Pets gone WILD!

Bill Kern, an assistant professor and extension vertebrate pest management specialist at the UF/IFAS Fort Lauderdale Research and Education Center, holds a female green iguana. Kern says the reptiles, which were brought into the state from tropical areas as pets, are becoming a common sight throughout South Florida and thrive outdoors as far north as the Tampa Bay area.

“They are a prime example of how exotic animals can become a nuisance in Florida,” he said. “They feed on fruit and ornamental plants and dig burrows that can cause erosion around retaining walls and seawalls.”

The reptiles, which can carry salmonella, usually avoid people, but will defend themselves and bite if provoked by people or pets such as dogs and cats. Kern said alligators, dogs and raccoons are probably their only natural enemies in the suburban environments of South Florida. He plans to publish a UF/IFAS fact sheet on iguanas this summer.

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Tropical Agriculture: Florida’s Unique Role
Because Florida’s agriculture is so diverse, there is relatively little private sector research and education. New technologies and new solutions are gone. Now, Florida farmers, foresters and ranchers must constantly seek new approaches, locally. Costs of agricultural production reflect costs of impacts such as labor, land, water, chemicals and management — along with the impacts of government policy and regulations.

There was a time when costs could be lowered by simply increasing yields but those days are gone. Now, Florida farmers, foresters and ranchers must constantly seek new approaches, new technologies and new solutions. And these are all the products of research, development and education.

Because Florida’s agriculture is so diverse, there is relatively little private sector research and development (R&D) in the state. This means that UF’s Institute of Food and Agricultural Sciences (UF/IFAS) is the primary source of R&D for the state’s essential and dynamic agricultural sector.

However, UF/IFAS has experienced decreased real investment in the R&D portion of the state’s most stable industries over the past 19 years. And, as we look to the future, without the ongoing investment and support from the State of Florida, UF/IFAS can’t be all it must be to agriculture. Given an increased investment by the state, UF/IFAS is poised to establish relevant and responsive research and development priorities that will have positive impacts on industry profits and sustainability in the global economy.

Mike Martin
Senior Vice President
for Agriculture and Natural Resources

OVER THE PAST NEARLY SIX YEARS | I have learned a great deal about Florida. Among many other things, I have learned that agriculture, including related natural resource industries, is a cornerstone of the state’s economy and critical to the state’s future.

To be sustainable, agriculture must be economically and environmentally viable. And economic viability means profitability. We know that agricultural profitability depends on expanding sales revenues in an ever-changing global market. Agricultural sales are influenced by international competition, changing consumer tastes and incomes, new product development, costs of transportation and marketing, and value added locally. Costs of agricultural production reflect costs of impacts such as labor, land, water, chemicals and management — along with the impacts of government policy and regulations.

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 Retraction: The Summer 2004 issue of IMPACT included an article on an Extension nutrition program for Hispanics. The Summer ’01 article was a sequel of an earlier story written by Paul Kimpel, who was not credited for the story. Also, the photo on page 28 of that issue should have been credited to Milt Putsch. IMPACT regrets these omissions.

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4 Taming Melaleuca in Florida
Imported from Australia more than a century ago, melaleuca has invaded a wide variety of natural landscapes in South Florida. To bring the troublesome tree under control, scientists with UF’s Institute of Food and Agricultural Sciences are working with state and federal agencies on the new TAME Melaleuca project.

8 Living on the Edge
On the edge of the tropics, Florida is the perfect place for all sorts of unwanted plants, pests and diseases to gain a foothold. To keep invasives out of the state — and control the ones that are already here — UF/IFAS researchers are developing a variety of effective management programs.

14 Caribbean Connection
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18 Orchideaceous!
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To make sure producers of high-value, specially crops have the post management tools they need, UF/IFAS is providing leadership for the Interregional Research Project No. 4.

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In the tropical forests of Latin America, the need to balance conservation and economic development is the goal of the new Integrated Graduate Education and Training Program, which is administered by UF/IFAS.

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A new UF/IFAS extension education program — presented in Spanish — is helping thousands of migrant farm workers in South Florida learn about safety and avoid accidents.

35 Hot Tomato!
Solar Fire, a heat-tolerant tomato variety developed by UF/IFAS researchers, can set new high temperatures, giving Florida growers a new option for improving production during the summer.

On the Cover
In Florida, where large-scale production of orchids is booming, the University of Florida’s Institute of Food and Agricultural Sciences is providing valuable research and education for consumers, growers and students. Pictured is a Doritaenopsis hybrid orchid (Dtps. Happy Smile x Dtps. King Shang’s Rose). Cover photo by Josh Wicklham. (Story on Page 18.)
**TAMING MELALEUCA in FLORIDA**

**IN FLORIDA**, where invasive exotic plants account for as much as 31 percent of all plant species, melaleuca is one of the most significant threats to biodiversity. Imported from Australia as an ornamental plant that would help “dry up useless swamps,” melaleuca has behaved badly — invading a wide variety of natural landscapes in South Florida. Everything from wetland marshes and prairies to cypress domes and pine flatwoods is affected, and one mature tree can hold as many as 50 million seeds.

By the early 1980s, only 50 years after it was introduced, melaleuca had spread over hundreds of thousands of acres. In 1967, it was found in Everglades National Park, and by 1993 it covered 488,000 acres in South Florida. Melaleuca is now listed by federal and state agencies as a noxious weed, making it illegal to possess, sell, cultivate or transport in Florida.

“The tree invades moist, open habitats, forming dense, often impenetrable stands of trees,” said Ken Langeland, a professor of agronomy in the University of Florida’s Institute of Food and Agricultural Sciences (UF/IFAS). “Native wildlife is threatened because the tree crowds out beneficial native plants. It’s also a serious fire hazard because oils in the leaves burn hot and are difficult to extinguish.”

Langeland, a specialist on aquatic and invasive plants, is chairman of the technology transfer team for the TAME (The Area-wide Management Evaluation) Melaleuca project, a multi-agency demonstration program established in 2001 by the U.S. Department of Agriculture in cooperation with the South Florida Water Management District and UF/IFAS. The melaleuca control program includes eight demonstration sites in South Florida.

“Combining different management control options will be more effective than any one method alone,” Langeland said. “The goal is to stop new infestations and treat existing infestations before they spread and become even more difficult to control.”

He said aerial spraying of herbicide is effective for large stands of melaleuca. Ground crews are used to girdle trees and apply herbicide to individual trees. Cutting melaleuca trees will not kill the stump or the roots, so herbicide must be applied to the cut surfaces to prevent regrowth. Flooding doesn’t kill mature trees but may kill some seedlings or prevent them from becoming established on flooded soils. And while fire may destroy seedlings and saplings, it won’t kill mature trees and actually helps release and spread the seeds. Heavy equipment, which is difficult to use in remote areas with dense melaleuca, may harm soils and native plants.

“‘The good news is that various government agencies have been able to clear melaleuca from almost 100,000 acres of publicly owned natural areas such as Big Cypress National Preserve, the Lake Okeechobee marsh and the Everglades,’” Langeland said. “‘The bad news is that the tree is still spreading rapidly on privately held lands where there are no controls — resulting in a no-net loss of melaleuca. Dense forests of melaleuca now occur mainly on private lands in Broward, Miami-Dade, Palm Beach, Lee, Martin and Collier counties.’”

Langeland said the TAME project is using an integrated pest management approach to control melaleuca.

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**To learn more about the TAME Melaleuca project, visit** [http://tame.ifas.ufl.edu](http://tame.ifas.ufl.edu)

**INTRODUCED TO FLORIDA IN THE MID-1880S,** melaleuca has spread quickly throughout South Florida, displacing native plant and animal communities, drying up wetlands, creating fire hazards and threatening the stability of the Everglades ecosystem. To bring the troublesome tree under control, scientists with the University of Florida’s Institute of Food and Agricultural Sciences are working with state and federal agencies on the new TAME Melaleuca project. **By Chuck Woods**

**ABOVE:** When melaleuca was brought to Florida from Australia in the 1880s, insects and diseases that attack the tree were left behind. This allowed the plant to grow and spread rapidly, displacing native vegetation. No native flora or fauna are known to harm melaleuca, which gradually forms an ecological wasteland dominated by the tree. **Inset:** Michael Meisnburg, left, and Ken Langeland examine melaleuca that has been shredded into mulch. Commercial melaleuca mulch, which has been composted for 90 days before bagging in order to kill the seeds, is an environmentally friendly and termite-resistant mulch.
**Taking a Bite Out of Melaleuca**

The best long-term management option may be biological control. Biocontrol involves the importation of agents, such as host-specific insects, to naturally control invasive species like melaleuca. After 16 years of research, five biocontrol insects have been imported from Australia, and two now available by mail order for South Florida.

In 1997, the melaleuca weevil (Oxyops vitiosa) was released to control melaleuca by feeding on leaves. By the end of 2002, the weevil was established in 12 South Florida counties, reducing seed production by about 80 percent on trees they attack.

In 2002, the melaleuca psyllid (Boreioglycaspis melaleucae) was released. About the size of a grain or small ant, the psyllid feeds on melaleuca’s clear sap, severely damaging seedlings.

Unlike the weevil, which is restricted to dry habitats, the melaleuca psyllid can become established in any melaleuca-infested area, Pratt said. “We expect this will provide more effective control of the tree.”

Other scientists working on the TAME project include Cressida Silvers, a USDA entomologist and project manager; Jim Cuda, an assistant professor in the UF/IFAS entomology and nematology department; and William Overholt, an assistant professor of entomology at the UF/IFAS Indian River Research and Education Center in Fort Pierce.

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For mail orders, there is a $20 handling and shipping fee for each insect order. For those who visit the UF/IFAS Extension Service at 8400 Picco Road in Fort Pierce and collect their own bugs at the site, there is no fee. The bugs can be ordered by calling Gioeli or downloading order forms from his Web site: http://kgioeli.ifas.ufl.edu/

**Biocontrol Bugs by Mail Order**

The TAME Melaleuca technology transfer team also includes UF/IFAS county extension agents such as John Brenneman in Polk and Hillsborough counties and Ken Gioeli in St. Lucie County.

Thanks to Gioeli, the melaleuca psyllid and melaleuca weevil are now available by mail order for South Florida residents who want to help control the invasive tree on their own property. Getting the beneficial insects is as easy as a phone call or visit to his Web site.

Gioeli is raising large numbers of the bugs in his “honey,” a term commonly used by scientists to describe an insect-rearing facility or insectory.

“Along with the melaleuca menace comes another worrisome problem: Lobate Lac Scale.”

Melaleuca is also a good host for the lobate lac scale, serving as a breeding ground where large numbers of larvae are free to spread to valued landscape and native plants, said Forrest Howard, an associate professor of entomology at the UF/IFAS Fort Lauderdale Research and Education Center.

The insect — no bigger than a pinhead — could become the most difficult problem yet for gardens and natural areas in South Florida. Native to India and Sri Lanka, it was first found in Broward County in 1999, and now it’s been found on more than 200 species of plants in South Florida. It attacks native species such as wax-myrtle, cocoplum, red bay, wild coffee and strangler fig as well as ornamental and fruit trees such as mango, ficus, black olive, lychee and star-fruit.

Of all trees, wax-myrtles are the most susceptible to the scale, Howard said. Wax-myrtles are an important berry-producing tree for birds in South Florida.

“Worse yet, the lobate lac scale (Pentatomobius lobatus) may eventually spread to other areas of Florida. Experiments are in progress to determine how well it will survive in cooler areas of the state, Howard said.

To develop more effective control measures, including biocontrol for the scale, Howard is working with Bob Pemberton, an entomologist at the U.S. Department of Agriculture’s Invasive Plant Research Laboratory in Fort Lauderdale, and Ru Nguyen, an entomologist at the Florida Department of Agriculture and Consumer Services Division of Plant Industry in Gainesville.

Howard is studying the biology of the scale insect and developing chemical controls for it; Pemberton is testing several different tiny, non-stinging wasps that he collected in southern Asia as biocontrol agents; and Nguyen is developing mass-rearing techniques for the biocontrol agents.

“Since lobate lac scale is a relatively new pest, we urgently need better ways to control it,” Howard said. “Certain pesticides are effective on insect pests of ornamental plants, but in some cases they cannot be used on fruit trees. Furthermore, control with insecticides is not appropriate for use in natural areas where lobate lac scale is a severe problem.”

He said biocontrol offers the best long-term solution to the scale problem, but a great deal of research must precede any introduction of biological control agents to insure that they do not negatively effect the environment.

Residents who want to treat lobate lac scale should contract their local UF/IFAS county extension service office for information.

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An online publication about lobate lac scale and its host plants may be found at http://creatures.ifas.ufl.edu/orn/scales/lobate_lac.htm
FROM INVASIVE Brazilian peppertree to citrus canker that could devastate Florida’s $9 billion citrus industry to exotic heartwater disease that kills livestock and wildlife, the Sunshine State is under siege as never before.

Dozens of dangerous insect pests, diseases and invasive plants have already found their way into the state, and others are lurking offshore — waiting for the chance to gain a foothold and cause irreparable damage to agriculture and the environment. An estimated 15 to 20 new insect species invade the state every year, and many become major plant pests. Invasive plants displace native vegetation and disrupt ecosystems. Most invasives flourish in Florida because the natural enemies that control them in their native lands are absent.

The fact that Florida is a major international tourist destination and trading partner with many nations also increases the risk of more problems down the road. And, worse yet, the tropical invaders could threaten the nation’s biosecurity.

But researchers with the University of Florida’s Institute of Food and Agricultural Sciences (UF/IFAS), who work with other state and federal scientists, are making progress against the intruders.

One new line of defense is the Biological Control Research and Containment Laboratory at the UF/IFAS Indian River Research and Education Center in Fort Pierce. Jointly managed with the Florida Department of Agriculture and Consumer Services, the 17,000-square-foot facility opened in June 2004.

Bill Overholt and Ronald Cave, assistant professors of entomology at the Fort Pierce center, said the primary mission of the $3.7 million facility will be to contain, evaluate and release natural predators and other organisms to control invasive plants and pests.

“We are working with state and federal scientists to test and evaluate biological control organisms before they are released into the Florida environment,” Overholt said. “The research will ensure that insects, mites and nematodes being used for control of invasives will not feed on unintended plants or other living matter.”

Overholt said their research program is focusing on three invasive plants: Brazilian peppertree, air potato and West Indian marsh grass. All three are on the Florida Invasive Plants in Florida, was introduced as an ornamental shrub-to-tree from South America in the 1840s. Now it’s the target of an integrated weed management program that includes biological, chemical and mechanical controls, said Jim Cuda, an assistant professor of entomology in Gainesville and chair of the Interagency Brazilian Peppertree Management Task Force.

“The Brazilian peppertree sawfly, one of several biological control agents being studied by UF/IFAS entomologists, could be approved for release this year by federal officials,” said Cuda, who also is project leader for the Brazilian Peppertree Biological Control Program.

Cuda and his colleagues found the wasp-like sawfly (Heteroperreyia hubrichi) in the forests of southeastern Brazil, where it feeds on the leaves of Brazilian peppertree. Their research shows that growth and reproduction of the plant is reduced by repeated defoliations caused by the developing larvae. He said the sawfly will be released into the Florida environment only after extensive testing to make sure it is not a danger to nontarget plants and animals.

Meanwhile, in the Florida Everglades where Brazilian peppertree has invaded more than 6,000 acres of farmland — creating an area known as “the Hole in the Donut” because it threatens Everglades restoration — federal officials are controlling the plant the old-fashioned way: they’re digging up the plants and the soil beneath them.

Yuncong Li, an associate professor at the UF/IFAS Tropical Research and Education Center in Homestead, said the Brazilian peppertree has been removed on about 3,000 acres of abandoned farmland in the Everglades National Park. She said this has prevented the spread of the plant and the soil beneath it.

Brazilian peppertree (Schinus terebinthifolius), one of the most widespread invasive plants in Florida, was introduced as an ornamental shrub-to-tree from South America in the 1840s. Now it’s the target of an integrated weed management program that includes biological, chemical and mechanical controls, said Jim Cuda, an assistant professor of entomology in Gainesville and chair of the Interagency Brazilian Peppertree Management Task Force.

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The air potato, an exotic yam that probably came from Africa, has invaded tropical hammocks and pinelands in 23 Florida counties. It rapidly climbs to the top of tree canopies, robbing existing vegetation of sunlight and nutrients. To learn more about the invasive weed and develop effective controls for it, UF/IFAS researchers are developing biological controls for other invasive plants such as strawberry guava, which is a major host of the adventive Caribfly as well as other insect pests and diseases.

Citrus Canker

When it comes to highly contagious diseases that threaten Florida’s $9 billion citrus industry, citrus canker is at the top of list. “We can live with other pest and disease problems, but canker is something we must eradicate,” said Harold Browning, director of the UF/IFAS Citrus Research and Education Center in Lake Alfred.

“If canker became established in Florida, it would have a severe impact on interstate and international shipments of fresh citrus fruit, which comprise about 20 percent of the state’s citrus industry.” Browning said. “When the disease is severe, defoliation, dieback and fruit drop can occur, and the fruit may be unmarketable.”

Over the past century, the Sunshine State has fought four invasions of the bacterial disease, which probably originated in Asia, and those victories have come off at least four invasions of the bacterial disease, which probably originated in Asia. Overholt said an insect that attacks the grass was discovered in Florida in 2000, and research will determine its host range and impact on the invasive plant.

In addition to Brazilian peppertree, air potato and West Indian marsh grass, UF/IFAS researchers are developing biological controls for other invasive plants such as Brazilian peppertree, air potato and West Indian marsh grass. UF/IFAS researchers are developing biological controls for other invasive plants such as Brazilian peppertree, air potato and West Indian marsh grass.

Florida is currently fighting three separate outbreaks of citrus canker, the worst since the initial outbreak in 1912. And UF/IFAS researchers are playing a key role in the battle.

Jim Graham, a professor of soil and water science at the Lake Alfred center, is working on the detection and spread of the disease. The research shows how easily canker bacterium is dispersed by thunderstorms as well as hurricanes and tornadoes in subtropical Florida. The disease can also be easily spread by harvesting personnel and urban residents who move infected plant materials.

The research findings have helped state agricultural officials establish new rules that stopped outbreaks of canker by extending the radius for tree removal around infected trees from 125 feet to 1,900 feet. Graham also leads research that identified strains of the bacterium that are responsible for current and past outbreaks of canker — findings that helped agricultural officials trace the origin of new infections.

“These new technologies, regulators can now survey, detect and eliminate the disease more rapidly, and quickly reduce the size and scope of quarantines,” Graham said. “However, if canker were to become permanently established in Florida, growers would have to manage the disease by spraying more chemicals on citrus varieties, such as grapefruit, that lack disease resistance.”

Dean Gabriel, a professor in the plant pathology department in Gainesville, has developed methods for rapid on-site detection of the disease, and the state agriculture department is now using the test. He also is evaluating how citrus responds to canker and investigating mechanisms to provide citrus with resistance to the disease. If the industry is forced to live with canker in the future, genetic resistance to canker is the ultimate solution, he said.

Heartwater

The outbreak of mad cow disease, or bovine spongiform encephalopathy (BSE), showed how disruptive animal illnesses can be to the nation’s cattle industry. To guard against another deadly animal disease called heartwater, UF/IFAS scientists have developed a new vaccine and other control measures.

The research will help protect U.S. livestock and wildlife from the deadly African tick-borne disease that has already spread from Africa to the eastern Caribbean.

“Obviously, we’re dealing with something we need to keep out of this country,” said Michael Burridge, a UF/IFAS professor of pathology in the College of Veterinary Medicine. “Like mad cow disease, heartwater is another foreign-animal disease worry for state and national cattle producers.”

Heartwater attacks blood vessels, particularly in the brain. Once infected, up to 90 percent of infected animals die. The disease does not affect humans and it cannot be transmitted by eating meat.

He said the tick that spreads the disease — known as the tropical bont tick — would thrive in the Southeast United States where heartwater could decimate cattle, sheep, goat and deer populations. And, he said, once the disease is established in the wild deer population, it would be impossible to eradicate.

The new vaccine — a breakthrough by UF/IFAS researchers — has been under development for more than 10 years. Described as “a conventional inactivated vaccine,” it has been successfully field tested in South Africa by Suman Mahan, a UF/IFAS veterinary scientist based in Pretoria. Mahan and Burridge are working with Intervet International in Boxmeer, Netherlands, a leading manufacturer of animal vaccines, to commercialize the vaccine.

“The real breakthrough is that we now have developed a safe vaccine that protects animals from death from heartwater under field conditions when the tick challenge is very heavy,” Mahan said.

Another concern, he said, is that the disease could enter the United States on wild animals imported for zoos or conservation and breeding purposes. The disease is widespread in livestock and wildlife in Africa. And, animals may look healthy but still carry the disease.

To check for the presence of the disease, particularly in animals being brought into the United States, the UF/IFAS researchers have developed two new diagnostic blood tests that now are available to laboratories. “Until now, the only way to detect the disease was by a brain biopsy, which is not practical under field conditions,” Mahan explained.

Burridge, who directs the heartwater project, said one of the main objectives of regulatory officials now is to eradicate the tropical bont tick in Caribbean countries and prevent the disease from spreading to the U.S. mainland.

To kill the ticks on livestock, UF/IFAS researchers have developed a tropical bont tick decoy — an inexpensive, environmentally sound tag that can be attached to the ears, neck and tail of livestock. The tag has both pheromones to attract ticks and a slow-release pesticide that spreads over the environment.

The novel self-medicating applicator is attached to a feeding trough, and it applies pesticide passively in a stress-free manner to animals as they feed from the trough,” Burridge said. “This device is known as the Appligator™, and prototypes have already been manufactured for UF by U.S. and South African companies.”

Since 1985, the UF/IFAS heartwater research project has received more than $16 million in grants from the U.S. Agency for International Development (USAID). Burridge said UF is the lead agency in the Heartwater Control Global Development Alliance, a new AID-funded initiative that is moving research from the laboratory to the commercial marketplace.
Tropical Soda Apple

With a name that sounds like an exotic new drink, tropical soda apple has been more aptly described as the “plant from hell,” according to UF/IFAS researchers who have developed a natural way to control the rapidly spreading weed.

“The highly invasive plant, which forms a dense and thorny thicket that is impenetrable to animals and people, has been classified by the federal government as one of the nation’s most noxious weeds,” said Raghavan Charudattan, a professor of plant pathology in Gainesville. “In Florida and seven southeastern states, it’s literally taking over, displacing native plant species in infested areas.”

He said the weed, native to South America, is a serious environmental threat to natural areas, and it’s become a major problem for the beef and dairy cattle industries.

Sharp thorns make the plant’s foliage unpalatable, but livestock, wild animals and birds that eat the fruit help spread the seeds. Mature plants can produce 50,000 seeds that germinate under a wide range of conditions. Seeds also can be spread by compost, sod and moving water, Charudattan said.

“Pastures infested with the weed have less area available for cattle grazing, which means the stocking rates — the number of animals per acre — must be reduced,” Charudattan said.

Until now, the only way to control the weed was with repeated mowing and chemical herbicides. But, Charudattan said, applying herbicides is a problem for the cattle industry because of possible chemical residues in milk and meat.

His research has shown that a common plant virus can be used to kill tropical soda apple, and he is seeking commercial partners to produce and market the virus as a natural biocontrol or bioherbicide.

“During a routine examination of several plant pathogens for their ability to cause disease on tropical soda apple, we discovered that tobacco mild green mosaic virus (TMGMOV) kills the weed,” he said. “Tests in pastures demonstrated the virus kills up to 97 percent of the weed.”

To determine which plants may be vulnerable to the virus, Charudattan is testing the virus on some 300 different plant species, including other weeds and cultivated plants. The virus does not affect people or animals.

“We know that some varieties of tobacco and peppers are susceptible, but the virus can be used safely in areas where tobacco and peppers are not grown,” he said.

The virus, which can be applied easily and inexpensively with a back-pack sprayer, is effective against tropical soda apple under a wide range of temperatures and in year-round growing conditions, he said.

Other UF plant pathologists working with Charudattan on the tropical soda apple project are Ernest Hiebert, a professor emeritus; James DeValerio and Mark Elliott, senior biological scientists; and Jonathan Horrell, a graduate student. Edward Jennings, Sumter County extension director, and Joseph Walter, Bradford County extension agent, are also working on the project.

Pink Hibiscus Mealybug

In 2000, when a Broward County resident spotted a strange-looking, fuzz-covered insect in his garden, state regulatory officials and UF/IFAS scientists acted quickly to control the pest.

“We knew it was only a matter of time before the pink hibiscus mealybug found its way into Florida from the Caribbean, and we were ready when it showed up,” said Lance Osborne, a professor of entomology at the UF/IFAS Mid-Florida Research and Education Center in Apopka. “If we had not acted quickly, the pest would have been a serious problem all over the state by now.”

The tiny insect with a pink body covered in white hairlike wax filaments can quickly strip a plant of its leaves and kill it. The pest attacks more than 100 plant varieties, including citrus, ornamentals, sugarcane and tomatoes. This species of mealybug also produces a toxin that causes significant damage to the plant. In the Caribbean, the mealybug killed 100-year-old trees. Each female lays up to 800 eggs, so mealybugs rapidly develop large populations.

Because the pest found here was in an urban setting, the only real option for managing the pest over the long term is with an effective biological control program, Osborne said.

He said officials with the state agriculture department’s Division of Plant Industry and the U.S. Department of Agriculture met the mealybug invasion with natural enemies imported from the Caribbean. And while imported parasitic wasps have been effective in controlling the pest, they won’t be able to eliminate the invasive bug completely.

Osborne and other UF researchers are testing chemical treatments that will control the bugs in commercial nurseries where there is zero tolerance for this particular pest.

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CARIBBEAN CONNECTION

In a unique partnership that connects scientists in the Caribbean basin, the University of Florida’s Institute of Food and Agricultural Sciences is working with the University of Puerto Rico and the University of the Virgin Islands to promote tropical and subtropical agricultural research. Operating under the T-STAR acronym, the program is funded by the U.S. Department of Agriculture to improve the quality of life for people in tropical and subtropical regions of the United States. A similar T-STAR program in the Pacific basin includes the University of Hawaii and the University of Guam. By Chuck Woods

EVER SINCE its accidental introduction into Florida from the Caribbean more than 30 years ago, the Diaprepes root weevil has been impossible to eradicate and difficult to control. The exotic weevil attacks citrus, ornamental plants, root crops, tropical fruit crops and grasses. Estimates show the weevil infests more than 100,000 acres of citrus and causes more than $70 million in damage annually.

“Despite all the damage, there is some good news,” says Jorge Peña, a professor of entomology with the University of Florida’s Institute of Food and Agricultural Sciences (UF/IFAS), who started a biological control program that uses wasps to attack the eggs of the Diaprepes root weevil. The wasps prevent weevils from reproducing.

With the help of funding from the Tropical and Subtropical Agricultural Research (T-STAR) program, Peña, in cooperation with other researchers, imported three tiny wasps from the Caribbean and released them in five South Florida counties. Early tests indicate the wasps are providing effective control of the weevil.

“Peña’s work is a prime example of how the T-STAR program supports and enhances our research programs,” said John Neilson, program manager of the partnership that involves UF/IFAS, the University of Puerto Rico and the University of the Virgin Islands.

Neilson, based at UF/IFAS in Gainesville, oversees more than 80 T-STAR projects at the three land-grant universities in the T-STAR Caribbean Basin Group. The U.S. Department of Agriculture’s Cooperative State Research, Education and Extension Service (CSREES) provides $9 million in annual funds for the T-STAR program, which includes $4.2 million for the Caribbean group.

Peña said biological control is appealing as a pest management tool because it relies on natural predators instead of pesticides. Biocontrol is also nontoxic and often self-sustaining.

Since the wasps attack Diaprepes root weevil eggs in Puerto Rico, Guadeloupe and other Caribbean countries, Peña’s first goal was to import the wasps from the islands to see if they would become established in Florida. He brought three different wasp parasites into the state, placed them under quarantine conditions and then released them in test plots. The three parasites are identified by the following scientific names: Quadrastichus haitiensis, Ceratogramma etiennei and Aprostocetus vaquitarum. Peña, based at the UF/IFAS Tropical Research and Education Center in Homestead, said female Diaprepes weevils lay their eggs in concealed sites, usually in the space between two adjacent leaves. Weevil egg masses are deposited in a gelatinous cement that seals the leaves together, protecting the eggs. Diaprepes eggs also are laid on broad-leaved plants, grasses and palm fronds. The parasitic wasps deposit their eggs into Diaprepes weevil eggs, preventing the weevils from emerging.

Working with the Florida Department of Agriculture and Consumer Services and various grower organizations, Peña has released more than 363,000 wasps of the species Ceratogramma etiennei since 1998, more than 160,000 Quadrastichus haitiensis since 1999 and more than 50,000 Aprostocetus vaquitarum since 1999.

John Neilson said the primary goal of the T-STAR program is to develop high quality and useful agricultural research that is relevant to industry needs. Visit http://research.ifas.ufl.edu/TSTAR/ for more information. Photo by Thomas Wright.
He said the wasps were released in Florida citrus groves, ornamental plantings and undisturbed areas. Ceratogammarus etetemi wasp parasites have attacked Diaprepes eggs in Miami-Dade County. Quadrastichus haitiensis parasites have been found in weevil eggs in Miami-Dade, Glades, Hendry and Polk counties, and Aprostocetus vaquitarum parasites have been recovered from weevil eggs in Indian River County. Peña said that two of the wasps are established in southern Florida, causing significant mortality to weevil eggs. He hopes they will become established across the state.

In fact, since their introduction, the wasps have begun to parasitize 35 percent to 100 percent of Diaprepes root weevil eggs in different crops. “Although we’re finding more and more of the wasp parasites in citrus groves and ornamental plantings—which is good—we need some additional studies to measure their effectiveness. We also need to learn how pesticide application affects the survival of the imported wasp parasites,” Peña said. “We will continue releasing the wasp parasites in Florida and document how well they control Diaprepes root weevils.”

Another example of T-STAR’s impact involves the production of papaya fruit, which is hampered by an unusual strain of the papaya ringspot virus. To combat the disease and help South Florida’s small papaya industry meet the Latino community’s growing demand for the fruit, researchers at the UF/IFAS Homestead center are using biotechnology to develop papaya trees that are resistant to the virus.

Mike Davis, a professor of plant pathology, and Johnathan Crane, a professor of horticultural sciences, have tested genetically engineered papaya trees that are resistant to tropical fruit diseases such as passion fruit juice, watermelon juice and coconut water.

Balaban, who helped develop the process, said freshly squeezed orange juice is mixed with pressured carbon dioxide, and then the juice is depressurized and separated from the gas, killing any harmful microorganisms. This process also helps preserve vitamins, increases product shelf life and inactivates an enzyme that causes orange juice to separate. UF has a patent on the new process that is licensed to Praxair Inc. in Chicago.

The T-STAR program also has been crucial to developing beef and dairy cattle that are more tolerant to high-temperature conditions in Florida and the Caribbean region, said Tim Olson, an associate professor in the UF/IFAS animal sciences department.

“T-STAR funding supported research that documented that Senepol (Ros taurus) cattle from the island of St. Croix were as heat tolerant as Brahman cattle,” Olson said. “And then we found that the heat tolerance is linked to a single gene—named the ‘slick-hair gene’ because it produces a very short and shiny hair coat—in Bos taurus cattle.”

Olson said that Holstein cattle with slick hair were first identified in a Puerto Rico dairy several years ago, and they produced over 20 percent more milk than their normal-haired hermaphrodites. “These cows apparently were the descendants of a single crossed breed—Holstein x native—I am sure,” Olson said. “T-STAR is currently supporting research in Puerto Rico that will examine the effect of the slick-hair gene in a number of dairies under varying management systems. In Florida, T-STAR is supporting the development of genetically superior Holsteins that also possess the slick-hair gene.”

Olson said calves with the slick-hair gene, sired by one of the elite bulls of the Holstein breed, are now being studied at the UF/IFAS Dairy Research Unit near Gainesville. He said 12 embryo-transfer, predominantly Holstein calves were recently born at the UF/IFAS Subtropical Agricultural Research Station in Brooksville, Fla. Some of these may include the first red and white, slick-haired Holsteins to be homozygous—having two copies of the slick-hair gene.

“The primary goal of the T-STAR program is to develop high-quality and useful agricultural research that is relevant to industry needs,” Neilson said. “Of course, the research also should protect the environment, enhance economic opportunities and provide for the social well-being of people in tropical and subtropical regions of the United States.”

The program was initiated by USDA in 1983 because Florida and other regions in the tropics and subtropics have unique ecosystems, problems and opportunities, he said. Often the people in these regions are in minority groups struggling to emerge from poverty and develop an improved quality of life. “T-STAR projects frequently focus on insect pests and plant diseases that represent a threat to U.S. agriculture, including the discovery and evaluation of biological controls for pests of U.S. agricultural commodities,” Neilson said. “The program also includes research on the collection and improvement of U.S. agricultural germplasm interests.”

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The primary goal of the T-STAR program is to develop high-quality and useful agricultural research that is relevant to industry needs.

—JOHN NEILSON

LEFT: Papaya ringspot virus symptoms. ABOVE: Mike Davis, left, and Jonathan Crane check for the presence of ringspot on papaya plants at the UF/IFAS Tropical Research and Education Center in Homestead. Photos by Thomas Wright. BELOW: Murat Balaban records data in his laboratory in the UF/IFAS food science and human nutrition department in Gainesville. UF/IFAS file photo.
Often described as the most beautiful flowers in the world, orchids have a distinct and undeniable mystique. With more than 25,000 identified species and 120,000 registered hybrids, they are the largest group of flowering plants — and the fastest growing segment of the nation’s $13 billion floriculture and nursery crops industry. In Florida, where large-scale production of orchids is booming, the University of Florida’s Institute of Food and Agricultural Sciences is providing valuable research and education for consumers, growers and students. By Chuck Woods
Orchid mania has spawned hundreds of orchid societies across the nation. In South Florida alone, more than 20 societies meet every month. The American Orchid Society, headquartered in Delray Beach, has nearly 30,000 members nationwide. And there are orchid shows throughout the year, including the world famous Miami International Orchid Show sponsored by the South Florida Orchid Society.

UF research on orchids dates back to 1957 when Tom Sheehan, now a professor emeritus in the environmental horticulture department, studied proper fertilization methods for using bark as an orchid growing medium. Sheehan also began using tissue culture to multiply clonal varieties and tested foliar application of fertilizer on orchids. He remains active in national and international organizations and orchid societies. Sheehan’s most recent book, Ultimate Orchids, is being published in seven languages. With his late wife, Marion, an assistant professor in the department, he co-authored An Illustrated Guide to Orchid Genera. Together they authored several other books and more than 350 articles for various scientific journals or orchid publications.

Over the past 10 years, the popularity of orchids has increased dramatically, thanks to new and improved cultivation and propagation techniques that allow commercial growers to produce large numbers of plants at affordable prices for the consumer. In response to the growing demand for orchids, the UF/IFAS Tropical Research and Education Center in Homestead has ramped up its ornamental research program and initiated an orchidology course. The course is offered through the UF/IFAS College of Agricultural and Life Sciences, which was one of the first colleges in the nation to offer a course in orchidology in the 1950s.

BEAUTY ALONE cannot explain our fascination with orchids. When it comes to variety, complexity and elegance, orchidaceous plants are unlike any other.

And, while orchids are.common in the tropics, they also grow wild under different climatic conditions on every continent except Antarctica. In North America, orchid species are native to every state — including Alaska where “arctic orchids” have been identified.

Not surprisingly, orchids are the national flower in many countries: Belize, Brazil, Colombia, Costa Rica, Guatemala, Indonesia and Singapore. In Venezuela, orchid species are native to every state — including the nation’s currency. In the state of Minnesota, the pink and white lady slipper (Cypripedium reginae) is the state flower.

Throughout South America during the 16th century, English explorers pioneered orchid hunting, and there are many accounts of hunters vanishing in the jungles without a trace. The competitive nature of these early expeditions prompted some explorers to collect as many orchids as possible and then burn the area to prevent others from finding the same prized specimens — a prime example of early habitat destruction.

Once just a hobby for the landed gentry with the money, time and patience to care for these exotic plants, orchid growing is now an international business, and Florida has become one of the nation’s top commercial producers. “Next to poinsettias, orchids are now the leading potted flowering plant produced in Florida, generating more than $23 million in annual farmgate sales,” said Terri Nell, professor and chair of the UF/IFAS environmental horticulture department.

“Next to poinsettias, orchids are now the leading potted flowering plant produced in Florida, generating more than $23 million in annual farmgate sales.”

—Terri Nell

Wagner Vendrame, an assistant professor of environmental horticulture at the Homestead center, is using tissue culture to clone and mass-produce orchids. To help reduce collection of specimens from the wild, he and graduate student Philip Kruth are micropropagating Florida native orchid species for preservation purposes.

“Native orchid species that are rare or endangered could be multiplied and reintroduced to their natural habitats, greatly increasing their numbers,” Vendrame said. “If we can mass-produce some of our native orchids, they could be used in landscapes.”

His orchidology course covers the basic principles of orchid biology, culture and commercial production. The course includes the history, morphology, propagation and taxonomy of orchids as well as orchid pests and diseases, and other cultural practices. Laboratory sessions and field trips to South Florida nurseries provide students with hands-on experience.

Wagner Vendrame, who has developed a close working relationship with commercial producers in South Florida, presents an orchid short course every other year in cooperation with the Boca Raton Orchid Society.

“Not long ago a luxury item, orchids can be purchased at prices comparable to other flowering pot plants,” he said. “When a few basic cultural requirements are met, growing orchids in the home environment can be a rewarding experience.”

Vendrame said species and hybrids of six orchid genera are the most popular because they’re easy to grow and produce beautiful flowers: Phalaenopsis, Dendrobium, Vanda, Cattleya, Oncidium and Epidendrum.

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Phalaenopsis, (top left) the most popular potted orchid plant, is widely grown in Florida. With a flowering period that may last up to three months—and a short cycle from seedling to flower—this genus and related hybrids are good candidates for mass production. They respond well to Florida’s warm, humid climate, producing long, arching sprays of white or pink flowers that resemble a flight of moths, hence the common name “moth orchid.” Thanks to hybridization, yellow, orange, red, spotted and two-tone varieties are available.

Dendrobium (top center) is a large and diverse genus with 1,500 species in the Pacific basin—ranging from Japan to Australia—and with many species and hybrids under cultivation in Florida. The Dendrobium phalaenopsis species and its hybrids are the most popular because they’re easy to grow and produce lots of flowers that may remain open for three or four weeks. Dendrobium has been the backbone of the orchid cut-flower business for many years.

Cattleya (top right) is widely cultivated. Called the Queen of Flowers, it was the most popular orchid for corsages until the 1960s. Thanks to intense hybridization for more than 150 years, there is a wide choice of sizes and flower colors. Florida has a several nurseries that specialize in the production of Cattleyas.

Vanda (bottom left) is a genus whose popularity has increased dramatically, especially in tropical and sub-tropical regions. Vandas are widely grown in Florida, and hybridizers have produced a large number of multigeneric crosses. They produce a dozen or more flowers ranging in size from two to four inches. Colors vary from white to variegated patterns of brown, green and pink to blue and purple. Ascocendas, hybrids between Vanda and Ascocentrum, have flowers that are about half the size of those on Vandas.

Oncidium (bottom center) is a large and diverse genus with more than 1,200 species occurring naturally from Florida to Brazil. Flower color ranges from yellow and brown or white and brown to purple, pink and red. This is a hardy orchid that will flower under adverse growing conditions. When given proper care, Oncidiums produce even more flowers.

Epipedium (bottom right) is one of the easiest and most prolific orchids to grow, producing many one-inch pastel flowers most of the year. There are about 500 species that occur naturally from the coastal plains of North Carolina to Brazil. Seed-stem types can be grown in outdoor gardens in South Florida—or in pots elsewhere.

When it comes to habitat, orchids can be terrestrial, epiphytic (those that grow on other plants) or lithophytic (those that grow on rocks). The habitat dictates the type of growing medium to be used, Vendrame said.

“Terrestrial orchids will grow in any well-drained medium that contains 40 percent or more organic matter and nutrients, and provides good support and water-holding capacity,” he said.

Epiphytic media include bark, charcoal, coconut fiber, fiber from tree ferns, peat, perlite, sphagnum moss and combinations of these materials. Research has shown that most species and hybrids will grow well and produce flowers in these growing media when fertilization and irrigation are carefully adjusted. Most orchids require partial shade for optimum growth and flowering.

Vendrame said growing containers vary from plastic to clay pots and wire or redwood hanging baskets. Epiphytic orchids can be grown on slabs of tree fern, corkbark or directly on the trunk of trees.

As a general rule, Cattleyas, Dendrobium, Epipedium and Oncidium orchids should be repotted every two or three years as the growing medium decomposes or new plant growth extends over the container edge, he said. Phalaenopsis and Vanda orchids do not need to be repotted as often.

Vendrame’s research and education program includes work with some of the leading commercial orchid producers in South Florida.

Kerry Herndon, president of Kerry’s Bromeliad Nursery, Inc., in Homestead, is the largest orchid grower in Florida and one of the two largest orchid growers in the world.

“To produce high-quality orchids for the national market, we have relied heavily on the scientists and technicians at UF’s Tropical Research and Education Center,” Herndon said. “Their expertise and experience has been very valuable to us and the orchid industry in South Florida. Several of our employees are currently enrolled in the environmental horticulture program at the center, which is a great benefit to the grower community.”

Rob Fuchs, president of R.F. Orchids in Homestead, is known worldwide for breeding Vanda hybrids that win awards at orchid shows. Fuchs supports the UF research and education program by donating plants and providing guided field trips for students.

“Wagner Vendrame’s work on orchids is an excellent addition to the research and education center in Homestead,” Fuchs said. “We’re happy and proud to open our private garden to his students on field trips so they can learn how plants grow under different conditions.”

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Martin Motes, owner of Motes Orchids in Homestead, also is known worldwide for breeding excellent Vanda orchids. His book, Vandas: Their History, Botany and Culture, soon will be available in a paperback edition. He also publishes a monthly email newsletter on growing orchids in South Florida. To subscribe, contact Motes at vandas@mindspring.com.

While some growers import “liners” or even full-grown plants from Thailand and finish growing them here, Motes believes plants can be produced more cheaply in the United States, resulting in a better quality product for consumers and greater profits for growers.

Motes said: “We’re working with UF to combine their research and education programs with the experience of long-time orchid growers to bring the South Florida orchid industry to a new level of sophistication and profitability.”

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Welcome to the complex world of government regulations and corporate marketing decisions that affect the availability of pesticides for specialty crops.

Since all crop protection products must go through a lengthy and expensive testing process to earn the Environmental Protection Agency’s seal of approval, manufacturers need strong economic incentives to make sure that their investments in research and development will pay off in the marketplace.

For corn, cotton, soybeans and wheat — crops that are grown on millions of acres — manufacturers will develop pesticides and go through the regulatory hoops to obtain EPA product registration. However, for specialty crops — usually 300,000 acres or less — there is little or no incentive for manufacturers to invest in the research needed to obtain EPA product registration, leaving many producers without effective pest management options.

“The bottom line is that agrochemical manufacturers make their money controlling pests on millions of acres, but they won’t spend money to develop and register a product for a crop that is grown on a few thousand acres — or for a seldom-seen pest,” said Marty Marshall, a professor with UF’s Institute of Food and Agricultural Sciences. “There is no incentive for companies to help the little guy who’s growing 300 acres of watercress.”

While the acreage for many of these specialty crops may be small, they are high-value crops. In Florida, the value of specialty crops exceeds $4.7 billion annually, and that’s why the Interregional Research Project No. 4 is so important, he said.

Since 1963, the IR-4 project has provided safe and effective pest management solutions for specialty crop growers, saving more than $1 billion a year in crop losses in the southern region that includes 13 states and Puerto Rico, Marshall said.

Marshall, who is director of the southern region, said IR-4 is a partnership of producers, manufacturers, federal agencies and land-grant universities that develop field and laboratory data needed by EPA to approve the use of various pest management tools on specialty crops. One of several different, multistate projects in the nation, IR-4 also provides the economic incentives manufacturers need to support a pesticide registration by EPA.

The IR-4 project, which is funded by the USDA Cooperative State Research Education and Extension Service and the USDA Agricultural Research Service, helps growers remain economically viable in global markets, and provide a safe and secure food supply.

In 1976, the IR-4 program was expanded to include registration of pest control products for nursery, floral, forestry, turf crops, forestry seedlings and Christmas trees. In 1982, the program added biological control agents or biopesticides.

Florida is a leader in the production of specialty crops. In fact, 98 percent of all crops produced in the state fall into this category, including most fruits, vegetables, herbs, nuts, nursery and flower crops. To make sure producers of these high-value crops have the pest management products they need, the University of Florida’s Institute of Food and Agricultural Sciences is providing leadership for the Interregional Research Project No. 4. Funded by the U.S. Department of Agriculture, the IR-4 Project includes four regions in the nation. The southern region contains land-grant universities in 13 states and Puerto Rico.

Special Help for Specialty Crops

Specialty crops dominate Florida agriculture, which relies on a wide range of pest management programs, and these crops generate more than $4.7 billion in annual farmgate sales. (Visit, from left: blueberries, strawberries, caladiums, Swiss chard. Opposite: mangos, beans, papaya, nectarines.)

To learn more about the IR-4 project, visit http://ir4.rutgers.edu
Mike Aerts, assistant director of the Environmental and Pest Management Division of the Florida Fruit and Vegetable Association in Orlando, said that — over the years — IR-4 has been responsible for securing EPA registrations for virtually every food commodity produced in the state. “It’s hard to envision a sustainable pest management system in Florida agriculture without having IR-4 as a partner in the crop protection registration process,” Aerts said. “The reality in Florida is that we would have significantly fewer crop protection options available to us without IR-4.” He said manufacturers understandably hesitate obtaining registrations for products to be used on minor commodities. “This hesitation stems from the direct relationship between limited production acreages and limited potential economic returns, and the fact that prominent liabilities may be tacked onto inputs used in the production of high value specialty crops.” Aerts said the IR-4 project has filled important voids in crop protection management. For example, the IR-4 project cleared the way for lettuce and endive growers to use an effective herbicide, thereby saving growers in the state more than $2 million a year in labor costs to remove weeds. “During the past year, fruiting vegetables, Cole crops, herbs, leafy Brassica crops, cucurbits, succulent beans, potatoes, citrus, watercress, blueberries and strawberries all received access to new crop production tools purely because of IR-4. Without IR-4, crops such as okra, Swiss chard and other similar commodities would for all intents and purposes never receive a priority for registration,” Aerts said. “Others such as tropical fruit producers would essentially never have a chance to access newer chemistries, purely because their total acreages are limited,” he said. “Thanks to IR-4, various tropical fruits gained access this past year to Switch® fungicide, Admire® insecticide and Knack® and Courier® insect growth regulators.”

The 1996 Food Quality Protection Act requires greater emphasis on using reduced-risk and safer chemicals, along with integrated pest management (IPM) and biologically based products. As a result, more than 80 percent of products that IR-4 scientists now work on are reduced-risk chemicals. The approval of safer products reduces toxic exposure to birds, fish, wildlife, beneficial organisms, human health and lowers the potential for groundwater contamination, Marshall said.

In order for the program to respond to the pest control needs of specialty crop growers, project requests are solicited from growers, commodity groups, university researchers and extension personnel, USDA researchers and other interested parties. The needs and goals of the program are summarized once a year. In 2003, the IR-4 project identified 96 projects and scheduled 740 field trials for new or expanded product registrations.

Since its inception in the 1963, the IR-4 Project has obtained more than 7,200 EPA registrations for specialty food crops and more than 10,000 ornamental clearances, Marshall said.

With the looming 2006 phase-out of methyl bromide, an effective soil fumigant that controls nematodes and other soil-borne pests, the IR-4 Project is focusing on alternatives for this product. The fumigant, which is used on many specialty crops, is being phased out because it contributes to the depletion of the Earth’s protective ozone layer.

Jim Gilreath, an associate professor of horticultural sciences at the UF/IFAS Gulf Coast Research and Education Center in Bradenton, and Joe Noling, a professor of nematology at the UF/IFAS Citrus Research and Education Center in Lake Alfred, are leading the effort to find cost-effective replacements for methyl bromide in Florida.
When vast areas of the Amazon and other tropical forests are being cleared for farming and economic development, University of Florida researchers are helping break the worrisome cycle of destruction with a new interdisciplinary research and education program.

The UF effort is directed toward several tropical areas, including Brazil where satellite images show that over 10,000 square miles of Amazon rainforest were cut down in 2003, about twice the annual rate of the 1990s.

“The traditional starting point for conserving tropical forests has been the creation of parks that protect them from people and development,” said Daniel Zarin, an associate professor of tropical forestry with UF’s Institute of Food and Agricultural Sciences (UF/IFAS). “Parks are a critical cornerstone for conservation, but parks alone will not suffice.

“In developing countries, the pressure to use tropical forests for economic purposes is enormous, and that’s why the need for our new interdisciplinary research and training program is so great,” he said. “There’s a growing need for trained professionals in tropical conservation and sustainable development who can solve real-world problems.”

Zarin, who directs the Integrated Graduate Education and Research Traineeship (IGERT) program, said it includes students and faculty in UF’s College of Agricultural and Life Sciences and College of Liberal Arts and Sciences.

He said tropical forests in Brazil, Belize, Bolivia, Guatemala and Mexico are the main focus of the five-year program, which is supported by a $2.8 million grant from the National Science Foundation (NSF). The grant is administered by the UF/IFAS School of Forest Resources and Conservation.

In July 2003, the UF IGERT program also received a $64,000 supplemental NSF grant to teach a course in Brazil on forest policy in the Amazon. The course, conducted in Portuguese, is being offered jointly with three Brazilian universities.

Zarin said NSF awarded the grants to UF because of its strong programs in tropical ecology and tropical conservation and development. Officially known as the Working Forests in the Tropics Program, the UF research and training effort is linked to more than 20 cooperating institutions in Latin America, including universities, government agencies and nongovernmental organizations.
The term ‘working forests’ emerged as a way to distinguish production forests from those set aside as ‘wilderness.’ In Latin America, working forests are part of a larger emphasis on the simultaneous promotion of conservation and rural development, which includes consideration of ecological, economic and social sustainability,” Zarín said. “Some forests are valued for their wood while others are valued for other forest products, or for watershed protection, biodiversity conservation or removing carbon dioxide from the atmosphere.”

Zarin said the three main goals of the UF research and education program are to compare the tradeoffs between different economic and conservation options; to learn how social, economic, political and environmental issues affect economic development and conservation; and to determine how local communities, regional governments, international agencies, philanthropic foundations and the private sector can best intervene to improve forest management and conservation in the tropical forests of Latin America.

“The conventional logging common in most tropical forests is often cited for its destructive impacts such as loss of biodiversity, decline of wildlife populations, increased erosion and fire susceptibility,” said Francis Putz, a UF professor of botany and a member of the program’s executive committee. Putz said an alternative to conventional logging is reduced-impact logging, which is intended to produce greater financial returns without heavy damage to forest ecosystems. Other options include management for nontimber forest products. Brazil nuts, palm fruits and natural latex are among the more commonly harvested species in Latin America’s tropical forests, said Karen Kainer, an assistant professor of tropical forestry. Kainer, another member of the program’s executive committee, also has an appointment in UF’s Center for Latin American Studies.

The key to evaluating the sustainability of any forest use is its impact on what ecologists refer to as ecosystem services, which includes the forest’s role in protecting the watershed, conserving biodiversity and sequestering carbon dioxide. Zarín said the economic value of these services is now being recognized, and they’re being bought and sold in some pilot projects in the region.

UF graduate students are taking advantage of the opportunity to work in different tropical forest regions, including the Amazon in Brazil, lowland areas in Bolivia and the Maya Forest in Belize, Guatemala and Mexico, he said. “Like other UF doctoral programs, this one requires technical proficiency in a scientific discipline,” Zarín said. “And the cross-disciplinary components of the program will provide the broader perspective generally lacking in doctoral programs.”

Amy Duchelle said the IGERT program attracted her to UF to pursue her doctoral degree in wildlife ecology and conservation. She is spending this summer in Brazil, participating in two of the program’s field courses and working with researchers in partner organizations. “With a wonderful cohort of graduate students and faculty, an interdisciplinary curriculum that includes field courses in the Maya Forest and Brazilian Amazon, and the opportunity to work with a wide range of partner organizations in Latin America, the program has exceeded my expectations.”

Kelly Keefe, who is working on her doctoral degree in forest resources and conservation, said the program increased her understanding of the critical need for conservation in the tropics. “Before I started the program, my focus on physiology and ecology was very narrow, with much less understanding of the unique footprint that social, economic and political history leaves on an area, and how this footprint influences conservation and development.”

Miriam Wyman, whose doctoral research focuses on ecotourism in the Maya Forest, said environmental problems do not observe international boundaries. “It is important that the international community works together on environmental concerns that connect us all, and the IGERT program addresses that need,” Wyman said. “Students, faculty and organizations from different regions are working together to solve real-world issues — there is no better training I could have asked for.”

Last year, seven IGERT fellows were awarded to doctoral students who are now completing their first year in the program. An additional eight fellowships were recently awarded to students who will enter in August 2004, and a third round will be awarded next year. The program also runs a competitive small grants program to support additional UF doctoral students conducting field research in tropical working forests.

UF academic units participating in the program include anthropology, botany, environmental engineering, forest resources and conservation, geography, geology, Latin American studies, law, natural resources and the environment, sociology, soil and water science, wildlife ecology and conservation, and zoology.

Other UF faculty on the program’s executive committee include Marianne Schmink, a professor of Latin American studies; Susan Jacobson, a professor of wildlife ecology and conservation; and Richard Stepp, an assistant professor of anthropology. More than 30 other UF faculty are affiliated with the program.

Schmink said students conducting research in the program must be familiar with a variety of disciplines and have skills ranging from language proficiency to cultural sensitivity. “The graduate program will provide hands-on training and experience in communication, ethics, teamwork and cross-cultural skills that are sorely needed by scholars and practitioners working in tropical forest regions,” she said.

Jacobson said interdisciplinary programs are more difficult to evaluate than single-discipline programs. The real success of the program will depend on the ability of graduates to work effectively in tropical regions and solve difficult problems.

“We anticipate that graduates of the program will be attractive employees for government and other agencies as well as academic institutions and the private sector,” she said.

Other measures of the program’s success will include refereed scientific publications produced by students and faculty in collaboration with Latin American colleagues, along with extension publications and workshops in regions hosting the research program. The Working Forests in the Tropics Program Web site will provide a global network for communication: www.tropicalforests.ufl.edu/ftt. The program is organizing an international conference — “Working Forests in the Tropics: Policy and Market Impacts on Conservation and Management” — to be held February 13-15, 2005, at UF in Gainesville. Additional information and registration materials are available at www.conference.ifas.ufl.edu/tropics.
IMMIGRANTS from Mexico and other countries in the tropics make up the majority of Florida’s seasonal agricultural workers, a work force that is almost 200,000 strong, according to University of Florida estimates.

Many of those workers move from job to job as the seasons change, operating farm equipment and applying pesticide to crops. Yet many of them can’t read basic safety instructions or warning labels written in English, and some receive little instruction on farm safety.

But Cesar Asuaje, a regional specialized extension agent with UF’s Institute of Food and Agricultural Sciences, is on a mission to change that — one farm at a time.

Based at the UF/IFAS Palm Beach County Extension Service in West Palm Beach, Asuaje regularly travels to citrus groves, sugarcane fields, tomato farms and other agricultural enterprises throughout South Florida, teaching a one-day, on-the-job safety course to Spanish-speaking migrant workers. He currently is offering the extension education program in the following 11 counties: Broward, Collier, Hendry, Hillsborough, Manatee, Martin, Miami-Dade, Orange, Palm Beach, Pinellas and St. Lucie.

Every year, workers fill Florida’s fields, maintaining and harvesting crops that make the state a powerhouse in American agriculture. According to UF studies, more than 90 percent of those workers hail from Latin American countries, and nearly one-fifth of them have no previous work experience in United States.

“What those workers don’t know about agriculture, it seems, can truly hurt them,” Asuaje said. “In recent years, Hispanic workers have accounted for a growing number of injuries and fatalities in the agriculture and related industries such as landscaping.

“As a result, injuries and fatalities among Hispanic workers are increasing, and the language barrier is one reason for that,” Asuaje said. “In a lot of cases, people are hurt because they can’t read signs or safety instructions, and some don’t want to let on that they don’t understand.”

According to statistics from the U.S. Occupational Safety and Health Administration (OSHA), reports of fatal injuries among Hispanic workers on the farm rose 18 percent during the period from 1999-2002, while nonfatal injuries rose by 33 percent. In the landscaping industry — a sector of Florida agriculture that employs large numbers of immigrant workers — nonfatal injuries increased by 63 percent over the same three-year period.

“It’s a trend you see everywhere, but particularly in Florida,” said Luis Santiago, Ft. Lauderdale area director for OSHA. “They’re doing work that others won’t do — and usually that means dangerous work.”

When you can’t read instructions on heavy equipment, just about any work can become dangerous. Santiago cited a recent spate of deaths among migrant workers using heavy-duty industrial lawn mowers in landscaping operations in South Florida residential areas. Many industrial mowers are top-heavy, and they are marked with clear warnings against using them on steep inclines. But workers unfamiliar with the warnings often use them on steep slopes near canals — and sometimes tumble in.

“We’ve had people drown in as little as a foot of water,” Santiago said. “The mower tips over, they fall into the canal, and they’re pinned under the mower.”

He said another problem is occurring in more rural settings, where increasing use of all-terrain vehicles in agriculture has more migrant workers driving the off-road vehicles on country roads.

Workers are also subject to all the traditional hazards of farm life, including the health effects of spraying pesticides on crops.
Federal regulations require worker safety training for every beginning farm worker — training that usually consists of watching a Spanish-language videotape on worker safety. Because of the fast-paced working environment on most farms, there’s no guarantee that every migrant worker will receive effective training, Asuaje said.

“Most workers are honest, but there are some employers who don’t show the video because they want to avoid claims against them if something goes wrong,” Santiago said. “A lot of these workers have never seen a respirator, for instance, before working here. If they’re spraying pesticide without the proper equipment, they might not even know that this is not allowed.”

In the late 1990s, Asuaje decided to fill the gap by traveling to South Florida farms and providing the training himself.

“It’s good to have the video training materials when there are so few people available to teach this class,” he said. “But it’s better to have someone teaching in person if you can. People are going to remember more if they’re taught in person.”

Asuaje has taught basic worker safety classes to about 3,500 workers since classes began in December 2000. He believes the classes have made a difference in the way his students approach safety in the field. His success is difficult to quantify — the program is new and statistics on migrant workers can be difficult to collect — but the classes are growing in popularity with agricultural producers who want to avoid accidents among migrant workers on the farm.

“We have more people participating every year since the extension education program started, and that’s good indication of the demand for this training,” Asuaje said.

The popularity of the worker safety program has led Asuaje to begin offering other Spanish-language classes.

His office is one of the few places where Florida residents can take Spanish-language classes toward a license to apply pesticides — something that can give a fledgling landscaping company a leg up on competitors who are not licensed to apply pest-control products to lawns and shrubs. Asuaje said the class is popular among immigrants who started as landscape workers and went on to found their own landscaping companies.

The test for the license is in English, and applicants need some basic reading skills in English to be successful in the examination, but instruction in Spanish can make a difference in how well the students grasp the basic concepts of the class.

“We start with Spanish and include more and more English as the class goes along,” Asuaje said. “It’s good because, if someone has a problem understanding something, we can work it out in Spanish, which is easier.”

He said workers with acceptable reading skills seem to benefit the most, while those who have lower reading skills will begin the learning process for pesticide license certification. Asuaje has also begun offering occasional workshops for small farmers who are Hispanic. Some of the students in those classes are immigrant farm workers who have become tenant farmers.

Others are well-to-do newcomers from Latin America who want to set up small farms, either as residential farms or as new businesses. And many are longtime South Florida residents, familiar with local agricultural practices in their communities, but not current on government regulations.

“One of the problems with small farmers, especially the Hispanic folks, is that they get a lot of their information from each other,” Asuaje said. “Too many plant the same crop at the same time, and then they all harvest at the same time, which drives the price down. I try to teach people that before you plant 10 acres of something, you need to know how to sell it.”

About 500 people have gone through the pesticide certification classes and small farm workshops since they began. And Asuaje says he’s only scratched the surface of the demand for Spanish-language instruction among small farmers and agricultural workers.

“I’m always teaching a class somewhere, to somebody, and I get a lot of requests for more,” he said. “There’s enough work here for more than one person.”

Growing tomatoes in Florida’s hot, humid climate isn’t always easy. Too hot and the fruit won’t set. Too much rainfall and the fruit will rot. And fruit growers are continually trying to control pests that can develop diseases and lose their leaves.

These problems have been largely solved with the introduction of Solar Fire, a heat-tolerant variety developed by researchers at the University of Florida’s Institute of Food and Agricultural Sciences.

“Solar Fire is our best bet yet for a tomato that can set fruit at warm temperatures,” said Scott, a professor of horticultural sciences at the UF/IFAS Gulf Coast Research and Education Center in Bradenton. “Most tomatoes that can set fruit at higher temperatures have small fruit, but this one is different. And you can plant this variety earlier in the fall growing season than other varieties.”

Solar Fire has medium- to large-sized fruit, just above 6 ounces, with an attractive red color and gloss. Each vine bears a lot of fruit, so crop yields are good. It is a firm tomato, an important factor when shipping production, he said.

“It’s best when eaten fresh in salads or sandwiches, rather than cooked or canned,” Scott said. “I like it with onions, feta cheese and Caesar dressing.”

Solar Fire is resistant to races 1, 2 and 3 of Fusarium wilt as well as Verticillium wilt race 1 and to gray leaf spot. It has moderate resistance to fruit soft rot, a bacteria that attacks damp tomatoes after the fruit has been harvested.

“Until now, if you wanted to plant tomatoes in Florida from July through August, you’ve been pretty much out of luck,” said Tony DiMare, vice president of DMare Ruskin Inc., one of the state’s largest tomato producers. “There are a few varieties such as Florida 91 that can be planted in early fall, but summer heat has always meant the fruit won’t set. We’re glad to see the introduction of a new heat-tolerant variety.”

Growers are invited to see the new varieties, usually on someone’s farm, DiMare said. “A small amount of seed is offered to growers so they can plant single rows of the tomato, called strip trials. If growers like the way the tomato performs, they’ll plant a couple of acres to see how the plant fares under commercial production techniques.”

He said commercial production has become a science, and new varieties come under close scrutiny.

“We check the moisture in the soil and monitor the nutrition we add to the plant,” DiMare said. “We analyze the sap from the petiole of one of the tomatoes in the field for nitrogen and potassium levels to see if we need to add fertilizer. When the fruit is ripe, we check density, color, interior color and texture. We also look for flavor — consumers don’t want tomatoes that taste like cardboard.”

Once the varieties are accepted for further production, they are named — often for the characteristic they were bred — such as Solar Fire’s tolerance for heat, DiMare said.

Like other new tomato varieties developed by UF/IFAS researchers, Solar Fire began life as a number. Florida 7943B.

Reggie Brown, director of the Florida Tomato Committee, an industry group based in Orlando, said tomatoes are the most valuable vegetable crop grown in Florida.

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Jay Scott helped develop the new Solar Fire tomato variety, which sets fruit all summer, higher temperatures. Seed for the new variety will be available this season.

A winter cash crop in Florida since the 1870s, tomatoes now bring more than $400 million into the state annually.

“We think this tomato will extend the tomato season in Florida, and will prove to be a significant addition to the fresh tomato business in the state,” Brown said.

Solar Fire has been licensed for production with Harris Moran Seed Company in Modesto, Ca. Bruno Libbrecht, product manager for tomatoes for Harris Moran, said his firm has fields of Solar Fire under cultivation, and seed will be available in late May to early June 2004.

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