent death. White's group is using them to sample bacteria inhabiting groundwater aquifers

Bio-Sep® beads offer a new approach to cultivate novel soil microorganisms that hold potential for bioremediation and the discovery of new antibiotics, and commercially valuable enzymes.

that are contaminated with uranium or hydrocarbons found in oil and gasoline.

The beads can be used for studying the breakdown process of virtually any chemical. Another application that Radosevich is pursuing is looking at how antibiotic-resistant bacteria in the manure from large animal production operations might be transferring resistance genes to other bacteria inhabiting the soils to which the waste is applied as fertilizer. Instead of lacing the beads with atrazine, he and his group are baiting them with antibiotics.

So far, they've isolated a large number of bacteria with high levels of resistance to the antibiotics in the beads. Radosevich is hopeful that some of them could be producing antibiotics of their own that scientists haven't yet discovered. Additionally, he hopes to discover novel enzymes that could prove useful in the booming biofuels arena for breaking down plant cellulose. **UT**

— Kris Christen



Dr. Radosevich, second from right, and his research team are investigating ways to break down chemicals and create new antibiotics.



Through Endowed Scholarship

Mayfield Family Honors Father and Leader

Innovation is something the Mayfield family knows. Their name has always been synonymous with quality dairy production in Tennessee, but it was the groundbreaking innovations led by Tom Mayfield that helped make Mayfield Dairy Farms an industry leader. Now the family is breaking ground again by giving \$200,000 to the Institute of Agriculture to establish the Thomas B. Mayfield Endowed Scholarship. The scholarship will support students pursuing food



science degrees at the University of Tennessee.

Tom Mayfield was born on the family farm in McMinn County in 1919. After graduating from McMinn County High School, Tom followed in his father's footsteps and began studying dairy science at UT. Tom returned home early after the loss of his father to help run the dairy. During World War II, Tom became a Navy aviator and flight instructor. He returned home after the war to resume family creamery and dairy operations with brother C. Scott Mayfield, Sr. Tom aspired to give the consumer the best possible milk. By doing so, Mayfield helped modernize the U.S. dairy industry.

Through a series of savvy innovations, Tom's leadership propelled Mayfield Dairy Farms to one of the most respected milk and ice cream brands in the country. Mayfield was the first dairy in the U.S. to add a vacuum system that assured pure and fresh-tasting milk. Another first came when Mayfield started making and filling its own jugs in a continuous operation. They were also the first in the country to add acidophilus and bifidum cultures to make milk easily digestible. And, of course, Mayfield is well known for

their ice cream. With Tom's help, Mayfield Dairy pioneered a number of innovations that led *Time* magazine to name Mayfield's ice cream the "World's Best Ice Cream" in 1981.

Tom retired as president of Mayfield Dairy Farms when the company was sold to Dean Foods Co. in January 1990, but his influence as a community leader has not diminished. Along with his milk and ice cream successes, Tom has led many organizations and remained active in the community. He has served as president of the International Association of Ice Cream Manufacturers, Southern Association of Dairy Food Manufacturers, and the Tennessee Dairy Products Association. He helped organize the Chamber of Commerce of Athens and was their first president. He has also been active in the Athens Kiwanis Club and Keith Memorial United Methodist Church.

Like his commitment to family, business, and community, Tom has also maintained his relationship with UT. Tom served UT over the years through service on the Alumni



Board of Governors and the Institute of Agriculture Alumni Council. In 1982, he was presented the Chancellor's Award for his service to UT. According to Rob Mayfield, Tom's son and Mayfield's current vice president of technical services, "Dad always viewed his education at UT and the help he received from the university over the years as instrumental to his success."

Now the Mayfields are happy to help UT students achieve their own success through the scholarship. "The Mayfield family is a perfect example of the rewards that dedication and innovation can make in agriculture and for higher education," said Dennis Jones, director of planned giving, "We're lucky to have them as friends and supporters, helping develop the next generation of agricultural leaders in Tennessee through this generous gift." **UT**

—Amy Yancey

Black Flies Beware

Abatement Program Takes Aim at East Tenn. Gnat Problem

Before long residents in Cocke and eastern Sevier counties may have something that they haven't had in more than a decade: gnat relief. Through funding from the state legislature, Dr. Kevin Moulton, assistant professor of entomology with UT, is leading a black fly abatement program that should decrease populations of the nuisance gnats that plague area residents and animals from May through October. Larvae of the gnats, or black flies, live in flowing water. Larvae of the species causing the problem there, *Simulium jenningsi*, develop in large watercourses, such as the French Broad, Pigeon, and Little Pigeon Rivers.

"We've been having major problems with gnats for approximately 15 years, and they've gotten worse in recent years," says Mark Wallace, the PGA professional and operator at Bent Creek Golf Course in Gatlinburg. Wallace has witnessed economic losses caused by the gnats, and so have other area businesses, including Jellystone Park Camp and Resort and Nantahala Outdoor Center. The Cocke County Board of Education has noted the problems the gnats cause during athletic events.



Black flies, though tiny, are causing big problems in Cocke and Sevier counties.

Area resident Dan Ford says, "When the gnats start hatching off, they swarm horses and cattle, biting and making their skin red and raw under their chins, inside their ears, and under their bellies—all the places the animals can't protect. More importantly, these gnats attack people, especially children. Their bites make whelps that itch for hours. We have family and friends who will not consider living here due to the gnat infestation."

Dr. Moulton is working to change that. Once permitting from the Tennessee Department of Environment and Conservation is in place, he plans wide-scale treatments of the Pigeon River and West Prong

Little Pigeon River using a biological control agent, *Bacillus thuringiensis* var. *israelensis* (Bti). This year will be limited to efficacy and nontarget studies along a short stretch of the Pigeon River; hopefully, 2008 will bring the wide-scale treatments needed to suppress the gnat

population.

Moulton used DNA fingerprinting to identify the species of black fly causing the problem; the remedy,



Entomologist Dr. Kevin Moulton collects black fly larvae from the Little Pigeon River between Pittman Center and Sevierville. The flies plague humans and animals alike.

Bti is equally precise—it is selective towards larvae of black flies (gnats) and mosquitoes, particularly at the low dose needed (15-25 parts per million). Bti is an EPA approved "green pesticide", which is this regulatory agency's most stringent environmental hazard rating. Scientists around the world largely agree that Bti poses no threat to people, fish, or the environment. Bti is presently used by 20+ states and Canadian provinces for black fly control and many more areas for mosquito control. Incidentally, during the mid- to late 1980's the city of Kingsport, TN, used it to control black flies emerging from the Holston River.

Bti doesn't eliminate all larvae, it

simply reduces their numbers. Remaining larvae are still available as a food item for fish. Treatment occurs at two-week intervals from April or May through fall. The study also includes a component to evaluate the social and economic impact the gnats have on the affected region.

Wallace is confident there will be gains. "This is one program that the state can fund that will actually generate money in terms of recouping tax revenue. Believe me, it's going to help us make money. But that's only half the issue for me, because I like the outdoors and you can't enjoy it here. We need the help that this (abatement program) will provide." **UT** —Margot Emery

UT Family and Consumer Sciences programs reach out to families in need

Families in Crisis— UT Extension Answers

UT Extension Family and Consumer Sciences faculty and agents address important issues facing Tennesseans as they cope with social, economic, and technological change—Many of these changes threaten the health, safety, and well being of individuals, families, and communities



Spotlighting Teen Issues

A program called “Spotlighting Teen Issues” has helped many troubled teens. According to the Tennessee Council of Juvenile and Family Court Judges, in 2004 more than 63,000 children were referred to the juvenile court systems. In 2005, the Hardeman County Juvenile Court Judge contacted the county’s family and consumer science agent with UT Extension about providing classes to juveniles. “The course has been extremely effective,” said Juvenile Court Judge Charles M. Cary. “I am pleased to state that no juvenile that I have ordered to attend the course has been a repeat offender in my court.”

Tennessee also has among the highest rates of child deaths, teen birth rates, single parent families, and teen deaths. To this end, among other important programs, “Windows of Opportunity: Bright Beginnings for Young Children” is a parent and childcare provider education curriculum focused on guiding young

children from the time of birth through the first 3-5 years of life. It is focused on understanding and enhancing young children’s growth and development to make sure wise decisions are made later in life.

Turning Points for Families

Tennessee ranks fourth nationally in bankruptcies and divorce, a vital indication that families need educational programs to reverse these alarming statistics. UT answers this call with programs like “Turning Points for Families” and “Spotlighting Teen Issues.” The former focuses on the fact that inadequate parenting and interpersonal skills are associated with family instability, which negatively affects child well-being and results in increased costs to individuals, communities, and governments. Extension agents work with families who are at risk for instability, such as when children have been removed to state custody, divorcing parents, relatives as caregivers, stepfamilies, and teen parents.



Tennessee Saves

UT Extension programs extend beyond family and health. “Tennessee Saves” is a program that is dedicated to teaching youth and adults about the need for savings and to motivate them to make savings a habit and to begin regular savings contributions early in life. “There are nine coalitions across the state and additional local partnering groups that are coordinating savings education in their communities,” said Dr. Dena Wise, head of “Tennessee Saves” and “The Changing Workplace.” “Some of the biggest financial challenges consumers face are dealing with changes in the workplace—stagnant wages in low-paying occupations, increasingly complex retirement packages, and health care cost issues,” Wise said. “In 2005, UT was designated lead university for a multi-state program funded by the National Association of Security Dealers and targeted to young employees at the worksite. This program, called “Money Crunch,” is being implemented in Tennessee, Kentucky, Florida, and Kansas.”



Safe Food for Tennessee

Another UT Extension initiative that helps Tennesseans in the health care arena is “Safe Food for Tennessee.” Did you know that the mishandling of foods containing harmful microorganisms causes more than 76 million cases of food-borne illnesses every year? Can you imagine the increased health care costs and enormous loss of productivity?

“Safe Food for Tennessee” focuses on educating consumers about safe food-handling practices that include:

- Clean (hands, surfaces, utensils, etc.)
- Separate (preventing cross-contamination—the transfer of harmful microorganisms from a food or surface to another food or surface)
- Cook (cooking foods to a safe internal temperature high enough to kill harmful microorganisms such as bacteria)
- Chill (cooling foods within two hours of serving them to prevent growth of harmful microorganisms)

“Extension educators are implementing various curricula like ‘Cook’s Corner,’ a curriculum for adults that teaches basic cooking skills and food safety,” said Dr. Janie Burney, R.D., associate professor/nutrition specialist. Educators are provided monthly educational materials such as presentations, the “Wit, Wisdom, and Practical Advice on Food Safety” newsletter and a 12-month planner to assist them in promoting this very important UT Extension initiative.

Children's Environmental Health

UT's "Children's Environmental Health" initiative is a broad program that encompasses many health and safety issues. Children are at greater risk than adults for most health and safety issues pertaining to housing and the environment. Numerous educational materials, videos, exhibits, etc. are available. Programs are also designed for childcare providers.



Homeland Security and Emergency Preparedness

UT Extension programs advocate for Tennesseans on many fronts, including another initiative titled "Homeland Security and Emergency Preparedness." In this realm, UT works with families and local authorities throughout the state on being prepared for different types of emergencies and/or disasters. These include, but are not limited to, emergency supplies, family communication plans, and basic knowledge of the different types of emergencies, disasters, and terrorist threats that may exist and how to be prepared and respond.

Tennessee Choices for Better Health Care

Taking care of yourself is just one vital link in overall health care. Low health literacy for many Tennesseans impairs their ability to navigate a complex health care system. This stifles prevention and management of health problems, which contributes to rising health care costs and poor overall health. UT Extension's "Tennessee Choices for Better Health Care" answers this call.

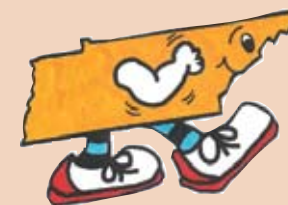
By providing classes, toll-free assistance numbers, and experts at the county level, "Tennessee Choices for Better Health Care" educates the public on how to be preventative and proactive when it comes to their health and gives them the power of knowledge when it's time to make the best health care decisions.

"Our main focus is to help people make better decisions when it comes to their health care by empowering them with knowledge," said Dr. Barbara Clarke, R.D., professor and Extension health specialist/co-director, UT Center for Community-Based Health Initiatives. "By increasing health literacy and showing people how to navigate a complicated health care system, our program aids in better health and lower health care costs—something we all benefit from."

Tennessee Shapes Up!

In the program "Walk Across Tennessee," Carole Stroble, mother of three and bank receptionist in Paris, Tenn., recruited about a dozen fellow workers and took off. "We walked three to five miles every day from May 1 to September 21—a total of 510 miles," Stroble described. "We walked our mileage before and after work. The results were incredible. We all felt better, looked better and lost lots of weight. I participate and volunteer in many UT Extension programs, all of which are hugely beneficial."

The "Walk Across Tennessee" program, administered statewide, is just one of the many success stories resulting from the plethora of programs and initiatives created by UT Extension to help Tennesseans overcome obstacles in their lives. "The epidemic of overweight and obesity among all age groups in Tennessee ranks among the highest in the country and contributes to serious health problems like arthritis, heart disease, diabetes, hypertension, and stroke," said Dr. Betty Greer, R.D., professor of Family and Consumer Sciences. "Our program, 'Tennessee Shapes Up!,'



teaches people throughout Tennessee to make better nutritional choices," Greer added. "People all over the state, just like Carole, are benefiting from our program."

"Tennessee Shapes Up!" forms partnerships with county-level staff to reach Tennesseans who so desperately need to *shape up*. From exercise to portion control, this UT Extension program educates folks on all elements of better health. The goal was to reach, through a variety of strategies, almost all citizens in the targeted counties. And Extension delivered results, exemplifying the power of Extension's connectedness to the state's citizens. In the "Tennessee Shapes Up" initiative, there were 12,627 group meetings that reached a total of 331,618 Tennesseans. Of the adult participants surveyed, 77% reported consuming fewer sugar-sweetened beverages; 83% reported eating more whole grains, and 86% reported walking at least 30 minutes on most days.

UT – Leslie Ogle

The power of UT's Family and Consumer Sciences Department is its vital link connecting the resources of the university to citizens in all 95 counties across the state.

The department's vision is healthy, responsible, productive individuals, families, and communities. The long-term impact is a profound economic one.

Building Better Leaders for Tomorrow

Ray and Dorothy (Dot) Spann have always been dedicated to worthy endeavors. Ray, though retired, is still one of the state's leading dairy experts. Dot spent her career devoted to food and nutrition and remains active in those roles today. But what the Spanns may care most about is youth development with an eye to the future. With four children, nine grandchildren, one great grandchild, and another on the way, it shouldn't come as a surprise that the Spanns recognize the value of raising good people. In fact, Ray and Dot have given more than \$110,000 to the Tennessee 4-H Club Foundation over the past several years with that goal in mind.



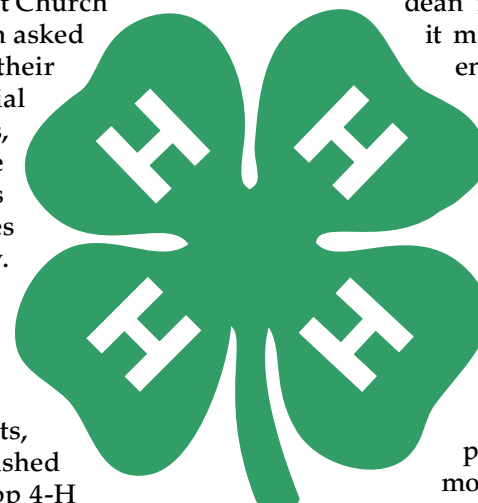
Ray and Dorothy Spann

Ray, a native of Charlotte, Tennessee, met Dot when he enrolled at UT, Martin, and worked part-time on the school farm. They met through Dot's father, who taught at Martin. Ray spent 35 years of his career as a UT Extension statewide dairy specialist and consulted for Monsanto for another six before retiring. He was also a dedicated 4-H volunteer despite his busy career, working with dairy project youth and eventually becoming a major donor with Dot. Ray is still active in the dairy and livestock community, participating in events such as the Mid-South and West Tennessee fairs. He is recognized throughout the United States as an expert in dairy cattle judging.

Dot's life has centered on food and nutrition. Throughout her professional career, she taught nutrition at Jackson State Community College. Dot also served as a dietician and nutrition consultant for the Tennessee Department of Education, supervising school meal programs across West Tennessee. Retired

since 1993, Dot continues to use her knowledge to help their church with its meal programs. Both Spanns are active members of Forest Heights United Methodist Church in Jackson. When asked about 4-H and their generous financial support, Ray says, "Our youth are our future. 4-H is youth." Dot agrees wholeheartedly. "4-H allows young people to develop important life skills."

Through their gifts, they have established the Earl M. Knepp 4-H Scholarship Endowment in memory of Dot's father. They have also supported the Western District 4-H Endowment and statewide 4-H dairy endowments. The Spanns' contributions have earned them recognition as members of the 4-H Hall of Fame Diamond Benefactor's Society, but that's not why they give.



Ray says that they just hope to get other people involved and engaged in Tennessee's youth programs. And according to Charles Goan, interim dean for UT Extension, it makes a real difference. "Ray and Dot Spann's generosity and spirit help make our 4-H programs outstanding. It takes the support of donors and volunteers like the Spanns to offer our youth the kind of projects and role models that make Tennessee 4-H one of the best youth development programs in the country." **UT**

—Mark Gateley and Amy Yancey

For more information on Tennessee 4-H or to make a gift, contact Mark Gateley at (865) 974-7436 or mgateley@utk.edu.

Up, Up, and Away

4-H Opens Youths' Eyes to Careers in Science, Engineering

It's no secret that we need more scientists and engineers. Filling that need starts in our school systems by funneling youth into study and career paths that meet the nation's needs. It's something that Governor Phil Bredesen feels strongly about.

"It's important for Tennessee to provide our students with top-notch training in science and math," says Bredesen. "The skills we give our students today will serve them for the rest of their lives. For example, it would be impossible for me to have earned my college degree in physics, start a business or balance Tennessee's budgets without these foundational skills. Tennessee needs bright young people who will help us

keep pace with a high-tech, changing economy. The key to that success starts now, in our schools."

For 2007, Tennessee's 4-H Youth Development Program has launched an initiative to open youths' eyes to the excitement and challenge of career opportunities in science, engineering, and technology (SET). The effort, part of a national mission mandate from the U.S. Department of Agriculture, centers on channeling young people who have the ability, talent, and initiative into looking into SET possibilities in college. Preparation starts in selecting science and math courses in high school.

"Our SET curricula really focuses on one area that I believe is important, which is arithmetic," says new 4-H State Specialist Daniel Sarver. "Our program gives youth an idea of the careers in that area and tells them what type of coursework is needed, what type of preparation is needed, to have a career in that field, and also through the learning-by-doing that we do, we get them excited about being a scientist or engineer."

"A lot of times a student may see the math and not understand where it leads. 4-H's learn-by-doing method in which they can do fun things and see where the coursework leads helps them connect the dots."

The key to success starts in our schools

That's just what 4-H'ers are doing in counties across Tennessee. In a fun project underway in Sullivan County schools, seventh graders construct and launch hot air balloons made of tissue paper and glue. Working with their math teachers, the students measure how long the balloons are in the air and how far they float.

"Some took off right away. Others failed to get off the ground. We talked about how that's like life sometimes," says Vickie Clark, 4-H agent and county director.

In Robertson County, 4-H youth learned to use global positioning system (GPS) and geographic information system (GIS) technology to develop precise maps. They used their skills to develop computerized maps of the local school districts, fulfilling a local need. The youth are now starting to document all historical markers in their county. In Blount County, youth are using the same technologies with volunteer leaders to map non-point pollution sources in the Little River watershed.

"That combination of service, learning, and leadership links with everything we do in 4-H," says State 4-H Director Alice Ann Moore.

4-H plans to advance its SET agenda through a combination of model programs and mini-grants at the county level. Other elements adding momentum to the effort are an environmental education camp, a computer camp that is being converted to an engineering camp, and



4-H's already strong animal science and family and consumer science education programs.

"It's important to remember that 4-H is, and always has been, a science-based program," says Moore. "We've always had a science base because that's where we come from. And now we're going to look more strongly at math and engineering. It's an exciting time for us."

Sarver sees widespread benefit for the new focus. "You can use SET with such a broad base of youth, from urban to rural. Whether you live on a farm or in the middle of town, this type of programming is going to be useful."

And for the youth, themselves, the possibilities are boundless. "The jobs in these fields are going to be great jobs, exciting jobs, and high-paying ones," says Sarver. "So we really need to get that word out to these youth, starting with junior high on up." **UF** —Margot Emery





A Lifelong Commitment

Charles and Julie Wharton have made an extraordinary \$5 million gift commitment to the Institute of Agriculture, bringing their total pledge to \$12 million dollars—Generous in spirit, as well, the Whartons agreed to share their story and talk about their passion for all creatures, philanthropy, and their roles within the Institute and the University of Tennessee

The first thing you notice as you pull into Poplar Creek Farms in Winchester is the sweeping view. Gently rolling farmland gives way to a stately home with panoramic mountain views and pastures well populated with Tennessee Walkers. Forty horses inhabit the farm, though at one time, Charles and Julie Wharton owned as many as 100. Walking horses are just one of Charles and Julie's interests in life. Animals large and small call Poplar Creek home, including 10 cats (seven as pets, three police the barn) and four dogs. All the pets are lucky rescues with the exception of bulldog Brody. While they are clearly committed to their pets, it's the combination of dedication to higher education and animal welfare that has been the hallmark of service that culminated this past

year with their historic \$5 million pledge to Institute programs. The gift will primarily support graduate studies and faculty and facilities development within the College of Veterinary Medicine, College of Agricultural Sciences and Natural Resources, and the Tennessee Agricultural Experiment Station.

Charles, a Shelbyville native, graduated in engineering from the University of Tennessee, Knoxville in 1965. He and Julie met in Huntsville, Alabama, shortly after Julie earned her mathematics degree from the University of Alabama. They both worked in the aerospace industry at the time. After they were married, Charles was accepted into the highly competitive MBA program at the University of Chicago. "It was difficult to get in,"

he laughs, "but even tougher to get out." Still Charles has remained loyal to UT. Since graduating, he's always found a way to give back. "It wasn't always a lot," he says, "but I always tried to give something." During graduate school, Charles recalls sending in five dollars with a note apologizing for not being able to give more, but with a pledge to do so later. He still seems genuinely warmed by the kind response his note and contribution received and has long since made good on that promise. If you ask why he's so committed to higher education, he doesn't hesitate to answer with his trademark frankness,

"The university is absolutely one of the most important institutions in the state. It serves every Tennessean not only through teaching, research, Extension, and health services, but also by acting as a catalyst for the economy—providing a qualified workforce and other important

resources that attract businesses and industry to our state," says Charles.

The Whartons continued to invest both time and money, despite long careers outside Tennessee. Charles's first job after completing his MBA was consulting across the country rescuing companies that were in financial trouble. They settled in Altadena, California, where Charles

worked for 17 years as executive director of the internationally prominent Los Angeles law firm O'Melveny & Myers. Even before coming home to Tennessee, they continued to stay active, supporting the university and traveling to Knoxville at least twice yearly as Charles chaired the Development Council. Julie also played an early role on the College of Veterinary Medicine's Board of Advisors in the 1980s through a relationship that began after bringing a pet bulldog to the hospital from Houston to be treated. She still remembers meet-

'UT is absolutely one of the most important institutions in the state'

Charles and Julie Wharton (center) congratulate 2006 Wharton Professors Dr. Steve Adair, Large Animal Clinical Science (l) and Dr. Seung Joon Baek, Pathobiology (r). The Whartons annually recognize two College of Veterinary Medicine faculty members for outstanding teaching, treatment, and research.



ing Dr. D. J. Krahwinkel, whose compassion and knowledge helped them form a lasting respect for the Small Animal Clinic. That relationship has continued with Julie serving again on the CVM advisory board. She is personally dedicated to making sure the hospital can continue to move forward with the much needed large animal clinic.

"They really care deeply about what they do. That's why faculty development is so important," Julie says. "We have to attract and retain talented faculty to maintain a certain level of care and excellence."

Charles and Julie were also returning regularly to visit the 700-acre farm they bought in 1987. Julie jokes that their involvement with horses began as a "stroke of bad luck" when they bought a pair for riding trails on the farm. Both still love to ride, and Charles in particular says he likes riding and showing performance horses. Their favorite time with the horses is in the evenings when they ride out to feed and check on them. Still, it's clear that owning and showing horses is not easy. Even with all the love in the world for the majestic animals, they are familiar with the headache and heartache that accompanies this challenging business. After losing their beloved champions I'm Busted in 2004 and Motown Legend last spring, they again credit the faculty and staff within Veterinary Medicine for their knowledge and compassion. According to CVM Dean Michael Blackwell, "Charles and Julie genuinely understand what it is we do, not just for animals, but for public and human health



A love of animals is an abiding theme in the Wharton's lives.

issues, as well. We're so very fortunate to have the support of these two visionary people."

Philanthropy and service have continued to be a central theme in the Whartons' lives now that they're back in Tennessee. Buddy Mitchell, associate vice president of agricultural development and government relations, notes that Charles and Julie are more than donors. "They're true friends," he says, "giving time, counsel, and leadership to help make the university and the Institute of Agriculture the very best institutions they can be." Comfortable in multiple roles, Charles currently serves on the Agricultural Development Board and chairs the Institute's Executive Steering Committee for the upcoming Tennessee Tomorrow campaign. He also continues to serve on the university's Development Council

'CVM really cares deeply about what they do'

where he co-chairs the Campaign Leadership Team. Julie is equally comfortable in multiple roles and was a founding member of the Alliance of Women Philanthropists. She continues to play an active role in both the alliance and CVM. Both talk about giving as an honored duty entrusted to those who want to

make a difference. When Charles speaks to others about giving, he likes to remind them, "There are some things you cannot change or influence, and you shouldn't invest time or energy in those things, but when you have a chance to make a real difference to improve the world we live in, then each of us has an obligation to give as much as we can."

In October, Charles accepted Governor Phil Bredesen's appointment to the UT Board of Trustees and is looking forward to his roles on the Advancement and Public Affairs

Committee and the Finance and Administration Committees. "It's an honor to be appointed. The University of Tennessee provides a hope for a better tomorrow," says Charles. The Whartons' commitment to higher education stems from the belief that the university represents the best opportunity for ordinary Tennesseans to succeed in life and are engaged in helping the university improve access to education in the state.

UT President John Petersen welcomes Charles' appointment as a trustee. "He brings with him exceptional management skills, a broad knowledge of the university, and a commitment to students and the people of Tennessee. His genuine understanding and appreciation of the value of education, and the doors it opens, will be a great asset."

The respect is mutual. Charles cites Petersen's vision and strategic plan as one of the primary reasons he's excited about the future of UT. "He's done an amazing job as president. We're headed in the right direction." With the added leadership and support of people like Charles and Julie Wharton, we certainly are. **UT**

— Amy Yancey

Butternuts and Cherokee Basketry

Sustaining the Environment and the Tradition

Carol Welch has been weaving handmade baskets for 40 years, taught by Cherokee master weaver, Lottie Stamper. Now, Welch passes her basket weaving skill on to new generations.

The craft of creating a Cherokee basket starts with a living tree.

Just the right kind must be found. Straight young saplings of white oak are chopped down and scraped into splints thin enough for weaving. Dye material is also gathered by hand.

“Peel the roots of the trees, just under the dirt. I like them better. Cut them off. It won’t hurt the tree, the main roots go way down,” Welch said, describing how to collect surface roots from the butternut tree.

Butternut roots are boiled to make a rare black dye, less available since the tree species became scarce. The shades, from deep gray to black, depend on what part of the tree the extract was taken from and how long it was boiled in the dye pot. Roots, bark, and nut husks can be used to make long-lasting, natural dyes.

Welch works from her home in the Qualla Boundary, which runs alongside the national park in the Smoky Mountains. At her level of mastery,

preparation, smoothing, dyeing, and weaving steps still take about two weeks to produce the characteristically geometric Cherokee basket.

The real problem for artisans like Carol Welch is a shortage of quality, native materials. The Eastern Band Cherokee have organized a revitalization of their ancient crafts, reinstating traditional materials with the traditional methods that make their works distinctively Cherokee.

A chance meeting at the Southern Appalachian Man and the Biosphere conference in 2004 drew the University of Tennessee’s Tree Improvement Program, led by Dr. Scott Schlarbaum, into the Cherokee revitalization.

UT graduate research assistant Sunshine Brosi spoke at the conference about her work with the threatened butternut tree, and her talk led to a collaboration between UT and the Revitalization of Traditional Cherokee Artisan Resources program.

Butternut trees are declining toward extinction from a canker disease that attacks the species, spread by virulent spores. Schlarbaum, an expert in forest genetics and tree cytogenetics, initiated the butternut study as part of a multi-state effort



Sunshine Brosi with butternut, which yields the darkest dyes used in basketry

to improve threatened hardwood forests in the United States.

“The University of Tennessee is the nexus for the largest interdisciplinary research effort on butternut in the country,” he says. Cooperators include federal agencies, such as the U. S. Geological Survey, USDA Forest Service and the National Park Service, state agencies, other universities, and private foundations. Field experiments have been established in a number of states, ranging from Missouri to Connecticut.”

Brosi describes how the UT Tree Improvement Program is setting up an environmentally sound resource cycle that provides the Cherokee with traditional craft materials, while helping the butternut species recover.

“Seedlings are planted from butternut trees growing in the Qualla Boundary and the local area. The new plantings will provide the Cherokee with nut husks, roots, and tree bark for basketry dyes, as well as hardwood for carving.

“Other butternut plantings are tested to determine genetic families which are the most canker-resistant. Seedlings from these trees are selected for natural genetic resistance and replanted in orchards, with hopes to create a disease-resistance breeding program,” she said.

If the test orchards begin producing canker-resistant seed nuts, the butternut could be re-established in U.S. forests, enhancing biodiversity and reviving a valuable timber resource. Butternut would also provide a mast source for a diverse range of wildlife and aid in erosion control.

Brosi said UT is also setting up plantings of white oak for the Cherokee basketry craft. The seedlings there grow under tree shelters, which prevent branching and cause the saplings to grow straight.

These young trees will become the ones harvested for handmade baskets, leaving older oak to slowly mature in the Qualla forests. **UT**

—Terri Friedman



Dr. Sue Hamilton, director of the UT Gardens, makes a point.



Garden Girls on the Air

Popular Radio Program Delivers Expert Advice

Helping the public to enhance their gardening skills as well as solve horticulturally based problems, the Garden Girls radio show has really blossomed.

Fielding questions ranging from palm trees to purple weeds, callers keep this group on their toes. "It is kind of like being a general practitioner in the world of medicine," Dr. Sue Hamilton explains of the 'Girls' role each Saturday from 2-4 p.m. Eastern on FM 100.3 WNOX.

Alongside Dr. Hamilton, UT Extension garden expert Beth Babbitt answers questions from callers within a five-state area as well as a worldwide Internet audience. Both are faculty members in UT's Department of Plant Sciences. "Our audience is about 6,500 people," says Christine Jessel, the show's host. Andrew Pulte, an arborist and graduate student, is the newest member of the gardening team. Pulte not only helps answer phone questions, he fields the e-mail inquiries as well. The group's Internet guru, he enables the Internet audience to not only listen in live, but also find past shows on the Web site.

Following the gardening calendar, the weekly topics stay in tune with the seasons. January is the prime pruning time, so they have entire programs complete with experts to help gardeners make the perfect snip. February means fruit trees, and in September turf grass is the hot topic. Whatever the season, the gardening calendar on their Web site keeps green thumbs busy year round.

The show is not just for those with a passion for plants. Gardeners of all skill levels can get great tips on the average mass-produced plants found at 'big box' retailers as well as rare varieties available only at specialty shops. Even Jessel, a self-proclaimed "black-thumb" has learned much from the digging duo. "Living in an apartment, I have become quite the container gardener. I have definitely learned a lot," she proudly admits. Occasionally, the group will get stumped by a question. In that case, they give the caller the number of their local Extension agent. The agent will find an an-

swer to the problem, or forward the person on to a university specialist. Either way, the group wants to ensure the public is helped, and that is Dr. Hamilton's number one priority. "At the end of the show I am energized, uplifted and feel good; like I have really helped people find solutions," says Dr. Hamilton.

Flipping through books the size of your grandmother's Bible, the girls assure each caller that they will find the answer. They also use the Internet to solve perplexing pest problems and chemical conundrums. Clicking away on his laptop, Pulte flies through Web pages and search engines to ensure they give each caller a thorough answer to their question. "These resources help validate and assure us, as well as add to our credibility," says Dr. Hamilton. These numerous sources, coupled with their vast horticulture

knowledge, ensure the group leaves no question unanswered.

"It is fun to talk to like-minded people, and Beth and I kind of hold each others' hand and support each other as we go through the show," says Dr. Hamilton. It is not only their passion for plants, but their love of teaching that keeps the show alive and the audience growing. **UT**

—Amy Davis

"It's just so gratifying to help people solve problems," Babbitt says. "I really do enjoy it."



It's Not Your Daddy's Beef Operation

Advancing State's Beef Industry is What UT Programs are All About



Dr. Warren Gill educates Master Beef Producers on the importance of nutrition management for their operations.

Gary Lands raised beef cattle on his farm in Rockwood for 25 years before he enrolled in UT Extension's Master Beef Producer Program. What he experienced was transforming. "Until then I guess I was just treading water. After the class I changed quite a few things. I started vaccinating. I put in water. I built a hay shed and put in a heavy usage feed area. It's made a big difference in how I operate."

Those are sweet words to backers of the program.

"Making positive changes is the purpose of the Master Beef Producer Program," says Dr. Jim Neel, professor and Extension beef cattle

specialist. "There are lots of sources of information available to producers, from the Internet on. The information in the Master Beef Producer Program is research-based and demonstrated to have worked."

Since 2003, 1,208 producers have become certified through the Master Beef Producer Program. It serves as the centerpiece of a number of educational initiatives and programs at UT that share a common goal: to guide Tennessee's beef producers in advancing the state's already thriving beef cattle industry to be the national leader in producing high quality, high performing and highly valued cattle. For an industry that is

already the most important source of agricultural revenue in the state, it's an important goal.

Agricultural economist Dr. Emmit Rawls says the state has all the inputs needed to achieve that aim. The effort just takes education and a healthy dose of cooperation among producers because product uniformity and collaborative marketing are keys to competing in today's marketplace.

"Tennessee has had several marketing programs going on to help producers create or add value to the cattle," Rawls notes. "And it's important to have a marketing system in place that *captures* that added value." For example there are several marketing initiatives in the

state that help producers capture \$5 to \$10 per hundred pounds above weekly auction prices for cattle that have been specially prepared for market. These include the Giles and Upper Cumberland Beef Alliances, the Hereford Marketing Alliance, and the Southeast Pride Sales.

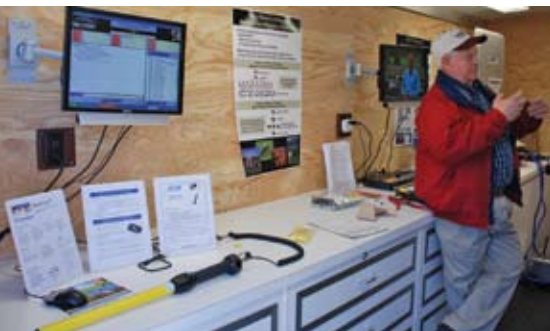
Among UT's efforts are cooperative beef cattle alliances, educational outreach to producers on the value of improving herd genetics, and special sales of preconditioned cattle. Newsletters and new Web-based videos help spread information.

Another component assisting in moving the Tennessee beef industry ahead is the Tennessee Department of Agriculture's ag enhancement program. It has a cost-sharing component to help producers have adequate handling facilities, to improve their genetics, and upgrade their hay storage facilities.

Cattleman Todd Bunch of Jefferson County uses UT's record keeping FIRM software to track individual animal performance. "I've had some

Jefferson County producers John Reuschel, left, and Todd Bunch, right, find value in feedlot information on their cattle. At center is Extension Agent Jonathan Rhea.





Producers such as Morgan Jones of Monroe County learn more about technology used in animal identification through a trailer developed by UT Extension.

Two new products aid beef producers

Cattle producers and others interested in quality beef production and management are invited to take a walk down Cattle Lane... or, more specifically, participate in free online education sponsored by UT Extension and the Department of Animal Science.

Clyde Lane, professor of animal science and Extension beef cattle specialist, has developed a video library and accompanying fact sheets that are now available online. The site, which is part of the UT Beef Extension program, plays off the name of its developer. Called the Tennessee Cattle Lane, it features a series of 22 short videos. Topics include hay feeding and storage, culling animals based on disposition, forage testing, beef quality assurance, breeding soundness examinations of bulls, fly control, and selecting handling equipment, among others. The fact sheets that accompany the videos may be printed for free for educational purposes.

In addition to the video series, Lane provided the inspiration for what's being regarded as a breakthrough product being delivered statewide through Farmers Cooperative's stores. Lane was seeking a way to communicate Beef Quality Assurance (BQA) messages across to herd owners when he had an epiphany. His idea was to print the message on a chiller bag to be used to keep animal vaccines purchased at the



Clyde Lane, right, discusses the new animal health product bag with Mark Montgomery of the Farmers Cooperative's Lexington Store.

Co-op at the proper temperature until producers could make it home with them. Some 50,000 of the insulated, informational animal health bags are being distributed through Co-ops across Tennessee. They're expected to have a substantial impact on Tennessee's beef industry, according to the Co-op, by reducing the costs of vaccine replacement, vet services, and unnecessary tissue damage.

The bags are also available to suppliers and BQA coordinators in other states. At the National Cattlemen's Beef Association meeting in Nashville, the bags were distributed as favors, receiving attention there.

"I'm so appreciative of the Co-op's assistance in making this happen," says Lane. **UT** —Patricia Clark McDaniel with Mark Johnson

surprises. The two cows that really are the backbone of the herd are a couple that I wouldn't have realized were. With record keeping, I know."

Like most of Tennessee's cattle producers, Bunch works off the farm. Although heat synchronizing his herd adds work, he says the approach he learned from UT is well worth the return. "I don't have the time to get out there every day and watch over them. Now I don't have to."

UT is also providing leadership with the Tennessee Livestock Network, which aims to produce source-verified cattle eligible for shipment to Japan.

In the Tennessee Beef Evaluation Program, Rawls and county agents

work with producers to send cattle to a feedlot in southwestern Iowa. The experience gives the producer valuable data on feedlot performance and carcass traits, which can help them make any needed management changes and assist them in marketing their cattle to future buyers.

While cattle production in Tennessee continues to pass from one generation to another, today the market is far more complex. "You can't just produce what you want any more and assume somebody's going to take it at top price," Rawls says. "You need to be focused on what the market wants because the price spread between what it will take and what it wants is getting wider, particularly at the feeder cattle level."

And that's why advancing Tennessee's industry is, and will remain, an important goal. **UT**

—Margot Emery



Graded sales such as this one in Sweetwater capture added value by marketing cattle in larger groups.

Students Go Jamaican

Study Tour Probes Complexities of Competing in a Global Market

Article and photos by Erin Byers,
Biosystems Engineering, Class of 2008

Last May, 11 UT students from Animal Sciences, Fisheries, Agricultural Economics, Engineering, and Tourism stepped off a plane in Kingston, Jamaica, for a two-week journey around the mountain island. The trip was organized and run by Drs. Delores and Mike Smith and Rich Davis on UT's end, and several incredibly generous folks from Jamaica's Ministry of Agriculture, who worked hard to show us the Jamaica they were so proud of—a beautiful country that produces some of the highest quality agricultural products in the world. From produce to livestock, from the fields to the processing plants, from hourly wage earners to wide-scale economic impacts, we got to see every piece of the puzzle.

We explored Jamaica's efforts to remain in the global market when other countries can produce more

agricultural goods with less money, and how to best take care of the island's natural resources. We visited several research institutions, such as the Caribbean Agricultural Research and Development Institute (www.cardi.org/), the College of Agriculture, Science and Education (www.case.edu.jm/), the Bodles Agricultural Research Station, and the Ministry of Agriculture itself. At the Ministry, we heard presentations on globalization and sustainability. The Institute researches chemical-free pest control and ways to turn banana and coffee production waste into nutrient-rich compost. Undergraduates at the college conducted extensive research on experimental soil mixtures and hydroponics. Bodles featured a cattle artificial insemination facility, a bee research center, and a field of hot peppers bred for resistance to



a tobacco virus. Though Jamaicans may not have the funding and facilities to do broad research like we do in the U.S., they are able to perfect their own crops and methods.

We saw the production side of several major Jamaican crops. The island produces some of the finest coffee in the world in its Blue Mountains. We hiked two miles up a steep mountain (tough for us, life as usual for those who worked there) to see rows of coffee plants clinging to dramatic slopes. That afternoon, we saw the factory in town where the beans were dried, processed, sorted by hand, and tested for quality. We began to realize how a pound of this coffee could cost thirty dollars. We also visited a banana farm, an ingenious facility where zip lines carried banana bunches to the washing and packing building. It gave a whole new meaning to the song, "Come Mister tally man, and tally me banana—Daylight come and me wan' go home!"



In our travels across Jamaica, amidst the beautiful scenery we saw the fairly rough environment many Jamaicans live in. Small houses made of sheet metal lined the winding roads, which in many places had broken away. To hear about international trade and economic troubles and then see its effects was very eye-opening. Still, the smells of spicy food and sounds of reggae from the smallest shacks showed us a great joy for life. In a way, there is a sense of bounty all Jamaicans share—a bounty of sun-





shine, the warm ocean breeze, and fruits growing wild year-round.

Study abroad opens your eyes to new attitudes. It's like taking a class from your favorite professor who really encourages you to stretch your mind—only instead of one professor, you learn from every person you meet, and every experience you have. We experienced the culture, learned some things about agriculture, and saw how delicate the economic balance between different parts of the world really is. The Caribbean has a lot to offer, and I especially recommend a trip like this if you have only seen the islands as a vacationer. Get out on the road, see the countryside, climb the mountains—see the real Jamaica! **UT**



CASNR Study Abroad Programs Abound

When it comes to study abroad programs, students in the College of Agricultural Sciences and Natural Resources have a wealth of options.

They can travel across the globe to Thailand to learn about fisheries, national parks and wildlife, agronomic production, agritourism, orchid tissue culture, forestry practices, environment restoration, and so much more. Or, through a partnership program with Iowa State, they can visit the Australian continent to learn about the natural resources and agricultural practices of the Land Down Under. Visits also continue to Jamaica, where students can savor jerked spices and tropical agriculture. Or they can travel across the pond to England and Ireland, visiting some of the great gardens of the world.

CASNR students are indeed ready for the world.



CASNR Associate Dean Dr. Mary L. Albrecht and Dr. Joe DiPietro, UT Vice President for Agriculture, congratulate Dr. Neal Eash, associate professor of soil science, on receiving the Gamma Sigma Delta Excellence in Teaching Award for 2006.



Avian Ecology Lab Travels to Mexico

Students in the Department of Forestry, Wildlife, and Fisheries traveled to Veracruz, Mexico, in early October for the fourth North American Ornithological Conference. The theme was "Wings without Borders," acknowledging that many migratory songbirds cross the borders of Canada, U.S., and Mexico twice a year. Now researchers also are reaching across the borders to share their studies. From left are students Benny Thatcher, Leslie Bulluck, Ana Raymundo, Tiffany Beachy, with field assistant Alex Pena, Dr. David Buehler of UT and Jesus Gamboa of the National University of Mexico.



Fountain Wars Champs

Last summer in the Fountain Wars competition at the American Society of Agricultural and Biological Engineers conference, undergraduate Biosystems Engineering students launched a tennis ball to accurately hit a target; rolled a filled two-liter bottle up a short ramp; knocked over six soda cans; and filled a stand pipe with water. The students met other criteria, as well.

The UT team included Curtis Million, David Foster, Tammy Cheung, Ken Swinson, and Steven Krajewski. Out of a possible 500 points, UT achieved a score of 433; the next highest score was 364. The team brought home First Place Overall and also won the Most Innovative Design award. Congratulations go out to all the UT Fountain Wars team members!



Mary Lewnes Albrecht, Associate Dean of the College of Agricultural Sciences and Natural Resources, is in her second year of service as Academic Programs Director of the Board on Agriculture Assembly of the National Association of State Universities and Land-Grant Colleges. NASULGC is the nation's oldest higher education association.



From Public Horticulture to Biotechnology

Plant Sciences Students Reap Rewards

From amusement parks to the research lab, from the golf course to the editorial desk, graduates of the Department of Plant Sciences put their individual talents to work in a wide array of fields.

The department offers concentrations within four disciplines. "More than half of our students are in Landscape Design and Construction," says Dr. Bob Augé, instructional coordinator for the department. Next most popular is Turfgrass Science and Management, and third is Public Horticulture.



In fall 2006, the department added its newest track of study: Science and Biotechnology, which introduces the latest trends in molecular biology, biotechnology, and genomics. Undergraduates get hands-on experience in laboratory settings, which makes them attractive job candidates, and employers consider a bachelor's or master's degree in biotech a golden degree. In addition, Knoxville is within a day's drive of nearly half the industry's research facilities worldwide.

Garry Menendez, an associate professor in Landscape Design and Construction, sees his students finding first jobs in local nurseries, or hanging out their shingle to run their own landscape contracting business.

"This field attracts creative people who like to be outdoors and beautify their environment," he says. But his students don't need to see the future from behind a wheelbarrow. "My philosophy is to put in your sweat equity during the internship." In the second part of their career, students can use their education to shift gears and wear a different hat as a manager, contractor, or regional representative of a major company.

For graduates in Turfgrass Management, one of the more popular first jobs is assistant golf course superintendent. "Eventually, growing the grass becomes the easy part," says Dr. John Sorochoan, assistant professor of turfgrass science. "Communication is the number one challenge." Minors in business, communications, and economics come in handy, as does a command of Spanish for those managing a Hispanic labor force.

The internship experience in Turfgrass Management gives students a



competitive edge, as well. "We have developed a curriculum and schedule for the spring semester of the junior year that lets students start in March," says Sorochoan. This allows interns to be available for opening day of baseball season, at the Boston Red Sox, for example.

A concentration in Public Horticulture prepares students to understand the social aspects of the field, the interaction between people and plants,

says Associate Professor Dr. Susan Hamilton. "It's all about the impact and benefits of plants upon people and society," she says. This course of studies is one of only a handful in

universities around the entire nation.

Some graduates prefer to work behind the scenes, collecting rare plants and maintaining seed banks,



a reservoir of species for posterity in botanical gardens. "A catastrophic event such as a hurricane or tsunami could wipe out whole species of plants," says Hamilton. Others find their niche in child or adult education in botanical gardens, combining technical knowledge with good communication and education skills. Still others pursue careers in publishing or television production for a public thirsty for gardening information.

A master's or doctorate in Plant Sciences may prepare students to conduct research, enter a teaching profession, or earn more money, though specialization can narrow career options. No matter the chosen path, students in plant sciences find fertile ground for their skills. **UT**

— Elise LeQuire





Protecting Tennessee's Scenic Beauty

Cocke County Youth Learn Benefits of Community Planning

One of Tennessee's most rural and mountainous counties may be poised for traffic jams and unsightly sprawl.

It's possible in Cocke County, and now University of Tennessee Extension and the UT College of Social Work are partnering with local leaders and community stakeholders there to ensure the region's future growth is controlled, carefully planned, and benefits the children of the community.

Last fall, UT Extension and the Community House Cooperative kicked off a program called "Smart Growth for Healthy Kids in Cocke County" at Grassy Fork Elementary School in Hartford. At a school rally attended by a number of UT and local leaders, Grassy Fork students led the introduction ceremony, displayed their artwork, performed songs and poetry, and gave tours of the school's new greenhouse.

"In 15 to 20 years, these kids will be making important decisions for this region of Tennessee," says Dr. Martha Keel, a Family and Consumer Sciences expert with UT Extension. "Now's the time to get them to value their community.

'Smart Growth' is about economic growth. It's about establishing a community that's a good place for its citizens to live, and for children to be healthy."

UT Extension recently received a \$32,000 grant from the Environmental Protection Agency to implement the "Smart Growth" program in Cocke County—the only grant of its kind awarded in the southeastern United States. Grassy Fork was chosen as one site for the program, and about \$5,000 of the grant has already been spent on the greenhouse. There Grassy Fork students will grow seedlings of trees that will then be planted in the community, as well as healthy vegetables they can eat in their cafeteria.

"We're going to be taking cafeteria food waste, composting that down, and using that as an organic fertilizer for the greenhouse and growing vegetable transplants to supply the cafeteria," says Cocke County UT Extension agent Kevin McConnell.

Grassy Fork students are excited about the prospect of working in

the greenhouse, and they believe the program is a great way to protect the beauty of their mountain community. "We're learning about how not to change the environment. Just leave it the way it is," says 8th grader Alyssa Shepherd, who gave a speech at the kickoff event.

'Smart Growth' is about establishing a community that's a good place to live, to be healthy

As part of this effort, Grassy Fork students learn about the pitfalls of sprawl, including congestion, longer commutes for residents, unsightly

and vacated property, and economic loss for the community.

"We want to make this a pretty, attractive community instead of a place that has trash everywhere," says student Emily Hall.

"You can end up with parts of your downtown area becoming vacant," adds Dr. Keel. "So you get a lot of unused property. You just keep growing out and out instead of revitalizing what's already there."

Part of the national "Smart Growth" program includes a list of 10 principles that will lead to community development. One of those principles details

involving local stakeholders in this effort, and this particular plan will be emphasized in Cocke County.

"This community has very strong roots," McConnell says. "It's very proud and there's a family feeling that it has here."

UT Extension leaders say if the "Smart Growth" program is successful in Cocke County, they hope to implement the plan in other areas of Tennessee. **UT** — Chuck Denney

For more information, contact Martha Keel at mkeel@tennessee.edu.



The November kickoff featured seasonal plants. Soon vegetables and trees will be growing in this school greenhouse.



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Arthritis Program Honored

The Tennessee Arthritis Education Partnership, which is helping citizens learn to self-manage chronic symptoms, has received two national honors

The Centers for Disease Control and Prevention bestowed its prestigious Partnership Award on the program and also acknowledged the partnership as an Exemplary Public Health Program that can serve as a model for reaching underserved populations in other states.

The National Arthritis Foundation presented the partnership with a National Public Health Innovative Award for outstanding achievement.

The partnership is a collaboration of UT Extension, the Tennessee Chapter of the Arthritis Foundation, and the Tennessee Department of Health's Arthritis Control Program. Dr. Bobbi Clarke, professor and health specialist, leads UT's efforts in the program. 

—Terri Friedman



Arthritis exercise at the McMinn County Senior Center and tai chi exercise in Humboldt helps keep citizens fit. More than 6,100 Tennesseans participated in the partnership's arthritis education programs in 2006.



OUTREACH