

# UF/IFAS **GUIT COAST** Research & Education Center

### The UF/IFAS Gulf Coast Research

**and Education Center** (GCREC) is one of 12 comprehensive teaching, research and Extension facilities operated by the University of Florida Institute of Food and Agricultural Sciences throughout the state. Situated in areas known for strong agricultural production, these UF/IFAS facilities serve local growers by focusing on production issues affecting the area's most important commodities.

Currently, GCREC has operations at two sites. The 475-acre main facility in Balm, located in southern Hillsborough County, hosts most of the center's research activities, as well as housing GCREC laboratories and faculty offices. The other site is home to the GCREC teaching program, UF/IFAS CALS at Plant City, based at Hillsborough Community College's Plant City campus in eastern Hillsborough County.

The Tampa Bay area has long been a population center in Florida, as well as a multifaceted agricultural community. For these reasons, UF/IFAS operates other research facilities in West Central Florida besides GCREC. They include the Tropical Aquaculture Laboratory in Ruskin (Hillsborough County), which supports the state's ornamental fish industry; the Range Cattle Research and Education Center in Ona (Hardee County), which focuses on beef production; and the Citrus Research and Education Center in Lake Alfred (Polk County), which specializes in citrus fruit. In addition, there are UF/IFAS Extension county offices conducting outreach activities in all 67 Florida counties.

For more information about the overall UF/IFAS enterprise, see the UF/IFAS Briefing Book at https://tinyurl.com/IFASBriefingBook2019.

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For a map to GCREC, visit https://bit.ly/2GAdEGg.

Private donations help support ongoing teaching, research and Extension activities at GCREC, and giving opportunities are open to the public, regardless of whether they have prior affiliation with UF. For information about supporting GCREC, please visit https://bit.ly/2Y9R2Hn.







#### Credits

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# **Vice President**



In my early travels as the new leader of UF/IFAS, I've seen few facilities that please me more than those at the UF/IFAS Gulf Coast Research and Education Center (GCREC). It is a great place to work and to serve the growers who benefit from the discovery and innovation it produces.

Among the modern facilities are:

• A fourbay workshop

where scientists have access to tools and workspace for developing machinery such as a tractor-mounted sprayer that uses artificial intelligence to distinguish between weed and crop and targets only weeds with herbicide.

- A 5,000-square-foot addition with offices, a conference room and equipment rooms to help us do more work focused on making area growers' operations more efficient, sustainable and profitable.
- A lab for processing strawberry samples.
- The recent addition of residential space for eight more graduate students.

More important than the buildings are the people at GCREC. When GCREC opened at its Balm location about 15 years ago, it employed about 75 people. Today, with our expanded facilities, we employ about twice that many to address producers' challenges.

The faculty are creating new strawberry cultivars, continuing a long tradition of supplying the area's growers with varieties that grow best in Hillsborough County and surrounding areas. Now, though, they're supplementing traditional breeding techniques with the use of genomics to accelerate the search for a profitable berry.

The same thing is happening with tomatoes, as our breeder now works with a fellow scientist with expertise in genomics and bioinformatics to speed development of a fresh-market tomato that can be mechanically harvested. Yet others are searching for the next alternative crop, investigating blackberries, ornamentals, pomegranates and even hops. Gulf Coast is also one of the sites for our hemp research initiative, which has drawn huge interest from growers, investors, government officials and businesspeople statewide.

It's not just the people employed at GCREC who make it work. Our industry partners have been key to the center's success. In my first visit to the center, I was able to meet industry leaders who have supported the center financially, helped guide its priorities to ensure its relevancy and developed strong relationships with faculty, staff and administration. They include leaders from the strawberry industry, the tomato industry, the Florida Farm Bureau Federation, FNGLA and the crop protection industry. It was a who's who of Florida agriculture leaders who support and engage with the center.

GCREC experts are dedicated to all three functions of the land-grant mission – teaching, research and Extension. GCREC oversees a teaching program, the UF/IFAS College of Agricultural and Life Sciences at Plant City. Here, we offer three degree programs, in Agricultural Education and Communication, Geomatics, and a new addition launched in 2018, Food and Resource Economics (FRE). One sign that the FRE program is off to a good start is that its lead faculty member has been honored in 2020 with a CALS Innovation in Teaching Award.

My job is to support the men and women who support Florida agriculture. Like these faculty and staff members, I wake and work to serve growers.

The center director, Jack Rechcigl, has done such a good job at this that we have him leading a second research and education center in Ft. Lauderdale. He is finding synergy and to make both centers more efficient and impactful.

I hope to meet more of the community in the region served by GCREC at the annual Florida Ag Expo, even if this year's is virtual. It's a great way to share what we've learned – scientist and producer alike – as this center continues to advance agriculture in Florida.

Sincerely,

Scott Angle

J. Scott Angle UF Vice President Agriculture and Natural Resources

# **Center Director**

#### The UF/IFAS Gulf Coast Research and Education Center

(GCREC) has evolved from a small tomato research laboratory with one scientist to a comprehensive enterprise with 20 scientists and more than 200 employees, offering responsive research solutions to assist growers in the Tampa Bay area and throughout Florida.

Since 2005, GCREC has been based at its present 475-acre location in Balm, in southern Hillsborough County. But our history extends back more than 90 years and includes two notable facilities in the Bradenton and Dover areas. Both were established in 1925, to meet specific needs – Bradenton focused on production of vegetables, ornamentals and cut flowers; Dover focused on strawberry production. In recent years, new concerns have arisen, including environmental protection, urban/rural interface and land-use changes spurred by population growth. Our move to Balm in 2005 created new opportunities, helping us enhance our research efforts and launch a teaching program based at the Hillsborough Community College's Plant City campus.

GCREC's mission and vision have remained consistent throughout its history, and support UF's land-grant mission to serve the state of Florida. Specifically, GCREC develops and disseminates new scientific knowledge and technology to help Florida agricultural producers remain competitive, both domestically and globally. Key elements of our research mission include development of improved crop varieties, low-input crop production and pest management systems, conservation methods that improve the sustainability of agriculture and urban landscaping, and strategies to address economic challenges and increase the profitability of Florida agriculture. Our faculty members also excel in the areas of teaching and Extension outreach.

We are fortunate to have the support and guidance of our Gulf Coast Council, comprising more than two dozen individuals, among them state officials, growers, leaders from the private sector and representatives of commodity groups. The Council helps GCREC personnel identify research and Extension needs in the local area and beyond. This input helps GCREC set and revise its priorities so that we may continue providing innovations and solutions for our agricultural community.

### **Core Programs of the Future**

 Genetic improvement of tomato, strawberry, landscape and ornamental crops for increased nematode and disease resistance and better horticultural characteristics;

- Development of alternative crops for Florida production, including artichoke, blackberry, hops, industrial hemp and pomegranate;
- Integrated Pest Management (IPM) systems for crop diseases, insects, nematodes and weeds, including greater use of disease forecasting



and decision-support systems;

- Best Management Practices (BMPs) for sustainable crop and ornamental production systems, and sustainable management methods for urban landscapes;
- Environmental impact assessments of known and emerging water contaminants;
- Economic analyses to help growers optimize profitability of vegetables, fruits, landscape and ornamental plants, and analyses of labor and trade issues affecting Florida agriculture;
- Remote-sensing technologies for agricultural production and environmental monitoring.

The UF/IFAS Gulf Coast Research and Education Center has proudly served Florida agriculture for 90+ years, and we look forward to many more significant achievements in the decades to come.

Thank you,

Jack Rechcigl Center Director and Professor UF/IFAS Gulf Coast Research and Education Center

# **Chair of the Gulf Coast Council**



#### The UF/IFAS Gulf Coast Research and Education Center Advisory Council –

often called the "Gulf Coast Council" locally - is a coalition of 25 to 30 individuals that exists to help GCREC assist growers as effectively and efficiently as possible.

The council accomplishes this task by identifying major issues related to agricultural industries in the

greater Tampa Bay area, and elsewhere in the state. Also, council members provide input on policies and procedures related to GCREC's operations, and make practical suggestions for improvement. We provide industry perspective to GCREC personnel regarding their programs, including research priorities. Most importantly, we support GCREC's objectives and activities, and our job is made easier by the outstanding team working there.

"Catching lightning in a bottle" is a phrase used to describe extraordinary accomplishments. It aptly describes UF/IFAS' achievements in recruiting the leaders, researchers, Extension personnel and support staff who serve at GCREC, as well as earning the trust of stakeholders who have come to rely on them. Together, we have several common goals, but one stands out from the rest: to be responsive to the needs of growers by identifying challenges and solving problems. GCREC does this exceptionally well. Its scientists use the latest knowledge and innovative research methods to make useful discoveries that can be applied in the field. They set short-term and long-term goals to help keep area growers in business today, tomorrow and for years to come.

In addition, GCREC faculty and staff make positive impacts throughout our great state. They help Floridians enjoy fresh, nutritious food at the lowest possible prices, beautify our landscapes, and keep our state's agricultural and natural resources-based industries strong. When GCREC experts breed tastier strawberries, find better ways to manage invasive pests, and help growers increase their revenues by producing bigger yields with the same inputs, they are truly serving the public.

The collection of talented experts at GCREC would be the envy of any similar facility, anywhere. GCREC stakeholders are blessed to have access to this world-class teaching, research and Extension enterprise and do not take it for granted. In closing, the council would like to express its tremendous appreciation to UF/IFAS for creating and continually improving GCREC, enabling its personnel to carry out the land-grant mission in such a spectacular way.

Sincerely,

Semeth Parker

Kenneth Parker Chair, Gulf Coast Council Executive Director, Florida Strawberry Growers Association<sup>SM</sup>



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# **About GCREC**

Located in southern Hillsborough County between the communities of Balm and Wimauma, the Gulf Coast Research and Education Center is one of 12 comprehensive academic facilities operated across the state by the University of Florida Institute of Food and Agricultural Sciences to conduct teaching, research and Extension activities and serve the needs of local agricultural and natural resourcesbased industries.

The history of GCREC reaches back to 1925, when UF established a small laboratory in Bradenton to help tomato growers cope with a fungal disease outbreak and give them access to improved varieties. Ever since, the GCREC enterprise has remained focused on assisting local growers, though time has brought many changes to the area. As the following pages demonstrate, the GCREC faculty and staff remain dedicated to the never-ending task of keeping Florida's Gulf Coast agricultural and natural resources-based industries competitive, regardless of changing circumstances.

The current GCREC headquarters is located on a 475-acre research farm with 35 buildings, including greenhouses, growth rooms and graduate student housing facilities, totaling almost 300,000 square feet of space. There are over 200 employees at GCREC, including scientists, UF/IFAS Extension personnel, administrators, support staff, post-doctoral associates and graduate students. GCREC researchers work closely with Florida growers to address on-farm challenges, and also engage in state-of-the-art molecular research involving genomic selection, genome sequencing, molecular marker development and CRISPR technology to solve problems facing the state's agricultural industries. In partnership with the Hillsborough Community College (HCC) Plant City campus and the UF/IFAS College of Agricultural and Life Sciences, GCREC also operates UF/IFAS CALS at Plant City, which offers undergraduate and graduate degree programs via distance education. Several GCREC faculty members in this teaching program work from the HCC Plant City campus, about 25 miles northeast of Balm.

GCREC faculty are active throughout the state, conducting research on vegetables, small fruits, ornamentals and alternative crops.

Florida's Gulf Coast is well-known for its tomatoes and strawberries, and the ornamental and landscape plant industries that followed. The Sunshine State has long been the No. 1 U.S. state for value of fresh-market tomato production, and Florida currently ranks No. 1 in value of production of fresh-market cucumber as well. Florida is also the No. 2 state for strawberry, greenhouse crops, squash and bell pepper, all of which are grown locally in abundance.

Though GCREC personnel devote a great deal of effort to these established commodities, they are also keenly aware that successful industries have sprung forth from small-scale experiments with new crops. For example, in the 1940s, forward-thinking producers in Lake Placid in central Highlands County began growing ornamental caladium plants; their community now produces 98 percent of all caladium bulbs sold worldwide. Other additions to the Gulf Coast's agricultural portfolio in recent decades include blueberry, gerbera daisy, lisianthus and melons. All of these industries received strong support from GCREC and other UF/IFAS units – in most cases, entire programs were developed to serve these industries as they reached prominence, and the programs have continued and evolved as circumstances required.

As growers will attest, production tactics and management challenges for tomato and strawberry have changed dramatically since these crops were introduced to the Gulf





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Coast during the late 19th century. One of the biggest innovations for both industries was the advent of plastic culture production systems, which employ raised crop beds covered with polyethylene sheeting to reduce moisture loss and discourage weeds, insects and plant pathogens. Plastic culture is now employed by most Florida tomato, strawberry, bell pepper and vine crop producers, and over the years GCREC faculty members have contributed numerous innovations to improve its profitability and sustainability.

Sustainability has become a more prominent feature of GCREC's research efforts – perhaps the most notable accomplishment in this realm was creation of the Strawberry Advisory System, a web-based decision-support tool that informs growers when conditions are suitable for development of fungal diseases in their fields, indicating that fungicide application may be appropriate. One estimate indicated that the system helps participating Florida strawberry producers reduce their fungicide use by an average of 50 percent.

The work of GCREC plant-breeding teams also helps growers earn more money. The Tasti-Lee® tomato, released in 2006, is probably GCREC's most famous cultivar, thanks in part to a well-funded marketing program carried out by licensees. The Sweet Sensation® and Florida Brilliance strawberry cultivars, released in 2013 and 2018, respectively, are household names within the grower community. Altogether, UF/IFAS varieties account for about 90 percent of all commercial strawberry plants grown in Florida.

Other economic issues of particular concern at GCREC today include competition from foreign growers, farm labor costs and development of tomato varieties suitable for mechanical harvesting.

To better connect with growers, industry figures and the public, GCREC created the Florida Ag Expo, which debuted in

2006 and has been held every year since, drawing thousands of visitors. And there's no end to GCREC's enthusiasm for finding and promoting new opportunities for growers. For example, in 2017, the center began hosting a hops field day, to introduce area growers to this promising specialty crop.

Everyone at GCREC is proud to be part of the land-grant tradition of service to agricultural producers, and want to be the best in the world at what they do. They welcome questions, comments and involvement from growers, industry personnel and the public, because this feedback is essential to planning GCREC's next steps.





Tomato and strawberry have been significant commercial crops along Florida's Gulf Coast since the late 19th century, thanks to the area's abundant sunshine and rain, sandy soils and mild winter temperatures. These conditions enabled growers to harvest and sell their produce earlier than competitors in other states, thus obtaining higher prices. However, because Florida's climate is so favorable to plant pathogens, pests and weeds, these pioneering tomato and strawberry growers often struggled to turn a profit.

A crisis erupted in Florida tomato production circa 1920, when an unfamiliar complex of fungal diseases appeared and then returned in subsequent years. In 1925, the University of Florida opened its first Gulf Coast research facility. The Tomato Disease Laboratory was established in Bradenton to address this situation. The lab's efforts quickly led to practical management methods for the diseases involved, which facilitated greater winter tomato production. The lab also evaluated numerous tomato varieties and recommended that local growers adopt the 'Marglobe', co-developed by UF and released by USDA in 1925, boasting resistance to *Fusarium* and *Verticillium* wilts.

Later in 1925, Florida's State Plant Board created a laboratory in Plant City to research strawberry diseases. Hillsborough

County then donated Springhead as the site strawberry lab. It was a unit of UF's Florida Experiment Station 1927. One of its notable the determination in 1931 was the greatest disease threat and that it could be managed with added a breeding program in 1948 first strawberry variety, 'Florida 1952. It quickly became the state's cultivar and held that status until

Meanwhile, the Bradenton lab evaluations on major and minor in the late 1930s and launched a program in 1943 with the goal of eight acres near for a larger designated as Agricultural and opened in achievements was that anthracnose to Florida strawberry fungicides. The lab and developed UF's Ninety', released in leading strawberry the late 1960s.

conducted extensive nutrients of tomato tomato breeding putting diseaseresistant varieties into growers' hands faster. During the years prior to World War II, Bradenton researchers also conducted field trials on numerous vegetables and vine crops, including bell pepper, muskmelon, onion and pole bean. The Bradenton facility added a research program devoted to ornamental plants and floriculture in 1945.

In the 1950s, vegetable growers began experimenting with plastic culture systems, which use raised crop beds covered with polyethylene sheeting. Recognizing the potential this technology held for strawberry farming, UF researchers developed a plastic culture system for this crop, which was recommended to growers beginning in 1958. Similar efforts soon followed for tomato, bell pepper and melons, all of which are now commonly grown with plastic culture. In years to come, GCREC researchers would devise numerous methods for enhancing the profitability and sustainability of plastic culture systems, such as water-saving microirrigation practices for strawberry.

In 1960, Hillsborough County and the Florida Legislature moved the Springhead operation to a new facility near Dover with the goal of expanding the lab's research portfolio well beyond strawberries. Known as the UF Strawberry and Vegetable Field Laboratory, it opened in December 1963 and was overseen by the Bradenton lab's personnel. This arrangement marked the first time both facilities operated under a single leadership team.

In 1988, the Dover facility opened a laboratory dedicated to strawberry tissue culture. Plants generated in this manner are genetically identical to the parent, a factor that can be highly useful in evaluating prospective new cultivars.

2005 brought the most significant single event in GCREC's history, formal opening of the current 475acre facility, located in Balm, Florida. The acreage was donated by Hillsborough County and funds from the sale of the Bradenton property allowed the new facility to be constructed, bringing the Bradenton and Dover centers together in one centralized location.

# **Greatest Accomplishments**

2005-Present







In April 2005, UF/IFAS formally opened the 475acre Gulf Coast Research and Education Center facility in Balm. With this expanded, improved facility came new achievements and opportunities as well as a renewed sense of purpose. The support of central Florida growers was essential throughout the long process of turning a very ambitious plan into a state-of-the-art academic facility, and the entire GCREC enterprise owes a debt of thanks to these men and women for their assistance, then and now.

#### 2006

First Florida Ag Expo held at GCREC in November to showcase GCREC research in fruit, vegetables and ornamentals, and to offer local and statewide growers and industry figures a chance to network, exchange ideas and learn about new technical developments.

### 2007

'Cranberry Star' caladium cultivar is released as a result of collaboration between GCREC's caladium breeding program and plant pathology program. The name was a GCREC entomologist's suggestion; the cultivar features bright burgundy-colored spots on white leaves.

### 2008

The 'Florida Radiance' strawberry cultivar is released. The cultivar's high yields made it a leader in the Florida industry for a decade and very successful worldwide. In fact, 'Florida Radiance' is the most successful variety in the history of the breeding program, reaching 2 billion plants sold in 2019.

Tomato cultivar 'Tribeca', previously known as 'Gulf Stream', is released. It features heat-tolerant fruit setting and resistance to tomato spotted wilt virus.

Caladium cultivar 'White Butterfly' is released for Florida caladium growers and the nursery and landscape industry.

### 2009

Plant defense elicitors are promoted as alternatives to copper-based pesticides for the management of bacterial diseases in tomato.

#### 2010

GCREC's Tasti-Lee® tomato reaches supermarkets and other retail outlets. As of 2019, Tasti-Lee® is the largest-selling round tomato brand in the U.S. This vine-ripened variety features high levels of lycopene along with a deep red color, adding to its consumer appeal.

GCREC-bred caladium varieties Royal Flush<sup>™</sup>, Strawberry Star<sup>™</sup>, Summer Pink<sup>™</sup> and Tapestry<sup>™</sup> released. In 2013, Royal Flush<sup>™</sup> and Tapestry<sup>™</sup> garner "Best of the Best" awards at the Ohio State University Annual Cultivar Trial.

Release of the first gerbera daisy varieties with significant resistance to powdery mildew.

Insecticide resistance management program for silverleaf whitefly expanded.

#### 2011

Winterstar<sup>™</sup> strawberry released. It is outstanding for its high early yields and sweet flavor, becoming a favorite of growers in the Middle East.

#### 2012

An Internet-based decision-support tool known as the Strawberry Advisory System debuts. It enables growers to receive notifications when weather conditions may lead to disease development, indicating that fungicide applications may be needed. Growers who adopted the system cut their fungicide use by an average of 50 percent, potentially saving about a quarter-million dollars annually for a 26-acre farm.

#### 2013

GCREC-bred strawberry 'Sweet Sensation® Florida 127' released. Taste panels rate it as the most flavorful strawberry in the history of the breeding program. It has steadily grown in popularity, reaching 30 percent of the Florida industry by 2019.

### 2014

In collaboration with the nonprofit 2Blades Foundation, GCREC researchers demonstrated the utility of the pepper *Bs2* transgene to confer bacterial spot resistance in tomato.

The comprehensive photographic field guide, *Trees: North & Central Florida*, published by UF/IFAS Communications. UF/IFAS releases two caladium varieties developed at GCREC, 'Sizzle' and 'Passionista'.

### 2015

As part of the 10<sup>th</sup> Florida Ag Expo and the Center's 90<sup>th</sup> anniversary celebration, GCREC holds the ribbon-cutting for a new addition.

Researchers with GCREC and the UF/IFAS Citrus REC in Lake Alfred develop novel strategies to mitigate weaknesses in post-methyl bromide fumigation systems for management of soilborne pests and pathogens impacting strawberry and vegetable production in South Florida.

Researchers in the Urban Soil and Water Quality Lab investigate strategies for nitrogen reduction from onsite wastewater treatment systems. Research results and recommendations were incorporated statewide into several of the Florida Department of Environmental Protection's Basin Management Action Plans for reducing nitrogen levels in the state's first-magnitude springs.

### 2016

Four more caladium varieties bred at GCREC released – 'Cosmic Delight', 'Hearts Desire', 'Fiesta' and 'Icicle'.

Alternative crops for Florida growers begin to be evaluated including artichoke, blackberry, hops and pomegranate.

Release of the first sterile lantana cultivars, Bloomify Red<sup>™</sup> and Bloomify Rose<sup>™</sup>, enabling homeowners and landscapers to use this colorful plant with no concerns about it spreading.

Researchers with GCREC and CREC develop artificial intelligence for weed detection and identification in strawberry and vegetable crops.

Strawberry cultivar 'Florida Beauty' is released. It is a compact cultivar with excellent fruit quality, and is the first day-neutral variety released by the UF/IFAS strawberry breeding program.

Established the Veteran Agriculture Selection Program in collaboration with the Hillsborough County Economic Development department, to assist local military veterans in developing marketable skills for civilian employment. In collaboration with the state-operated Veterans Florida organization, the program has expanded into Veteran Florida Agriculture Program, offering veterans opportunities at several UF/IFAS facilities.

In collaboration with Cornell University, GCREC strawberry pathology program starts novel work on the use of





ultraviolet light as an alternative method of controlling disease pathogens.

Strawberry molecular genetics and genomics program launches, to enhance and speed up new variety development using advanced molecular technologies.

#### 2017

'Florida Brilliance' strawberry is released. With its high yield, glossy fruit and disease resistance, 'Florida Brilliance' becomes the state's No. 1 strawberry variety by 2019.

The comprehensive photographic field guide, *Trees: South Florida* & *the Keys*, published by the University Press of Florida.

### 2018

In collaboration with the Norwegian University of Life Sciences, GCREC researchers develop a GPS-guided robotic device that emits ultraviolet light to control powdery mildew on strawberry plants.

UF/IFAS CALS Food and Resource Economics major established by GCREC at Hillsborough Community College Plant City.

### 2019

The first prototype "smart sprayer" equipped with artificial intelligence for precision herbicide application is successfully evaluated at GCREC.

Industrial hemp begins to be evaluated as a potential alternative crop for Florida.

The first statewide assessment of urban tree canopy coverage begins, providing a comprehensive accounting of the economic benefits of a resource impacting 89 percent of the state's 21 million-plus residents.

The Urban Soil and Water Quality Laboratory begins a collaboration with the newly formed Red Tide Institute at Mote Marine Laboratory to determine how the microbe that causes red tide outbreaks, *Karenia brevis*, responds to and utilizes nutrients in urban stormwater and municipal wastewater spills.

# **Grower Engagement**

# For many growers, their relationship with the UF/IFAS Gulf Coast Research and Education Center goes back decades.

"We started working with the center back when it was in Springhead, Florida. My father worked with Dr. Brooks, a plant breeder, who created the 'Florida Ninety' strawberry variety," says Carl Grooms, owner of Fancy Farms, Inc. in Plant City.

GCREC and other UF/IFAS research and education centers make it easier for growers to access expertise and the latest findings, he notes.

"If we have plants that aren't looking good, we can just take them down to the center and have them analyzed. And if we have a more widespread problem, the folks from the center are here right away. They are on the problem," Grooms says.

Growers outside of Florida don't necessarily have access to large research and education facilities like GCREC, he said. "It's a whole campus. When out-of-state growers come here, they are impressed with what we have."

Fancy Farms has benefited from GCREC strawberry variety trials and breeding programs, as well as the Strawberry Advisory System decision-support app. "Trials are an important part of moving the industry forward, and new varieties are paramount to keeping us competitive," Grooms says.

In addition to supporting Florida's strawberry and tomato industries, GCREC is a key source of science-based, unbiased recommendations on specialty and minor crops, says caladium producer Terri Bates, co-owner of Bates Sons & Daughters, Inc. in Lake Placid.

"Jack Rechcigl and the staff at GCREC have always been available to help with questions, tours, immediate issues and programs to help the growers," Bates says. "Recently, Zhanao Deng's new variety releases have helped us tremendously in the industry. We have been able to use his releases to replace older, less-vigorous varieties, and it has helped us stay current with the greenhouse industry. Nathan Boyd has done some phenomenal research on weed control that has been invaluable."

Beyond research findings and new varieties, growers agree that their long-term working relationships with the center's faculty and staff are greatly valued.

"Gary Vallad has worked collaboratively with us on numerous projects relating to various plant diseases," says Tony DiMare, vice president of DiMare Company, with tomato farms in Ruskin and Homestead. "We have worked closely with Sam Hutton on breeding projects and trials for breeding better tomatoes and, currently, tomato varieties that can be mechanically harvested. We don't have the expertise or time to conduct needed trials to address challenges we face on the farm, so research and education centers such as GCREC are critical to the success of our businesses."







# **GCREC Crop Teams**

To better serve Florida growers, GCREC faculty members work collaboratively, a strategy that brings together experts from multiple disciplines to address complex challenges. In fact, interdisciplinary collaboration is so much a part of GCREC's workplace culture that the center has established four permanent teams, all of them dedicated to crops that are prominent in the area.

### **Tomato Team**

The Tomato Team employs interdisciplinary approaches to understand the genetic control of important traits in tomato and harness this information to improve tomato production. The Team includes 10 researchers specializing in economics, entomology, geomatics, nematology, plant genetics, plant pathology, plant physiology and weed science. Overall, the Team seeks to enhance the profitability and sustainability of Florida's tomato industry through cultivar development and optimized crop-management strategies. The Team's tomato breeding program combines traditional breeding approaches with advanced genomic techniques to develop tomato hybrids and breeding lines tolerant to the many pest, disease and weather-related challenges inherent to Florida.

Amr Abd-Elrahman
Shinsuke Agehara
Nathan Boyd
Johan Desaeger
Zhengfei Guan

Sam Hutton Tong Geon Lee Hugh Smith Gary Vallad Feng Wu

### **Ornamental Team**

The GCREC Ornamental Team conducts research and outreach to help growers who produce nursery and landscape plants, turfgrass and to trees, and to help the property managers, landscaping professionals and homeowners who establish and maintain them. Team members breed colorful new varieties of caladium, gerbera daisy and other species, and devise improved management practices to conserve resources. To help Florida producers remain competitive, the Team emphasizes development of varieties with novel traits, and recent successes include sterile varieties of the popular landscaping plants lantana, ligustrum and nandina, which can be grown outdoors with no risk of them spreading to unintended areas. The Team also works to enhance the environmental sustainability of ornamental plants and landscaping practices.

Nathan Boyd Zhanao Deng Johan Desaeger Zhengfei Guan Andrew Koeser Sriyanka Lahiri Mary Lusk

Natalia Peres Hugh Smith Gary Vallad Feng Wu

### **Strawberry Team**

The Strawberry Team seeks to enhance the profitability and sustainability of Florida's strawberry industry. It consists of 10 researchers specializing in plant breeding and genetics, genomics, economics, weed science, plant pathology, plant physiology, entomology, nematology, geomatics and precision agriculture. The Team's breeding program integrates conventional and advanced molecular methods to develop superior strawberry cultivars that are grown in Florida and around the world. The Team also develops innovative cropmanagement strategies to address production challenges posed by pests, diseases and environmental stresses.

Amr Abd-Elrahman	Sriyanka Lahiri
Shinsuke Agehara	Seonghee Lee
Nathan Boyd	Natalia Peres
Johan Desaeger	Vance Whitaker
Zhengfei Guan	Feng Wu

### **Alternative Crops Team**

The Alternative Crops Team investigates crops that are not commercially grown in Florida on a large scale, evaluating their suitability for Florida production and notifying growers about promising candidates. Presently, these include artichoke, blackberry, hops, industrial hemp and pomegranate. The Team's long-range goal is to create new markets and enable growers to diversify their operations to improve profitability and sustainability. To accomplish this, the Team's 10 members employ interdisciplinary research approaches to select or develop crop varieties well-suited to Florida growing conditions, optimize crop-management practices, develop pest-management recommendations and evaluate the potential markets and demand for new products.

- Shinsuke Agehara Nathan Boyd Zhanao Deng Johan Desaeger Zhengfei Guan
- Sriyanka Lahiri Natalia Peres Hugh Smith Gary Vallad Feng Wu

# **Amr Abd-Elrahman**

Associate Professor | Forest Resources and Conservation | Geomatics



#### Q. What is the impact of your current research?

A. Development of new methods to analyze very highresolution images is a hot topic in geomatics, and I have developed a method that enables us to identify a target object by analyzing multiple views of the same location that were taken by unmanned aircraft systems (UAS). The results of my research should improve our ability to identify different land cover types, including invasive plant species in wetland areas. My work can also be applied to strawberry production to help monitor plants in the field.

## **Q.** How does your work affect agricultural production?

A. The use of UAS images to monitor wetland cover changes provides a flexible and cost-effective tool

to assist management efforts. For example, invasive plant control operations require frequent and accurate monitoring to assess efficiency and guide management practice implementation, which can be provided by UAS imagery. Additionally, groundbased and UAS-based images can be used to predict strawberry yield by evaluating images that indicate canopy area, volume and the number of flowers and developing fruits visible. Yield information helps strawberry farmers plan for future expenses connected with harvesting and marketing their crops.

#### Q. What are you working on right now?

A. Regarding the use of UAS to identify land cover types, I've presented my results to more than 80 invasive plant specialists attending the Suncoast Cooperative Invasive Species Management Area workshop in Southwest Florida, and I'm seeking funding that would enable me to field-test my approach further. I am also writing a book chapter on this subject, which will be published in an upcoming textbook about the use of UAS.

In strawberry production, we are working on utilizing UAS and ground-based high spatial and spectral resolution images to: 1) assist strawberry breeding research by learning more about plant characteristics; 2) develop strawberry yield prediction models; and 3) detect and diagnose strawberry diseases based on visual symptoms such as leaf discoloration.

#### Q. What is your proudest accomplishment?

A. I am proud of developing a novel approach to utilize multiview information from UAS images to improve classification accuracy. The research extends the methods traditionally used to analyze UAS images. These approaches resulted in improved wetlands cover classification accuracy, including classification accuracy of the cogongrass land cover. This is also the second season we utilized our internally developed, ground-based imaging system to collect highresolution strawberry imagery to be used in ongoing phenotyping and yield-prediction research.

### Contact Abd-Elrahman at 813-757-2283 or aamr@ufl.edu

# **Shinsuke Agehara**

**Assistant Professor | Horticultural Sciences** 

#### Q. What is the impact of your current research?

A. We help central Florida strawberry and vegetable growers overcome constraints caused by the environmental stresses their plants endure. Our goal is to improve crop health, yield and fruit quality, while reducing inputs of irrigation water and fertilizer. One good example of our work is the multicolored plastic mulch we developed in collaboration with a commercial agricultural film manufacturer. The design was developed because high temperatures in early fall can stress young strawberry plants, and then cold weather in winter can slow fruit development and ripening. The new mulch helps keep soil temperature in the right range for strawberry. It has an aluminum stripe down the center, which reflects sunlight and keeps the top of the bed cooler, combined with black shoulders, which absorb sunlight and warm the sides of the bed. This mulch was used on about 200 acres during the 2017-18 season, and we expect more growers to adopt it now that the product is commercially available.

## **Q.** How does your work affect agricultural production?

 A. We provide growers with stress-management options, such as the multicolored plastic mulch.
Also, we develop fertilizer recommendations for new commercial strawberry varieties as they are released.
These efforts help growers maximize yields and reduce unnecessary fertilizer applications.

#### Q. What are you working on now?

A. Crop stress is always my main focus, and currently we're very interested in root function and its role in stress responses. To aid this effort, we've used a 3-D printer to build a device called a rhizotron that enables us to monitor root development in plants. The rhizotron is a rectangular frame about the size of a large book, enclosed by two plates of transparent plastic. When we fill the open space with soil and grow plants, we can closely observe their roots using a flatbed scanner. We're using the root data to optimize crop management practices such as irrigation and



fertilization. Besides crop stress, I'm working on cropmanagement strategies to support the development of alternative crops including hops, pomegranates, artichokes and blackberries. Commercial hops production in Florida has increased from zero to 30 acres in just a few years, which is exciting.

#### Q. What is your proudest accomplishment?

A. I'm proud of the multicolored plastic mulch, because it is easily implementable and we've seen significant yield increases. We hope to continue building on this concept and help Florida's strawberry and vegetable industries remain competitive.

### Contact Agehara at 813-419-6583 or sagehara@ufl.edu

# **Debra Barry**

Assistant Professor | Agricultural Education and Communication | Agricultural Education



#### Q. What is the impact of your current research?

A. I hope to increase the percentage of agricultural education and communication (AEC) students who go into teaching after they graduate. My research focuses on preparation and assistance for cooperating teachers. These in-service teachers are the ones who host our students in their capstone student teaching internship, where the interns teach in a real classroom under supervision. It's a degree requirement that often influences a student's career path. My research looks at ways of assisting the established teachers who mentor and supervise the interns. We've developed a workshop guided by data from a Delphi study I conducted, and developed support materials that could be useful for the cooperating teachers statewide.

## **Q.** How does your work affect agricultural production?

A. The education of competent agricultural educators makes a huge impact on the public, as well as on production agriculture. If future educators can make an impact, they are helping develop educated consumers, as well as the next generation of agriculturalists.

#### Q. What are you working on now?

A. Besides working on my dissertation, with plans of graduating with my Ph.D. in fall 2019, I have been giving much of my energy to my Extension work with the Ag Ed Institute. The Institute is a UF program that recruits talented Florida high school students who are interested in pursuing careers in agricultural education. It provides recruits with mentoring throughout their high school and early college journey so their transition into the agricultural education specialization at the UF/IFAS College of Agricultural and Life Sciences is a seamless experience.

Additionally, we have had great success with our now third annual Agriscience Teacher Education Symposium. This event brings all UF/IFAS students in the agricultural education specialization together with experts from the classroom, related stakeholders and industry leaders, and helps equip these students with valuable skills.

#### Q. What is your proudest accomplishment?

A. I am most proud of working with AEC department faculty to reorganize course delivery statewide for the agricultural education specialization. The efforts we made have created a more uniform delivery of content among the locations, enabled students to engage with the entire UF/IFAS CALS AEC faculty in Plant City, and have created a synergy that is very positive for our students and the program. I'm also proud of the immense growth that the AEC program at Plant City has experienced over the past several years.

### Contact Barry at 813-757-2288 or dmbarry@ufl.edu

# **Nathan Boyd**

Associate Center Director/Associate Professor | Horticultural Sciences | Weed Science

#### Q. What is the impact of your current research?

A. My research is focused on techniques and technologies that help growers manage pests while reducing their reliance on pesticides. This approach reduces input costs for growers and reduces the presence of pesticides in the environment as well as the presence of pesticide residues on food, all of which benefit the public.

## **Q.** How does your work affect agricultural production?

A. Our research is focused on helping growers manage pests – especially weeds – more effectively. We develop tools to predict when and where pesticides should be applied. We also develop tools to reduce reliance on pesticides; examples include the use of plastic mulches, improved application technology, and precision application technology with a focus on the development of smart sprayers. Our improved relay cropping techniques help facilitate the production of multiple crops in the same field with reduced inputs.

#### Q. What are you working on now?

A. My research team evaluates fumigants and herbicides for use in vegetable crop production. We develop machine-vision technology to be incorporated into smart sprayers so that herbicides can be applied only where weeds occur. We've also studied techniques for the production of multiple crops on a raised bed, either sequentially or at the same time. This approach reduces the production cost for each crop because input costs can be divided amongst multiple crops. We are also developing a range of temperature-based models to predict when weeds will emerge, which helps scouting and management efforts. The longterm goal is to develop web-based programs to help growers time herbicide sprays to optimize efficiency.



#### Q. What is your proudest accomplishment?

A. My proudest accomplishment is our research on the use of artificial neural networks to identify weeds and utilize artificial intelligence to apply herbicides only where weeds occur. An artificial neural network is a computer program that can "learn" to perform a task such as weed identification.

### Contact Boyd at 813-419-6619 or nsboyd@ufl.edu

# **Zhanao Deng**

Professor | Environmental Horticulture | Plant Breeding



#### Q. What is the impact of your current research?

A. The Florida environmental horticultural industry has a \$21 billion economic impact on Florida and employs more than 230,000 people. This industry needs improved plant varieties. Our program focuses on improving plants important to the industry. I have developed and released more than 30 new cultivars and have been awarded nearly 30 plant patents. With increased yield, enhanced stress tolerance, improved disease resistance and/or better plant characteristics and performance, these cultivars have helped secure nearly 50 licensing agreements with commercial growers and companies. Our research in alternative horticultural crops is helping establish and grow emerging agricultural industries in Florida and other states.

## **Q.** How does your work affect agricultural production?

A. Florida caladium growers supply almost all the caladium bulbs used in the U.S. and in the world. The new caladium cultivars produce more and better bulbs, which translates into better economic returns for caladium growers. These new cultivars have enabled Florida growers to retain existing customers and attract new customers.

Resistance to *Fusarium* tuber rot in caladium and powdery mildew in gerbera has helped growers reduce pesticide use and manage crops at lower costs. These traits also result in better performance and fewer disease problems when consumers grow caladiums and gerberas in their gardens.

Lantana has been an important garden plant in Florida and many other states. Our new lantana cultivars are attractive and competitive with commercial varieties, and also sterile and friendly to the environment and native plants. These cultivars provide the general public with an excellent alternative for use in gardens and water-saving landscapes.

#### Q. What are you working on now?

A. I continue to develop new caladium, gerbera and lantana cultivars; develop new techniques to speed cultivar development and screening; test alternative horticultural crops, including blackberries, hops, industrial hemp and pomegranates for emerging horticultural industries; breed new blackberry and pomegranate cultivars; and edit genes in citrus and other crops to enhance disease resistance.

#### Q. What is your proudest accomplishment?

A. New cultivars I developed and graduate students and postdoctoral research associates I advised.

### Contact Deng at 813-419-6605 or zdeng@ufl.edu

# **Johan Desaeger**

Assistant Professor | Entomology and Nematology | Plant Nematology

#### Q. What is the impact of your current research?

A. The primary goal of our nematology research is to increase grower awareness of plant-parasitic nematodes, one of the most underestimated agricultural pests in Florida and the world, as well as the adoption of Best Management Practices to control these soil-dwelling microscopic parasites. The nematodes that worry us the most in Central Florida are root-knot and sting nematodes. These nematodes tend to thrive in Florida's climate and sandy soils and affect almost every crop that is grown in the area, especially vegetables, strawberries and ornamentals. It is difficult to estimate actual crop loss due to nematodes because of the hidden nature and nonspecific symptoms they cause, but in heavily infected and poorly managed fields, 50 to 100 percent crop loss is not uncommon. Effectively managing these pests could influence improved crop vields and a more sustainable future for the state's agricultural industries, including improved soil health in the long term.

## **Q.** How does your work affect agricultural production?

A. Our efforts aim to allow growers to manage nematodes in their fields in a safer and more sustainable way, both in terms of the environment and costs. Nematode management has heavily relied on the use of broadspectrum soil fumigants, which all have high toxicity and a negative environmental impact. Through our research and Extension work we want to help Florida growers produce high-value crops with less reliance on soil fumigants.

#### Q. What are you working on now?

A. We work on a wide range of crops, including vegetables, strawberries, hops, hemp and ornamentals. With integrated nematode management as the focus of our research, we have many projects evaluating the different strategies that can be used, including fumigant and non-fumigant nematicides, biological products, cover crops, resistance/tolerance, sanitation and new practices like raised-bed geometry. We also study the nature of nematode-suppressive



soils and the importance of non-plant-parasitic nematodes that feed on bacteria, fungi and other organisms to better understand their role in overall soil health.

#### Q. What is your proudest accomplishment?

A. I hope my proudest accomplishment lies in the future. For now, I would have to say bringing nematology to the GCREC, mentoring students and lab members, and educating growers and other stakeholders about these most important and relatively unknown enemies to Florida agriculture. There was no nematologist at the center prior to my arrival, and now we have a fully equipped lab, trained staff and a research and Extension program that covers Central and South Florida.

### Contact Desaeger at 813-419-6592 or jad@ufl.edu

# John Diaz

Assistant Professor | Agricultural Education and Communication | Extension Development



#### Q. What is the impact of your current research?

A. My research helps to advance the science and practice of Extension program development and evaluation across the globe. My primary focus is, I am identifying meaningful evaluation frameworks and techniques that can be used to refine the field of Extension education and improve the impact of Extension programs.

## **Q.** How does your work affect agricultural production?

A. The agriculture Extension faculty and staff members who've completed the in-service trainings I offer are now better equipped to meet the needs of agricultural producers and the general public through their educational programs. The competency assessments that I use in connection with my in-service training sessions demonstrate that participants enhance their abilities to develop needs assessments and integrate the needs of their target audiences into program development. Direct observations also demonstrate that after completing the in-service training, participants implement best practices to improve their program evaluations, which is an important step toward program enhancement.

#### Q. What are you working on now?

A. I lead a team of evaluation specialists who are developing and implementing a newly created National Program Planning and Evaluation Professional Certificate Program offered by the Department of Agricultural Education and Communication within the UF/IFAS College of Agricultural and Life Sciences. I also lead a statewide effort to increase the capacity and competency of Extension educators to serve the growing Hispanic/Latino communities of Florida through a framework of culturally responsive teaching. In this effort, I lead a team of more than 30 UF/IFAS Extension faculty who provide the training and support needed to achieve systemwide change.

#### Q. What is your proudest accomplishment?

A. I am most proud of working with hundreds of UF/IFAS Extension faculty across the state and measuring noticeable enhancement of their program development and evaluation competencies. My research and Extension programs focus on bolstering the Extension evaluation sciences to provide greater clarity regarding the factors that influence behavior change and practice adoption among various stakeholder groups in Extension activities. I utilized an engaged scholarship approach (research that involves community members as well as UF/IFAS faculty) to work with agents across the state to help solidify meaningful solutions through evaluation, and then develop recommendations for policies and practices to advance local food systems, nutrition and wellness, natural resource management, youth development, conservation and community capacity-building.

### Contact Diaz at 813-757-2297 or john.diaz@ufl.edu

# **Zhengfei Guan**

Associate Professor | Food and Resource Economics | Agricultural Economics

#### Q. What is the impact of your current research?

A. My program assesses the impacts of changing policy and market environments on industry sustainability, and identifies optimal coping strategies. My current research addresses major challenges facing the Florida fruit and vegetable industry, which include foreign competition, government regulation and labor shortages, as well as issues surrounding immigration reform and the use of undocumented workers in U.S. agriculture. My work has been used by the fruit and vegetable industry to pursue various policy initiatives in Washington, D.C., and has received broad media coverage.

## **Q.** How does your work affect agricultural production?

A. My research on Mexican competition and labor issues has explained why imports of Mexican produce have increased dramatically over the past two decades, and how these imports affect U.S./Florida growers. Lower labor costs and government subsidies in Mexico are among the major factors that have driven the surge of fresh produce imports from Mexico, including those of tomato, bell pepper and strawberry. Recommended industry coping strategies include increased use of automation, reform of the H-2A guest worker program and pursuit of trade remedies.

Industry representatives have used my findings to pursue policy changes. My research has also resulted in changes to agribusiness management practices, including accelerated adoption of the H-2A guest worker program.

#### Q. What are you working on now?

A. My current research focuses on strategic management of trade relations, and system dynamics under competition and conflict. I am researching U.S.-Mexico trade, and the co-evolution and resilience of the produce industries of the two countries, including the emergence of new (mechanical harvest) technologies under the pressure of competition. My labor research addresses issues in farm labor management, general



labor economics and policy topics, such as migration/ immigration and race issues.

#### Q. What is your proudest accomplishment?

A. My research has been presented at places including the White House, Congress, federal and state agencies, as industry representatives sought to renegotiate NAFTA and the U.S.-Mexico Tomato Suspension Agreement, revise trade laws governing fresh produce trade, and make Farm Bill and immigration reform proposals.

### Contact Guan at 813-419-6590 or guanz@ufl.edu

# **Sam Hutton**

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Associate Professor | Horticultural Sciences | Tomato Breeding and Genetics



#### Q. What is the impact of your current research?

A. We're building on previous research that led to some of the best tomato cultivars in the world – including the Tasti-Lee®, released in 2006. Our work contributes to the sustainability and profitability of Florida's tomato industry, because the improved varieties we develop are better able to defend themselves against pests and diseases, and produce reliable yields of marketable fruit.

## **Q.** How does your work affect agricultural production?

A. Improved varieties help Florida's fresh-market industry remain competitive by enabling growers to reduce their input costs and increase their yields, thereby making more money. My program approaches tomato

improvement from multiple angles. Some of these involve identification of disease-resistance genes that can be used by breeding programs to develop varieties that are resistant to multiple pathogens. Others emphasize improvements in fruit quality, which include better flavor, superior color, improved fruit firmness, and resistance to cracking and other fruit disorders.

#### Q. What are you working on now?

A. Besides those goals already mentioned, we are working aggressively to develop fresh-market tomato varieties that can be picked mechanically rather than by manual labor. Mechanically harvestable tomato varieties could significantly reduce labor expenses, which presently account for nearly 50 percent of total tomato production costs. On the subject of disease resistance, we've recently begun focusing on target spot, a re-emerging fungal disease that affects tomato foliage and fruit, and one which can be extremely difficult to control. Working with the GCREC plant pathologist, we've identified sources of resistance to this disease and are now breeding with these plants to develop improved varieties.

#### Q. What is your proudest accomplishment?

A. We identified a gene known as Ty-6, which we believe is a naturally occurring gene in some tomato plants. It confers resistance to begomoviruses, a family of viruses that are transmitted by whiteflies and damage many crops. Several begomovirus strains infect tomato, and the most important thing about Ty-6 is that it seems to be effective against most of these - unlike other Ty genes found in tomato, which only protect against specific strains of begomoviruses. The varieties Fla. 8624 and Fla. 8638B are two recent UF germplasm releases that contain the Ty-6 gene, making it available for use in breeding programs elsewhere. These new releases, together with molecular resources we've developed for Ty-6, are helping tomato breeders use this gene more effectively for development of resistant varieties, and Ty-6 may become the most important and most widely used Ty gene of all.

### Contact Hutton at 813-419-6610 or sfhutton@ufl.edu

# **Andrew Koeser**

Associate Professor | Environmental Horticulture | Landscaping and Ornamentals

#### Q. What is the impact of your current research?

A. My research program focuses on tree risk assessment. In an assessment, a professional arborist systematically inspects a live tree to gauge how likely it is that part or all of the tree will fall to the ground – arborists refer to this kind of event as "tree failure." The assessment also looks at the possibility of people or property being struck by falling debris. I'm also involved in efforts to educate laypeople about trees and the benefits of urban forests. Also in that vein, I've produced several tree identification guides and they've been very well received.

#### Q. How does your work affect others?

A. The goal of my research is to support the arboriculture and urban forestry professions in growing and maintaining Florida's urban trees. This sector contributes \$1.37 billion to the state's economy each year, and that figure represents only tree sales and tree-care services. As urban forests become established and grow, their economic impact rises, and this benefits all residents.

For example, my team assessed the tree canopy coverage in Tampa, and we estimated that the city's trees accounted for \$7 million in energy savings associated with home cooling. In addition, urban forests sequester carbon, reduce stormwater runoff and benefit human health by producing oxygen and filtering pollutants from air and water. Our work led the city to change its preservation ordinance so that when a tree is removed, the city must replant trees with the same amount of canopy area within five years of the removal.

#### Q. What are you working on now?

A. I am working on a web application that will allow urban tree managers to map their trees and predict the likelihood of failure based on actual tree-failure data. Also, I recently received National Science Foundation funding to assess how a tree's proximity to other trees and structures can influence its risk of failure.



#### Q. What is your proudest accomplishment?

A. Honestly, it is seeing my grad students grow in their profession. When you have a good student, you do everything you can to see them flourish. Right now I have a really great group of students who are working on everything from urban tree diversity in the I-4 corridor to improvement of international treeprotection guidelines for construction projects that take place near trees.

### Contact Koeser at 813-419-6589 or akoeser@ufl.edu

# Sriyanka Lahiri

Assistant Professor | Entomology and Nematology | Strawberry and Small Fruit Crops



#### Q. What is the impact of your current research?

A. Overall, my work supports cost-effective and sustainable production methods for strawberry and small fruit crops, focusing on management of insects and other arthropod pests. We help growers monitor their fields and make use of Integrated Pest Management (IPM) approaches, because they are sustainable.

## **Q.** How does your work affect agricultural production?

 A. My research and Extension activities are geared toward reducing cost of production while meeting current crop-production standards and public expectations. Through workshops, educational materials and inperson communications, I help growers learn to conduct their own monitoring and identify whatever pests and associated crop damage they encounter. This helps them make informed decisions and manage their farms efficiently. Also, my program informs growers about the pesticide-resistance status of various organisms, and we investigate nonchemical forms of pest management.

#### Q. What are you working on now?

A. Currently, I am developing a program to address challenges posed by chilli thrips, various flower thrips and two-spotted spider mites in conventional and organic production systems for strawberry and other small fruit crops. One big project is identifying the "action threshold" for chilli thrips in strawberry and blueberry. This is a way of determining when it becomes essential to use insecticide to stop a thrips outbreak. Another project will try to expand our knowledge about the earliest stages in the life cycles of common pests, when they are often more vulnerable to chemical control. This knowledge may enable us to develop new IPM strategies that are more targeted and therefore more efficient.

With industry partnership, my team will evaluate several commercial pesticides this fall, to determine their effectiveness. We'll also screen local populations of chilli thrips to determine their resistance status to commonly applied insecticides. Furthermore, we are researching the effects of winter temperatures on chilli thrips populations. We are also assessing the efficacy of ultraviolet radiation to control insect pests in strawberry and small fruit crops.

#### Q. What is your proudest accomplishment?

A. I am most proud of my research experience and publications in assessing insecticide efficacy, host plant resistance, cultural control and beneficial insect ecology in the management of insect pests in field crops. The greatest advantage of working with these techniques is the wide-ranging applicability in a variety of crop production systems, including strawberry and small fruit crops.

### Contact Lahiri at 813-419-6585 or lahiris@ufl.edu

# **Kati Lawson**

Lecturer | Agricultural Education and Communication | Communication/Leadership

#### Q. What is the impact of your current research?

A. My current research could potentially lead to the development of organized professional-development opportunities for agriculture teachers who teach an agricultural communication curriculum at the high school level. In Florida, agricultural communication has been available at the high school level since 2005 and about 30 such programs exist today statewide. However, there are no ongoing professional-development programs currently available for these teachers. Agricultural communication is a dynamic part of the agricultural industry, and it is my belief that teachers need the opportunity to receive professional development on an annual basis to remain current with new technologies and changes in communications practices, and to help them improve existing skills.

## **Q.** How does your work affect agricultural production?

A. By providing quality professional development for high school agriculture teachers in the area of agricultural communication, student instruction could be enhanced. This would cause students to become more prepared agricultural communicators before reaching college. One of the main concerns shared by growers, industry figures and scientists is the level of agricultural literacy among members of the general public, and how to properly communicate the importance of agriculture to that audience. Equipping educators at the high school level with high-quality instruction would help students learn how to advocate for agriculture and speak to agricultural concerns and issues.

#### Q. What are you working on now?

A. I am working on evaluating the resources available and professional-development needs of high school agricultural communication teachers. This work is centered around my dissertation topic. In addition, I created a survey instrument distributed in fall 2019 to Florida teachers who teach one or more courses in agricultural communication at the high school level. This survey looks at areas of the agricultural communication curriculum in which teachers would



like more opportunities to receive professional development. Identifying these areas can help shape a professional development course that could be utilized by agricultural communication instructors for continuing education credits.

#### Q. What is your proudest accomplishment?

A. I am most proud of the growth in student numbers at the UF/IFAS College of Agricultural and Life Sciences Plant City location. The Communication and Leadership Development specialization in Plant City graduated its first student in December 2016, the semester after I started as lecturer. Since that time, I am proud to say that the CLD specialization in Plant City has sent 11 graduates across the stage in Gainesville, and we expect to graduate nearly 20 students by spring 2020.

### Contact Lawson at 813-757-2284 or kmcwaters@ufl.edu

# **Seonghee Lee**

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Assistant Professor | Horticultural Sciences | Strawberry Breeding and Genetics



#### Q. What is the impact of your current research?

A. Development of strawberry varieties with improved flowering, fruit quality and disease-resistance traits is a high priority at the University of Florida and around the world. We have developed DNA tests that help breeders predict which parents and offspring will carry traits of interest. This enables breeders to develop superior strawberry cultivars more quickly and costefficiently. We are also working to edit individual strawberry genes, using the method known as CRISPR-Cas9. Gene editing can quickly accomplish the same results as generations of cross-breeding.

## **Q.** How does your work affect agricultural production?

A. The varieties we develop benefit Florida strawberry growers, shippers, handlers and many support industries. They are not only more disease-resistant but possess better fruit qualities, with improved sweetness, flavor and shelf life. With farm-gate revenues of about \$500 million annually, strawberries are second only to citrus as Florida's most valuable fruit crop. The overall economic contribution of Florida's strawberry industry to the state's economy is estimated at more than \$1 billion, according to the Florida Strawberry Growers Association<sup>SM</sup> (FSGA). More than 100 strawberry growers make up the 11,000-acre Florida strawberry industry, and thousands of people work in associated and support industries.

#### Q. What are you working on now?

A. My research program focuses on identifying genes that control fruit quality and resistance to multiple pathogens in strawberries. The pathogens of interest are responsible for bacterial angular leaf spot, anthracnose, powdery mildew, *Phytophthora* root rot, *Colletotrichum* crown rot and charcoal rot, which are all problematic diseases in Florida strawberries. FSGA estimates that yield losses from soilborne diseases alone cost the state's growers approximately \$15 million in revenues each year. Using advanced DNA technologies, we are characterizing the genes for fruit quality and disease resistance for further development of new strawberry varieties.

#### Q. What is your proudest accomplishment?

A. Since 2016, we have discovered genes that control for disease resistance, flowering, aroma and other traits that naturally occur in strawberries. Using DNA tests, we are now able to screen tens of thousands of strawberry seedlings for desirable traits. My program also successfully established novel molecular breeding tools to more rapidly develop strawberry varieties that perform better for the farmer, taste better for the consumer and have increased disease resistance, making strawberries a more resilient crop and a more consistently available product.

### Contact Lee at 813-419-6611 or seonghee105@ufl.edu

# **Tong Geon Lee**

Assistant Professor | Horticultural Sciences | Tomato Genetics and Bioinformatics

#### Q. What is the impact of your current research?

A. Growers need us to develop fresh-market tomato varieties that can be harvested using machines to reduce labor costs. To address this need, we have focused on studying genetic variations that are associated with traits that are favorable to machine harvest. One of these is the jointless pedicel trait, where fruit comes off of the tomato plant with no stem attached. This is important because it prevents damage when the fruits are packed together during harvest. My lab developed inexpensive and rapid laboratory methods to develop tomato varieties with the jointless pedicel trait and other traits concerning the plant's architecture and fruit set. Breeders and researchers can use these methods to develop new varieties.

## **Q.** How does your work affect agricultural production?

A. As an applied tomato geneticist, I bridge the gap between the science developed in the laboratory and the field. I bring new technological tools to our GCREC tomato-breeding efforts, in two main areas: one is understanding tomato genotypes to select superior gene compositions; the other is applying contemporary tools such as the gene-editing methods known as clustered regularly interspaced short palindromic repeats, or "CRISPR." My research helps breeders satisfy the demands of the market in a timely manner by making it possible to develop and select new tomato varieties much faster. I'd like to think that my research also broadens the perspectives of producers and the general public when they learn about it, because they can understand the benefits of what we're doing.

#### Q. What are you working on now?

A. My program at UF/IFAS focuses on researching tomato genetics and helping to solve problems in tomato production. Our research activities have particularly close links to genomics, high-performance computing and molecular biology. We combine these techniques to understand more about tomato traits



and genetics. Our current project has two major emphases: genomics-enabled tomato improvement for mechanical harvesting to address the longterm economic viability of the fresh-market tomato industry; and helping make tomatoes more resistant to diseases, including bacterial spot and *Fusarium* wilt.

#### Q. What is your proudest accomplishment?

A. Since I arrived at the Gulf Coast Research and Education Center in 2016, my lab has established the CRISPR pipeline that led to the successful development of CRISPR-edited tomato plants in 2018. Now, we're expanding our CRISPR efforts to identify and rapidly create beneficial qualities in tomatoes. This is the beauty of adapting CRISPR for tomato research.

### Contact Lee at 813-419-6607 or tonggeonlee@ufl.edu

# **Mary Lusk**

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Assistant Professor | Soil and Water Sciences | Urban Water Quality



#### Q. What is the impact of your current research?

A. Everyone has a role in using Florida's groundwater supplies wisely and sustainably, so I conduct research that helps urban residents understand their role. This research is also important for urban planners and the builder/developer community because it informs urban management practices that can help improve water quality in our rapidly urbanizing state. Currently, there are more than 21 million people living in Florida, making us the third-most populous state in the nation. Therefore, we need research and Extension activities that help us identify ways of developing sustainably.

## **Q.** How does your work affect agricultural production?

A. We are all dependent on the same groundwater and surface water resources in Florida. My work is to study and protect those resources for all water users.

#### Q. What are you working on now?

A. I have several research projects concerning water quality in urban landscapes. In one, we're looking at potential soil amendments, such as compost, that can be added to new home sites just after construction to improve the water-holding capacity of the soils. This will help homeowners use less irrigation water on their lawns, thus reducing consumption of groundwater resources.

In another project, we're investigating how lawns maintained using Florida-Friendly Landscaping<sup>™</sup> principles differ from traditional lawns in terms of excess nutrient runoff to canals in the Indian River Lagoon watershed. Some of these canals have urban lawns right up to the water's edge, and some groups hypothesize that wider adoption of Florida-Friendly Landscaping<sup>™</sup> principles will reduce nutrient transport to the canals. But we want to test this to verify. We have a helpful, canal-front HOA in Cocoa Beach that has agreed to let us collect soil and water samples in different lawn types and make a year-long comparison study.

#### Q. What is your proudest accomplishment?

A. Currently, I am working on an Extension project that will provide public education on the connections between septic systems and water quality in Florida's springsheds. We have been awarded some grant funding by the Fish and Wildlife Foundation of Florida, and we're creating a fun, creative outreach project to help people know what happens "after the flush." Many people never think about their septic systems until they malfunction. We're hoping to increase awareness that poorly functioning systems can be one cause of contaminant transport from sewage waste to shallow groundwater and then to our Florida springs.

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# Luis Peña-Lévano

Lecturer | Food and Resource Economics | Agricultural Economics

#### Q. What is the impact of your current research?

A. I've been studying the economics of forest carbon sequestration and demonstrating how aggressive policies to decrease greenhouse emissions might have unintended, negative impacts on food security if we use less land to grow food crops and more to grow forests. Together with researchers from Purdue University, I developed a Computable General Equilibrium model, which uses global economic data to simulate the world economy and can be used to make projections about the effects of trade policies. In one study, we simulated the effects of policy changes meant to address crop-productivity losses due to global climate change. We found that well-intentioned steps, such as forest carbon-sequestration subsidies, could have adverse impacts on the production and availability of food commodities, particularly in developing economies.

## **Q.** How does your work affect agricultural production?

A. Our work with the CGE economic model suggested that if the average global air temperature increased by 5 degrees Celsius, the financial cost of coping with that change would be huge. Furthermore, our results indicated that it's more cost-effective to take steps now to mitigate climate change rather than waiting to cope with its effects later.

#### Q. What are you working on now?

A. In terms of my teaching appointment, I teach six courses, though not all during the same semester. They are: Principles of Food and Resource Economics, Economics of Resource Use, Quantitative Methods in Food and Resource Economics, Agricultural International Trade Policy, Advanced Agribusiness and Financial Management, and Contemporary Issues in Agribusiness Management.

I've been involved in the publication of three papers in 2019. One paper, which I mentioned previously, addresses the possible impacts of policies that promote carbon sequestration, and how these policies might affect the global economy and food



security. Another paper concerns the impact of foreign investment on trade-policy studies. The last paper deals with the perceptions of Georgia farmers regarding the H-2A guest worker program, which is a visa program that enables U.S. farmers to hire foreign workers temporarily.

#### Q. What is your proudest accomplishment?

A. I helped establish the UF/IFAS College of Agricultural and Life Sciences' food and resource economics degree program in Plant City, which started in spring 2018. I'm one of the faculty responsible for teaching in-person FRE curricula to our students. The students have responded positively, and enrollment has been increasing. Likewise, I am pleased that our first two seniors will graduate in December 2019.

### Contact Peña-Lévano at Ipenalevano@ufl.edu

# **Natalia Peres**

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**Professor | Plant Pathology | Strawberry and Ornamentals** 



#### Q. What is the impact of your current research?

A. We provide strawberry growers with tools to help them control all important diseases that affect their crop, in a more effective and sustainable way. Many diseases, mostly caused by fungi, threaten strawberries: anthracnose, botrytis, powdery mildew, angular leaf spot, *Phytophthora*, *Colletotrichum* and *Macrophomina*. The latter three diseases cause crown rots on strawberry plants that lead to plant death. The others harm the foliage and/or cause fruit rot. Losses vary from season to season because disease outbreaks are influenced by environmental conditions. That's where the Strawberry Advisory System (SAS) helps. Before we developed SAS, growers sprayed preventively each week. SAS provides alerts to growers when conditions indicate they should spray for anthracnose and botrytis, the two most destructive fruit-rot diseases. Also, our heat therapy research will help growers plant strawberry seedlings harboring fewer pathogens.

## **Q.** How does your work affect agricultural production?

A. Our research helps producers minimize their costs and protects the environment and consumers by minimizing unneeded fungicide applications. Also, a UF/IFAS economic study estimated that the Strawberry Advisory System saved \$1.7 million in anthracnose treatments and \$900,000 in botrytis treatments over a 10-year span of use for an average farm of about 25 acres.

#### Q. What are you working on now?

A. I am particularly excited about two projects using nonchemical alternative methods to control strawberry diseases. In one, we use heat to reduce the presence of pathogens in nursery plants. With this system, we use a steam chamber to heat plants at 44 degrees Celsius for four hours to try to reduce disease losses, but this has not been adopted by commercial farms yet. We are conducting these experiments because evidence shows that multiple strawberry diseases reach Florida operations through asymptomatic infected plants. We are also investigating ultraviolet light as a way to control powdery mildew, one of the important diseases damaging Florida strawberry. This is still in the early experimental stages at GCREC and a few commercial farms.

#### Q. What is your proudest accomplishment?

A. I am proud of developing the Strawberry Advisory System. Growers who have followed the system's recommendations have reduced fungicide applications by about 50 percent, while controlling botrytis and anthracnose – two major strawberry diseases. Growers are also maintaining their yields. But I gain the most satisfaction from seeing growers following our recommendations and benefiting from them.

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# **Hugh Smith**

Associate Professor | Entomology and Nematology | Vegetables

#### Q. What is the impact of your current research?

A. Growers are better able to diagnose their pest problems and employ a variety of methods to manage pests without overusing insecticides or using insecticides in a way that contributes to insecticide resistance.

## **Q.** How does your work affect agricultural production?

A. We help agricultural producers reduce their insecticide use and use more alternate strategies – such as beneficial insects and mites – to control pests where possible.

#### Q. What are you working on now?

A. I develop integrated pest management strategies for whiteflies in tomato and other vegetables, diamondback moth in cabbage and two-spotted spider mite in hops. My research on whiteflies helps growers offset the development of insecticide resistance by optimizing the placement of key insecticides within a broader management strategy - this is helping reduce transmission of tomato yellow leaf curl virus, a major limiting factor in Florida tomato production. We have demonstrated that Florida growers can reduce their reliance on neonicotinoid insecticides by incorporating products with different modes of action. Research on diamondback moth also addresses insecticide resistance and focuses on developing management strategies that enable growers to take full advantage of natural enemies that help control the moth when insecticides are used judiciously. Two-spotted spider mite is the primary pest of hops in Florida, but because insecticide use is not an option, we're developing strategies that rely primarily on predators that feed on the mite.

#### Q. What is your proudest accomplishment?

A. I'm proud of the diagnostic material I produced in collaboration with graduate students, concerning identification of thrips species found in Florida. Thrips are a diverse group of pests, but they are so small that individual species can only be distinguished from one another under a microscope. We developed a



photo-based key, posters and Extension publications to help producers identify thrips they find on crops, so that appropriate management steps can be taken. Also, my program has generated data demonstrating that improper insecticide use can actually boost populations of damaging invasive thrips, by removing less-harmful native species. This work was done in strawberry but is applicable to other crops. That's important because south Florida growers are always dealing with thrips.

In Extension, I am most proud of the hands-on pest and beneficial arthropod trainings sessions that I have developed that give participants practical experience in identifying pest and beneficial insects and mites associated with Florida vegetable and ornamental plants.

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# **Gary Vallad**

**Professor | Plant Pathology | Vegetables and Ornamentals** 



#### Q. What is the impact of your current research?

A. My program has: 1) educated growers in the proper use of pesticides through improved pathogen identification and pesticide recommendations; 2) demonstrated the importance of managing bacterial spot of tomato during commercial transplant production; and 3) reduced grower reliance on copperbased bactericides for the management of bacterial diseases of tomato.

## **Q.** How does your work affect agricultural production?

A. My research limits grower losses due to bacterial, viral and fungal crop diseases, which helps sustain the competitiveness of Florida agriculture. My program also helps develop focused disease-control strategies to improve stewardship of Florida's natural resources.

#### Q. What are you working on now?

A. My program continues research efforts with the UF/IFAS tomato breeding program to develop varieties with improved resistance to target spot (Corynespora cassiicola), bacterial spot (Xanthomonas perforans) and Fusarium wilt (Fusarium oxysporum f. sp. lycopersici). Such efforts will result in the most sustainable and cost-effective means to manage these diseases. My program continues to evaluate conventional and biological pesticides for efficacy against economically important vegetable diseases, as well as evaluate fumigant systems and pesticide alternatives for the management of common soilborne pathogens and pests.

#### Q. What is your proudest accomplishment?

A. My research program determined the role of overhead watering systems in spreading the bacterial pathogen X. perforans during the production of commercial tomato seedlings in protected agriculture structures. Also, I'm proud of discovering how the movement of bacterial strains not only led to seedling losses, but also accounted for disease outbreaks during field production. Our research identified several alternative compounds for the management of copper-tolerant X. perforans strains during commercial tomato seedling production. In collaboration with the UF/IFAS tomato breeding program, we identified several sources of resistance to the fungus Corynespora cassiicola that causes target spot on tomato. In addition, we developed tests to evaluate C. cassiicola isolates for resistance to common respiration inhibitor fungicides.

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# **Vance Whitaker**

Associate Professor | Horticultural Sciences | Strawberry Breeding and Genetics

#### **Q.** What is the impact of your current research?

A. We are very focused on flavor. Our lab identifies chemicals in strawberries that give us flavors and aromas we enjoy. Also, in our strawberry breeding efforts, we emphasize big data and genomics. By marrying extensive performance data from past years with DNA sequence data, we can predict how a new strawberry variety will perform in the future, even before we test it in the field. These research areas are leading to new strawberry varieties with better flavor for the consumer and better yield for the farmer.

## **Q.** How does your work affect agricultural production?

A. Florida strawberries have a \$500 million farm-gate value and an estimated \$1 billion annual impact on Florida's economy. These strawberries are packed with vitamin C and antioxidants and are found in grocery stores during the winter. However, our industry is struggling to survive in the face of rising labor costs and imports from Mexico. Our growers also battle root rot diseases that have worsened since the loss of methyl bromide. It is vital that Florida growers have access to strawberry varieties that are more cost-effective to harvest, more flavorful than the competition and more resistant to disease.

#### Q. What are you working on now?

A. In the past three years, our lab has discovered six chromosome regions that control fruit aroma and resistance to disease. We work with GCREC collaborator Seonghee Lee – a UF/IFAS assistant professor of horticultural sciences – to develop DNA tests that determine the genes in each plant. We use the tests to select the best parents for crossing and to choose the best seedlings from each cross before testing them in the field. It's a bit like stacking a deck of cards, where the deck is a strawberry variety and the cards are the different genes we want in the variety. We believe our program leads the world in the application of DNA information to strawberry improvement.



#### Q. What is your proudest accomplishment?

A. My greatest satisfaction comes from providing what our Florida farmers need. Successful varieties improve their livelihood and ensure a nutritious food supply. Our recent varieties include Sweet Sensation® (2013), 'Florida Beauty' (2016) and 'Florida Brilliance' (2017). Our varieties account for 90 percent of Florida acreage and are grown in more than 40 countries around the globe.

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# Feng Wu

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**Research Assistant Scientist | Food and Resource Economics | Agricultural Economics** 



#### Q. What is the impact of your current research?

A. My research on optimal yield distribution for strawberry has demonstrated the economic importance of early-yield varieties to the Florida strawberry industry. Yield distribution represents the week-to-week percentage of developing fruit that becomes ripe enough to harvest, throughout the harvest season. We want to determine the yield distributions that will generate the highest profit for Florida growers under various biological and market conditions. Some of these biological conditions are intrinsic, such as the plant's genetic attributes; others are environmental, such as pest and disease pressures. Market conditions include the time of year when the fruits reach buyers, buyer demand during a given time span, and the availability of fruit from other sources during that time span. We try to find the "sweet spot" where growers can obtain the most money for their product when it reaches maturity and is ready to sell.

## **Q.** How does your work affect agricultural production?

A. Research on the economics of early-yield varieties is a valuable tool but it must be put to use in order to have real-world benefit, so I work closely with UF/IFAS strawberry breeders to develop varieties that will perform well from a profit standpoint. For example, I was involved in development of the ideal early-yielding cultivar, 'Florida Beauty', which UF released in 2016.

#### Q. What are you working on now?

A. In collaboration with horticulturalists and geomatics scientists, I am working on predicting strawberry yield pattern so that growers can use the information when they make decisions about their marketing, labor and distribution expenditures. My goal is to develop improved yield-prediction models that incorporate geometric predictors such as the number of flowers and fruits, and strawberry canopy size, volume and height, all of which can be acquired from close-range, ground-based imagery. We want to make it affordable for growers to apply this technology.

#### Q. What is your proudest accomplishment?

A. Due to the continued and rapid increase of fresh strawberry imports from Mexico, Florida strawberry growers have experienced more price crashes and lower profits in recent years. The industry may see a steady decline over the coming years without new cultivars that address recent industry challenges. My research is helping farmers adapt to these pressures through new varieties and better predictive models that can keep them ahead of the competition.

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## **Gulf Coast Council Membership**

The success of the Gulf Coast Research and Education Center can be measured by the assistance that the operation provides to growers. To ensure that GCREC research and outreach programs remain focused on critical needs, in 2017 GCREC established the Gulf Coast Council – an advisory group made up of growers, agricultural industry personnel, state agency employees and elected officials, who provide input regarding current and future GCREC activities. With their broad range of backgrounds, Gulf Coast Council members offer new perspectives, and may recognize potential problems or opportunities that should be considered by GCREC faculty members in planning their activities.

#### Kenneth Parker, Chair

Florida Strawberry Growers Association<sup>SM</sup>

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