

LOUISIANA Agriculture

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Assuring Our Future Through
Scientific Research
and Education

LOUISIANA SUPER PLANTS
good for business and beauty
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LSU AgCenter Food Innovation Institute has eye to the future

V. Todd Miller

What's in a name? For the LSU AgCenter Food Innovation Institute, it is the promise of partnering researchers with entrepreneurs to shape the future of food production, consumption and, as the name suggests, innovation.

Launched in July 2013 as the LSU AgCenter Food Incubator, the institute — known as FOODii — began with 10 tenants. Its mission was to develop emerging food ventures and provide technical services to companies to help them survive and grow during the startup period by providing business support, services and resources.

FOODii now boasts 25 to 40 tenants at any given time, allowing for individualized attention.

In the intervening eight years, emerging technologies and challenges presented by climate change have necessitated the expanded mission and name change. Through innovation and education, the FOODii of 2021 seeks to ensure a sustainable food supply, protect the environment and improve the economic well-being of the world's growing population.

As a result, plant-based start-ups are becoming increasingly popular, said FOODii director Gaye Sandoz.

"Our plant-based and specialty product lines are growing and include Panaro Food Innovations sweeteners, Hanley's salad dressings and mushroom Bacom Bits, Skinny Roux, Fletcher Farm strawberry jalapeño barbecue sauce and many others," she said.

FOODii embraces the concept of "food for the future," which includes advances such as:

- 3D printing of food to deliver meals based on a person's metabolic panel. FOODii researchers will develop formulations for food capsules that are loaded into a 3D printer to print a meal.
- Alternative sources of food and protein. Partnerships with local businesses make it possible to create sustainable products such as flour made from insects and crops other than wheat.
- Production of meat and seafood from animal and plant cells grown in a cultivator. This type of cellular agriculture expands the food supply and reduces incidences of foodborne illness.

Having a future focus also means mentoring high school students through the Young Entrepreneur's Academy of Baton Rouge. There are currently three student entrepreneurs working in FOODii programs.

"FOODii has added value to food companies and restaurants in Louisiana. Some of these clients include Walk On's, Fiery Crab, Camellia Beans and Sal and Judy's," Sandoz said. "Through these connections, our food sciences students can work or volunteer with these clients and receive vital experiences that prepare them for their careers and hopefully keep them in Louisiana upon graduation."

FOODii is well positioned to grow. The current facilities in Ingram Hall and the Animal and Food Sciences Laboratories Building have 11,323 square feet available. Phase 1, which added a new bottling line, is now operational, and with the addition of Phase 2, the total space will grow to 19,126 square feet. It will feature the bottling line plus refrigeration and freezer spaces, a storefront and more.

V. Todd Miller is an assistant communications specialist with LSU AgCenter Communications and assistant editor of Louisiana Agriculture.



Gaye Sandoz is the director of the LSU AgCenter Food Innovation Institute. Photo by Olivia McClure

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ON THE COVER: Suncredible Yellow sunflowers reached the status of Super Plant in 2021. They have been a top performer for the past few years in trials at the Hammond Research Station in Hammond, Louisiana. They thrive in full sun and take the heat as well as any flower available. Pollinators love them, and they keep blooming through fall. Purchasing Super Plants from local nurseries helps the economy and makes the state more beautiful. Photo by Ashley Edwards

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AgCenter, USDA and LDAF reps meet for rolling crops field day

The LSU AgCenter Central Region held an Interagency Rolling Crops Field Day on July 20, 2021, with stops at farms that produce pecans, sugarcane, beef cattle, soybeans and crawfish. Mark Carriere, extension agent in Pointe Coupee Parish, led the group, which also included representatives from the U.S. Department of Agriculture and the Louisiana Department of Agriculture and Forestry. Among the stops were the following:

- At Gus May's farm in Ventress, AgCenter agent Michael Polozola discussed diseases and recommendations for growing pecans. AgCenter animal scientist Glen Gentry discussed feral hog eradication efforts using sodium nitrite. He was joined by LDAF feral hog control specialist Gene Cavalier, who discussed different trapping systems.
- At the Joe Beaud III farm in Morganza, AgCenter sugarcane specialist Kenneth Gravois discussed the sugarcane crop and challenges that hemp growers face.
- At Matt Frey's beef cattle farm in Morganza, AgCenter regional beef specialist Ashley Edwards and Guillermo Scaglia, LSU AgCenter ruminant nutrition and forage systems specialist, discussed beef research. Edwards also discussed the new Beginning Farmers program, which is a complement to the established Master Farmer program. **Johnny Morgan**

Teens learn life skills in 4-H workshop

A group of 10 teenagers from across New Orleans spent all day June 2, 2021, learning life skills at the Orleans Parish 4-H Healthy Living Workshop. LSU AgCenter 4-H youth development agent Alisah Okoro, who conducted the workshop, said the 13-to-18 age group is sometimes overlooked, and she wanted to do something about that. The workshop focused on meal and snack planning, reading and following a recipe, identifying cooking terms and equipment, and the importance of incorporating physical activity into their daily routine. The workshop was funded by a grant from the Walmart Foundation. **Johnny Morgan**



Chef Tasheena Butler from the Delgado Community College culinary department, center, helps students prepare their lunch during the Orleans Parish 4-H Healthy Living Workshop. Photo by Johnny Morgan

Two new sugarcane varieties introduced at field day

Two newly released sugarcane varieties took center stage at the LSU AgCenter Sugar Research Station's first live field day since 2019 after the coronavirus pandemic forced a virtual version last year.

Attendees of the July 21 event included some from as far away as Seattle and the nation of Colombia as well as new LSU President William F. Tate IV. They braved hot weather and muddy conditions to hear about fertilization techniques, pest control, cover crops and the two new varieties. L14-267 is the latest AgCenter release, while HoCP 14-885 is a U.S. Department of Agriculture variety. AgCenter sugarcane breeder Collins Kimbeng said both have shown promise in field trials.

"Plant breeding is like finding a needle in a haystack," Kimbeng said. "It takes about 12 years to get enough information to release a new variety, starting with 100,000 seedlings and going through numerous stages. By the time we release a new variety, we have good information about how it will perform." **V. Todd Miller**

Conservation, water quality topics at field day

Researchers discussed sustainability, farmland conservation and better water quality at the Cotton and Grain Field Day held at Somerset Plantation in Tensas Parish on June 24, 2021. Attendees took part in learning opportunities and hands-on demonstrations that highlighted the benefits of the best management practices that LSU AgCenter researchers are studying as part of a \$1.4 million grant from the Patrick F. Taylor Foundation. Producers attended the event to learn about improving ecosystem services and reducing chemical fertilizer losses — practices that researchers ensure are environmentally and financially sustainable. The Hardwick Planting Company's Somerset Plantation is one of two model farms of the Taylor Project and contains the cotton and grain portion. **Rexanna Powers**



Tensas Parish farmer Mead Hardwick (third from left) was presented the Outstanding Master Farmer Award for 2020 at the Cotton and Grain Field Day. Left to right: Mike Salassi, LSU AgCenter associate vice president; Stephen Austin, president of Louisiana Land Bank; Hardwick; and Eric Bergeron, Gowan Company representative. Photo by Rexanna Powers

College of Ag launches Career Closet

The LSU College of Agriculture will launch a new project during Ag Career Prep Week in November 2021 to support students in their professional development journey. It's called the Career Closet and it will make the student experience of finding professional attire more accessible, affordable and sustainable.

Ashley Grant, manager of internships and student engagement, said, "Career Prep Week is all about helping students build their professional network and engage in career development outside of the classroom. First-year students through graduating seniors can benefit from meeting with the employers, alumni and industry partners who attend events like the Etiquette Dinner and Ag Career Fair."

Gently used professional attire for the Career Closet is being collected from alumni, faculty, staff and friends of the college. As part of the Career Closet Pop-Up Shop, agriculture students will be able to shop these items for free. **Malorey Uzee**

Trajé, Maya Textile Artistry on display at Textile & Costume Museum

The Trajé, Maya Textile Artistry Exhibit on display at the Textile and Costume Museum in the Human Ecology Building on the LSU campus features the Travis Doering collection of textiles and related artifacts from 40 Mayan villages in the Guatemala highlands. It is curated by Jenna Tedrick Kuttruff, professor emerita, and Alexandra Forestier, graduate assistant, both in the Department of Textiles and Apparel Management. Trajé, or traditional dress, has deep significance to the Maya people. The tradition of weaving and symbolism has been passed from mothers to daughters for hundreds of years and supports the legacy of craftsmanship that defines the Guatemalan Maya culture. Accompanying the textile exhibition are photographs by photojournalist Connie Frissbee Houda depicting the spirit and sacredness of the Mayan people and their surroundings. **Jenna Kuttruff**



The Trajé, Maya Textile exhibit is in the Human Ecology Building. Photo by Olivia McClure

Internships are still underway despite pandemic

Participating in an internship is an excellent opportunity for students to gain practical experience related to their field of study or career field and helps make students marketable with employers. Students in each of the college's eight majors participated in summer internships in Louisiana and across the country. Many employers offer internships to assess potential job candidates and build a pipeline of talent for future hires. Despite setbacks caused by COVID-19, many students can still have in-person internship experiences, or their employers allowed them to participate in a virtual internship. **Annabelle Lang**



Hannah Laville, a senior in natural resource ecology and management, interned with the U.S. Department of Agriculture Natural Resources Conservation Service this summer in Clinton, Louisiana. Her responsibilities included meeting with landowners to discuss land management goals, surveying land to identify resource concerns and creating conservation plans to address those resource concerns. She is shown holding a sample of salvinia infested with a weevil used to eat and destroy this invasive weed. Photo provided by Hanna Laville



Mary Ponti, a senior in natural resource ecology and management, interned with the Audubon Nature Institute in New Orleans this summer. She assisted keepers in caring for different exotic animals, including giraffes, okapis and bongos. She also worked on a research project measuring habitat use of species housed at the survival center. Photo provided by Mary Ponti

From Our SOCIAL MEDIA

Join the LSU AgCenter on social media. AgCenter researchers and extension agents reach out via the web with videos, articles and helpful hints on Facebook, YouTube, Twitter and Instagram.

Join the conversation by following the LSU AgCenter.

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Facebook at facebook.com/LSUAgCenter

JULY 1 | July is the time for figs in Louisiana, and many of the popular varieties around the state have come from a breeding program at the LSU AgCenter, including LSU Purple, LSU Gold, Champagne, Tiger and O'Rourke.



JULY 28 | Daniel Swale, LSU AgCenter entomologist, is teaching his son how to keep bees! If you're interested in beekeeping, view the LSU AgCenter Beginning with Bees publication here: <https://bit.ly/BeginningwithBees>.

▶ YOUTUBE | View this video and our extensive
archive at youtube.com/user/LSUAgCenter

MAY 31 | Daniel Edgar, owner of St. Mary Seafood & Marina and star of Swamp People, provides a tour of his soft-shell blue crab operation in Franklin, Louisiana.



Instagram | Follow the AgCenter at
instagram.com/LSUAgCenter

JULY 8 | Meet Collins Kimbeng, sugarcane breeder at the LSU AgCenter. For decades the LSU AgCenter has built plant breeding programs to improve the crops that Louisiana farmers produce.

JULY 25 | Apple snails are an invasive species in Louisiana. They lay bright pink egg masses on structures and plants emerging from the water.



Twitter | Follow the AgCenter at
twitter.com/LSUAgCenter

JUNE 25 | Congratulations to the Louisiana 4-H Shooting Sports team on their 2021 national championship! Back-to-back consecutive titles!

in LINKEDIN | Follow the AgCenter at
linkedin.com/company/lsu-agcenter

JULY 6 | Hemp research is in progress at the LSU AgCenter. Samuel des Bordes and Kaylee Deynzer, LSU School of Plant, Environmental and Soil Sciences graduate students, are working on research to identify optimal production practices for cannabis cultivation in Louisiana as well as investigating ways to mitigate southern blight incidence in production systems.



■ There are two types of industrial hemp: essential oils (cannabidiol, or CBD) and hemp for fiber and grain.

Photo by Anna Ribbeck

BUDDING OPPORTUNITIES for Industrial Hemp in Louisiana

Michael A. Deliberto

The 2018 Farm Bill cleared the way for the commercial production of hemp within the United States and, in so doing, established hemp as a row crop alternative with the potential to be economically lucrative for U.S. producers.

Within the provisions of the 2018 Farm Bill, each state that was interested in the cultivation of hemp had to submit an industrial hemp production plan to the U.S. Department of Agriculture for preliminary approval before any hemp-related activities could begin. Louisiana's state industrial plan for the production of hemp was approved by the USDA in December of 2019. Upon federal approval of Louisiana's plan, the Louisiana Department of Agriculture and Forestry (LDAF) was tasked with the responsibility of accepting and vetting license applications for the production, transportation and processing of industrial hemp within Louisiana. Industrial hemp can be planted or cultivated in a field, in a greenhouse or in indoor growing structures.

As of April 2021, there were 100 licensed hemp growers, 14 licensed hemp carriers (people who transport from field to processor), 18 licensed seed producers and 36 licensed processors in Louisiana. In Louisiana, there were 932 acres of industrial hemp reported to the LDAF in 2020. Only 172 acres (18.5%) were harvested, with 756 acres (81.1%) being destroyed by either weather conditions or disease.

The economic consequences from these threats are dependent upon the scale of a grower's investment in the crop prior to crop failure. In the absence of varieties uniquely suited to Louisiana's growing climate, environmental factors represent a large hurdle for the industry, but this is expected to change with ongoing research.

The potential for industrial hemp production was greeted by potential growers with a mix of both optimism and excitement. Industry advocates tout the crop's sustainability and versatility, stressing their view that hemp should be seen as

an environmentally friendly alternative to a wide variety of other crops and synthetic products. Fundamental questions, however, remain surrounding the feasibility, deliverability and profitability of this new crop enterprise. Oftentimes, cost of production can pose as a barrier to entry for those interested in a new crop or business endeavor. Differences in end-use applications for industrial hemp is a principal factor in driving the cost of production. Industrial hemp flowers cultivated for cannabidiol (CBD), a chemical used in the health industry, is the most attractive end-use for industrial hemp because early net return estimates per acre have been attractive.

From production, marketing and regulatory guidelines, significant risks are still associated with the production of industrial hemp and serve to foment market volatility for CBD. This uncertainty extends throughout the production chain as retail markets for CBD are not yet fully understood and CBD demand remains unclear.

Economic modeling to estimate the cost of production for CBD are categorized for both labor-intensive, small-scale production and large-scale production coupled with mechanical harvesting. Recently, the overproduction of CBD depressed prices. Growers are developing production systems using current equipment lines to address challenges encoun-

tered during field cultivation and harvest operations. Fiber production models may be the latest sector to develop, but underdeveloped infrastructure in the disjointed supply chains remains a barrier.

Those in the industry describe the disjointed supply chain as a “chicken-and-egg scenario.” Farmers won’t grow it because they cannot find processors to buy it, and few processors have emerged because most cannot find a steady source of supply from farmers. Nevertheless, once everything has been ironed out and the hemp market and supply chain mature, hemp fiber holds tremendous promise for the industry. Brands such as Georgia-Pacific, Nike and Patagonia have announced initiatives to make hemp-based fiber products. Once companies with market-ready products seek out contracts for raw hemp fiber, acreage could increase dramatically in a short period of time. Interest in hemp production has been transitioning from CBD to fiber production, especially as prices for CBD are declining, according to industry groups.

Production costs for industrial hemp are greatly influenced by end-product usage. For example, industrial hemp destined for grain and fiber production are estimated to range from \$240 to \$320 per acre. Hemp produced in a row crop production system for CBD and grain can range from \$370

Samuel des Bordes,
graduate assistant,
examines hemp plants at
the LSU AgCenter Plant
Materials Center in Baton
Rouge, Louisiana.

Photo by Anna Ribbeck



to \$490 per acre. The most expensive production system for CBD, which uses raised plastic-covered beds with fertigation, ranges upwards of \$9,000 per acre. The cost of transplanted plant slips is estimated to range from \$5,000 to \$7,500 per acre (56% to 83% of total cost).

The hemp market was strong in 2019. However, with more states coming on board with the authorization of production, the market corrected itself in 2020 because surplus from the previous crop year was met with expanded acreage (and resulting biomass) in 2020. Prices were then sent in a downward trend. Some in the industry point out the fact that the 2020 price decline may have removed some of the irrational exuberance of the market entrants seen a year earlier, tempering the get-rich-quick element that likely saturated the market. As of March 2021, robust inventories of CBD biomass and extracted products coupled with reports of increasing demand have not yet translated into any significant recovery for prices.

With the planting of the 2021 crop, U.S. growers are entering their third season of federally legal commercial hemp cultivation. It is not surprising that prior years have seen missteps by new growers as they familiarize themselves with the crop while also working to build markets from hemp and hemp-products. To operate on a larger scale, some growers have invested in machinery or used existing row crop machinery (field cultivators, disking implements, etc.) with the latter placing a stronger emphasis on traditional commercial farming practices to produce hemp. Differences still remain between commercial row farming and hemp farming — namely the lack of herbicides and insecticides.

Another challenge in the seemingly constantly changing arena of industrial hemp is research. Several companies have entered and exited the business space in the past couple of years. This makes trying to establish relationships with them difficult. At the university level, getting access to the same seed sources can also be difficult. But as seed certification procedures are put in place for hemp varieties, this will facilitate research. With the passage of each additional growing season, more information regarding the production of hemp, variety selection, planting, harvesting and other best management practices will become available and serve to furnish producers enhanced knowledge and insight, ultimately enabling them to make better informed decisions.

Vertical integration has prompted many producers in the hemp industry to combat the disjointed supply chains. By integrating their businesses vertically, farming, manufacturing, marketing and sales fall under the same roof. This could serve as a means for growers to lower their costs and improve their operational efficiencies that may not necessarily be within their core competencies.

Emerging trends for 2021 could include more hemp products geared toward health with CBD's growing presence in the medical industry, hemp food products and biofuels production. But market volatility surrounding hemp makes any economic projections difficult.

Although the production of industrial hemp in the U.S. and Louisiana continues to be met with its share of challenges, the multifaceted opportunities for industrial hemp provide a degree of optimism that it can gain a foothold in the agricultural landscape of the Midsouth. Should grower-driven, university-led research efforts yield trial data results that corroborate the claims of advocates, the market for industrial hemp could expand, signaling a demand for increased production, thus placing industrial hemp in a place where it would compete for production acreage.

Michael A. Deliberto is an assistant professor in the Department of Agricultural Economics and Agribusiness.

Challenges of Growing Industrial Hemp in Louisiana

As a result of the 2018 Farm Bill, there was much interest in Louisiana in growing industrial hemp, so the LSU AgCenter formed a working group to explore this opportunity, according to Gerald O. Myers, professor at the LSU AgCenter School of Plant, Environmental and Soil Sciences.

Since no one had any real experience growing hemp, at least legally in the state, since the 1930s, he and fellow working group colleague, AgCenter chemist Ted Gauthier, joined a multistate project and travelled to Kentucky to learn a few best practices and bring some of that knowledge home.

Myers said there are two types of industrial hemp: essential oils (cannabidiol, or CBD) and hemp for fiber and grain.

Mainly because of CBD, the original numbers on the crop were promising, with some touting growers could make \$30,000 to \$40,000 per acre. Myers said this has yet to come to fruition.

"It's organically grown, so there are no labeled herbicides or insecticides," Myers said. "Therefore, there are a lot of hours devoted to cultivating it in the field, which costs time and money."

Growing hemp for fiber and grain relies on more temperate weather than Louisiana has, thus there isn't much history of growing it for that purpose in the Gulf region.

"We just don't get long enough day lengths like they do in more northern states," Myers said.

For those interested in growing industrial hemp, Myers said it should be done in tunnel houses or other types of controlled environments because growing it outdoors is difficult.

"We have several graduate students working on projects from date of planting studies to container studies to evaluating different strains and their productivity," Myers said. "Although the plant is considered a weed, it requires a lot more attention than a weed."

V. Todd Miller, assistant communications specialist, LSU AgCenter

LOUISIANA SUPER PLANT Selections for 2021



Jeb S. Fields

The Louisiana Super Plant program, which was established in 2009, is an education campaign of the LSU AgCenter that identifies superior plant material for Louisiana landscapes. The plants named as Louisiana Super Plants have gone through rigorous trials at multiple AgCenter locations across the state, as well as being approved by the Louisiana landscape and nursery industry.

So far, there are 56 selections in the program, including the following four new selections for 2021: Beacon impatiens, Suncredible Yellow sunflower, Muhly grass and Supertunia Mini Vista Indigo.

BEACON IMPATIENS

This plant is one of the top performers in trials at the Hammond Research Station in Hammond, Louisiana. It offers amazing warm-season color in shade gardens. Impatiens have long been a staple crop for shady Louisiana landscapes; however, with our high heat and humidity that extends throughout the night, some impatiens can develop mildew issues. Not the Beacons. They have mounds of color and pop in the shade without the disease issues. They come in a wide variety of flower colors and deep green foliage.



Beacon impatiens come in many different colors. Photo by Ashley Edwards

SUNCREDIBLE YELLOW SUNFLOWER

This plant is another of the top performers for the past few years in the Hammond trials. Quite the opposite from Beacon, Suncredible Yellow sunflowers thrive in full sun and take the heat as well as any flower available. Excellent for pollinators, these indeterminate sunflowers steal the show with a mound of color. Unlike most other sunflowers, Suncredible keeps blooming and branching, providing color into fall.



Suncredible Yellow helianthus make excellent container plants. Photo by Ashley Edwards

MUHLY GRASS

The third Louisiana Super Plant for 2021 is a longtime landscape favorite and native grass — *Muhlenbergia capillaris* — commonly known as Muhly grass. This native plant is a workhorse in the landscape, thriving in many conditions and resisting almost anything it encounters. One of the few ornamental grasses grown for its flowers, Muhly grass blooms with lacy pink flowers in the fall when most other grasses are turning down for the year. Muhly grass does well in sun or part shade, handles wet and dry soils, and is just plain adaptable. Hardy throughout the state, Muhly grass can grow 3 to 4 feet tall and spread 3 to 4 feet wide, which can be enjoyed as a single specimen or planted in bunches. Muhly grass is low maintenance, has year-round landscape appeal, and is one of the most drought-tolerant grass species available.



Muhly grass provides featherlike flowers in the landscape. Photo by Ashley Edwards

SUPERTUNIA MINI VISTA INDIGO

Petunias are some of the best cool-season plants in Louisiana, and this year we have added Supertunia Mini Vista Indigo as a Louisiana Super Plant. Supertunia Vista Bubbegum is still one of the favorite cool-season Louisiana Super Plants and one of the best landscape petunias for Louisiana Landscapes; however, the Supertunia Mini Vistas bring some added excitement. The mini part of the name indicates smaller flowers, which add a unique look and feel to the landscape. The Indigo also brings a distinctive color, with individual flowers ranging from soft white to lavender to deep indigo. The extreme flower density and vigor ensures that these will be well received in any garden. Grown in full sun, these make an excellent addition for the cool season, providing color, texture and appeal from November through May. These also grow well in containers.



Supertunia Mini Indigo has a unique display of colors in the same plant. Photo by Ashley Edwards

Jeb S. Fields is an assistant professor and extension specialist at the Hammond Research Station, Hammond, Louisiana.

Seed Treatment of Beneficial Bacteria Enhances Soybean Growth and Health

Jong Hyun Ham

Many farmers support advanced technologies to reduce inputs that result in greater sustainability and profitability on their farms and protect the inputs they do use. One area of interest is improving the efficacy of seed treatments with active chemical or biological materials, which could be a more cost-effective way to deliver crop protection inputs.

The global seed treatment market is envisioned to grow from \$6.4 billion in 2020 to \$11.3 billion by 2025, according to the MarketsandMarkets research service. This indicates great potential for the seed treatment industry and the demand for more innovative and effective products. The study of seed treatments is critical to ensuring that products are both economically and environmentally beneficial.

Beneficial microorganisms, including fungi and bacteria, are considered excellent for seed treatments because they would be less harmful to the environment than chemical materials. Moreover, beneficial microorganisms would provide long-term positive impacts on plant growth if they can successfully colonize host plants and persist after the initial stages of development.

There have been numerous studies reporting the effects of seed treated with beneficial microorganisms on various crops, including soybean. The mechanisms underlying the beneficial effects on plants include:

- The increase of available plant nutrients through metabolic activities such as nitrogen fixation, phosphate solubilization and production of siderophores, which help transport iron across cell membranes.
- Production of plant growth hormones, such as indole-3-acetic acid (IAA or auxin).
- Suppression of diseases through antagonistic activities against pathogens or by inducing plant defense systems.

In addition to growth promotion and disease suppression, protection from abiotic stresses, such as drought, flooding, nutrient deficiencies or abnormally high or low temperatures, is another beneficial mechanism that some plant-growth promoting rhizobacteria provide to host plants. Beneficial bacteria in soybeans and other legume plants have been studied with the diverse aspects of growth-promoting activity mentioned above. Particularly, rhizobia, which are symbiotic nitrogen-fixing bacteria that cause the formation of nodules on legumes, are an important group of beneficial bacteria for soybeans and other legume crops. Some strains of rhizobia demonstrate multiple beneficial roles, including synthesis of indole-3-acetic acid, production of siderophores and suppression of plant pathogens. Bacterial endophytes of soybeans — bacterial organisms that live within soybeans —

have also been reported to exert positive effects on growth, nodulation and disease suppression.

With the support of the Louisiana Soybean and Grains Research and Promotion Board, we have screened and characterized soybean rhizobacteria from Louisiana soybean fields based on their various beneficial activities for the growth and health of soybean plants to develop biological agents for soybean seed treatment. The first screening process was performed focusing on antifungal activity against a fungal soybean pathogen, *Rhizoctonia solani* (Figure 1). Interestingly, three of the bacterial isolates showing strong antifungal activities against the fungal pathogen also enhanced the growth and root development of soybeans in greenhouse trials (Figure 2). Although none of the three strains showed growth-promoting activity in field trials, we observed a substantial reduction of purple seed stain caused by *Cercospora kikuchii* with one of the three strains tested and the commercial seed-treating product, indicating that the bacterial strain is a good candidate of biological agent that can be used for seed treatment.

Furthermore, we extended the screening of rhizospheric bacteria based on other beneficial activities that were previously mentioned, including IAA production, nitrogen fixation, phosphate solubilization and siderophore production. Several strains of these beneficial bacteria showed significant growth-promoting activity when used to treat soybean seeds. Most biostimulants and biofertilizers are formulated with a single promising biological agent, which could result in a significant reduction of activity when the environment is not favorable. To avoid this type of risk, as well as to increase beneficial activity through additive or synergistic effects, we have formulated and tested mixtures of multiple bacterial agents with different types of biological activities beneficial to soybean growth and health. Strikingly, certain combinations of multiple bacterial strains caused a substantial increase of soybean growth and yield, indicating additive or synergistic effects of simultaneous seed treatment with multiple beneficial bacteria (Figures 3 and 4).

In greenhouse tests to compare with conventional fertilization, seed treatments with those bacterial mixtures were more effective than the application of a commercial fertilizer in the pot soil. In a preliminary field trial at the LSU AgCenter Central Research Station in Baton Rouge, they also produced soybean plants showing smaller damages of foliar diseases and insect pests compared to the control group, which had no seed treatment. Each bacterial mixture tested is composed of nine to 23 bacterial strains. With new funding from the United Soybean Board, we are conducting field trials with

these bacterial mixtures in three locations of Louisiana (Baton Rouge, Alexandria and Bossier City) and optimizing formulation conditions through testing various protective materials and subsets of each bacterial mixture (Figure 5).

Beneficial microorganisms that facilitate the growth of plants have long been studied as an ideal biological tool to improve crop production in environmentally friendly ways. We are working to develop an innovative seed treatment technology with bacterial agents that originated from Louisiana soils through designing bacterial mixtures based on biological data of their components. This study will greatly contribute to the sustainable production of soybeans in Louisiana through the reduction of crop management costs for fertilization and pesticide application, an increase in productivity and the improvement of soil health and food safety.

Jong Hyun Ham is a professor in the Department of Plant Pathology and Crop Physiology.

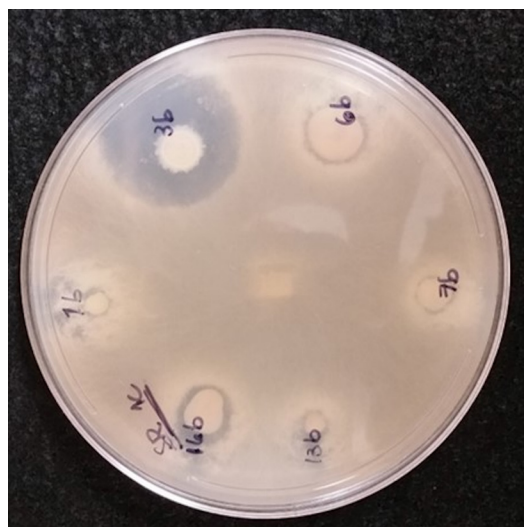


Figure 1. A soybean-associated beneficial bacterium showing antifungal activity against the fungal pathogen *Rhizoctonia solani*. The large inhibition zone surrounding the bacterium indicates its antagonistic activity against the fungal pathogen grown on the culture medium. Photo by Rosalie Calderon



Figure 2. Soybean plants grown from the seeds without any treatment (left), with a commercial seed treatment product (center), and a selected bacterial agent (right). This picture shows the more vigorous growth of soybean plants grown from the seeds treated with a selected beneficial bacterium. Photo by Rosalie Calderon



Figure 3. Soybean plants grown from the seeds 1) without any treatment, 2) with a commercial seed treatment product, 3) the bacterial mixture No. 1, 4) the bacterial mixture No. 2, and 5) the bacterial mixture No. 3 (from left to right). This picture shows the more vigorous growth of soybean plants grown from the seeds treated with bacterial mixtures of beneficial bacteria. Photo by Rosalie Calderon



Figure 4. Soybean pods harvested from one plant grown in the greenhouse. Imposed seed treatments for this result are no treatment check (T1), a commercial seed treatment product (T2), the bacterial mixture #1 (T3), the bacterial mixture #2 (T4), and the bacterial mixture #3 (T5). This picture shows the yield increase from the seed treatments with bacterial mixtures of beneficial bacteria. Photo by Rosalie Calderon



Figure 5. Rosalie Calderon, a Ph.D. candidate of the Department of Plant Pathology and Crop Physiology, is testing beneficial bacteria for their growth-promoting activity on soybean plants. Photo by Johnson Leonard

SOIL

A Habitat for Beneficial Microorganisms

Jayvee Cruz, Brenda Tubaña, Lisa Fultz and Jong Ham

Soil has many functions in our ecosystem, with the most notable being a medium for plant growth. Soil holds and supplies many plant-essential nutrients and is populated by multitudes of microorganisms, including bacteria and fungi, that are influential on plant growth.

The rhizosphere, from the Greek word *rhizo* or *rhiza*, which means root and sphere, is the zone where the soil is under the influence of the plant's roots. It is the region where the roots generate and release simple and complex sugars, growth regulators, amino acids, enzymes, etc., and is the site where intense microbial activity occurs. The diversity of microorganisms is important in maintaining soil quality and in enhancing plant growth. Plants are healthier and become more stress-tolerant when grown on soils inhabited by diverse microbial communities.

Plant growth-promoting rhizobacteria is a group of microorganisms that actively colonize the rhizosphere and exert beneficial effects on plant growth. These beneficial rhizobacteria affect plant growth and survival through direct and indirect mechanisms. The direct mechanisms include fixation of atmospheric nitrogen — an essential nutrient to plants — and production of various enzymes and phytohormones. The indirect mechanisms include production of antibiotic and siderophore, parasitism to pathogens and scavenging of nutrients from the soil. All of these affect plant growth and tolerance to stressful conditions in the field, such as salinity and flooding.

Silica solubilizing bacteria are rhizobacteria that can transform silica to orthosilicic acid, which is a plant-usable

form of silicon. Silicon is a beneficial nutrient with an outstanding role in enhancing plant defense mechanisms against stress from insects and pathogens. Silicon is accumulated in the form of silica gel and is deposited in the shoot and leaf epidermal cells, which can strengthen the mechanical structure and protective layers of plants. Another way silicon improves plant defense is through induction of systemic resistance inside the plant.

An LSU AgCenter research project was designed to identify and isolate silica solubilizing bacteria from soil and document the plant-growth promoting contributions of these bacteria. Soil samples were taken from sugarcane, rice, soybean, corn and wheat fields across Louisiana. From these soil samples, 130 bacteria were isolated with 20 isolates capable of solubilizing silica. These isolates also solubilize phosphorus and produce multiple plant growth-promoting compounds.

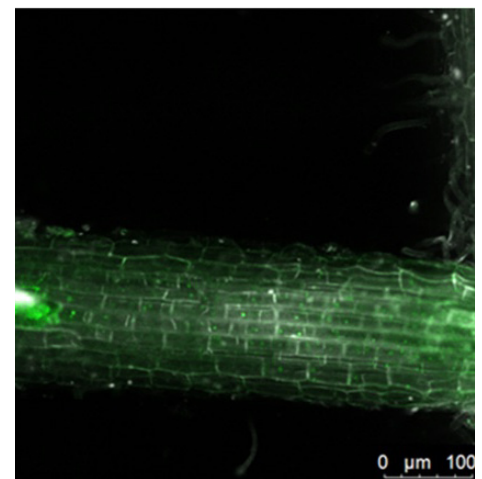
A suitable carrier is needed to facilitate the distribution of silica solubilizing bacteria isolates during application. This study examined survival of silica solubilizing bacteria in different carriers, including the byproducts from sugarcane production (bagasse) and rice production (rice hulls). The highest population of silica solubilizing bacteria was sustained for 150 days with a bagasse plus soil mixture carrier. Not only does this study suggest that the potency of these bacteria as a biostimulant can last for several months but it also brings value to bagasse.

Further work with one of the isolates revealed its ability to colonize root tissues of two-week old rice seedlings, which indicates that the application of

this biostimulant is possible through seed treatment. The process involved inoculating the roots of rice seedlings with silica solubilizing bacteria tagged with a protein that fluoresces green under a microscope.

The availability of a practical means of applying biostimulants is essential to scale up this technology. The outcomes of this study are important and foundational for developing bio-based approaches to improve crop performance. The availability of bio-based production technologies such as biostimulant application to soil and plants is essential to keeping the crop industry sustainable, productive and friendly to the environment.

Jayvee Cruz is a graduate student in the School of Plant, Environmental, and Soil Sciences. Brenda Tubaña holds the Jack E. and Henrietta Jones Professorship and Lisa Fultz is an associate professor in the School of Plant, Environmental, and Soil Sciences. Jong Ham is a professor in the Department of Plant Pathology and Crop Physiology.



Bright green dots inside the rice roots indicate the presence of the protein-tagged silica solubilizing bacteria. Photo by Jayvee A. Cruz



This sample of soil and tillage radish roots is entangled with mycelia and earthworms. Soil provides a niche for different organisms that promote nutrient cycling and plant growth. Photo by Daniel Forestieri



Different inoculant carriers for silica solubilizing bacteria consisting of silicate slag, fresh and burned bagasse, fresh and burned rice hull, soil and their mixes. Photo by Jayvee A. Cruz

On-farm research identifies options for managing fungicide-resistant aerial blight of soybean

Trey Price, Boyd Padgett, Myra Purvis, Dustin Ezell, Dustin Harrell, James Leonards, Fred Collins, Laura Lee, Jeremy Hebert and Jimmy Meaux

In areas of Louisiana where rice and soybean rotations are common, aerial blight of soybean (Figure 1) is a major problem. The fungal pathogen, *Rhizoctonia solani*, also causes sheath blight of rice (Figure 2). Since the late 1990s, strobilurin fungicides, which are known as QoI fungicides, have been used extensively in rice and soybean production to combat many foliar diseases. During the 2010s, field failures using these materials to manage aerial blight and sheath blight began to occur, particularly in the southwest portion of the state where 70%-75% of Louisiana rice is produced.

The concept of fungicide resistance is very similar to that of insect and weed resistance. One caveat is that fungicide resistance is not as easily noticed. Working with microscopic organisms, often the pathogens responsible for disease development are not as obvious as insect and weed pests. Resistant mutants naturally exist in the population, and repeated applications of fungicides eliminate sensitive individuals, leaving resistant strains. Resistant individuals then become dominant in the pathogen population. Most of the time, laboratory research in the form of poison plate assays or molecular testing is used to determine if fungicide resistance is occurring. Another way to detect fungicide resistance is with small-plot replicated field efficacy trials. If the products used to work and they no longer do, there likely is a resistance issue.

The aerial blight and sheath blight pathogen can survive in the soil for many years by producing sclerotia (Figure 3), which are small, hard masses that are the size of mustard seeds to purple hull peas and are white when fresh and brown when mature. Farmers need to keep in mind that any opera-

tion that moves infested soil is also moving *R. solani* to new areas, thereby making sanitation a key management consideration. In the case of aerial blight in soybean, rain splashing transports the pathogen in contact with plants, and flooding floats sclerotia directly in contact with rice. High humidity, frequent rainfall events and warm temperatures fuel epidemics. There are rice varieties somewhat resistant to sheath blight; however, it is unknown if there are current soybean varieties that have any resistance to aerial blight. It is also unknown if QoI-resistant strains incur a fitness cost with the mutation. For example, resistant strains would have lower growth and reproduction rates than sensitive ones.

With limited crop rotation options and long-term survival potential of the pathogen in the soil, the only current management option for aerial blight of soybean is application of effective fungicides. QoI resistance in *R. solani* has not yet been documented on LSU AgCenter research stations. Therefore, out of necessity, research to fight this problem has been conducted on farms where resistance has been documented or suspected. Over the past six growing seasons, multiple Louisiana soybean farmers have allowed researchers to conduct small-plot replicated research trials that are 0.25 to 0.5 acres in total area in their fields with the aim of identifying effective fungicide options for aerial blight management. Research trials were focused on identifying experimental and commercially available fungicides effective on QoI-resistant *R. solani*.

Conducting research on farms is more challenging than it is on research stations. When beginning this project, re-

Table 1. Effective fungicides for management of QoI-resistant aerial blight in soybean.

Active Ingredients (%)	Brand Name	Use Rate (fl oz/acre)
inpyrfluxam (31.25%)	Excalia 2.84 SC	2.0
flutriafol (26.47%) bixafen (15.5%)	Lucento 4.17 SC	3 - 5.5
pydiflumetofen (6.9%) difenoconazole (11.5%)	Miravis Top 1.67 SC	13.7
pyraclostrobin (28.58%) fluxapyroxad (14.33%)	Priaxor 4.17 SC	4.0 - 8.0
mefentrifluconazole (11.61%) pyraclostrobin (15.49%) fluxapyroxad (7.74%)	Revytek 3.33 SC	8.0 - 15.0
benzovindiflupyr (2.9%) azoxystrobin (10.5%) propiconazole (11.9%)	Trivapro 2.21 SC	13.7 - 20.7

searchers would have to apply treatments with a hand boom and harvest plots by hand, making it highly labor intensive. More recently, with funding obtained from outside sources, researchers were able to purchase a self-propelled multi-boom transportable plot sprayer that could be used to spray trials more efficiently with minimal impact to growers' fields. Once soybeans reached the appropriate growth stage, which was usually R3 to R5, or when aerial blight was first observed, which was sometimes as early as R2, researchers would travel to the farm and apply the fungicide treatments. Initial disease ratings were recorded along with two to three disease ratings throughout the season to monitor disease development over time. At the end of the season, we would estimate yields or coordinate with H. Rouse Caffey Rice Research Station personnel to harvest plots with a specialized combine. Parish agents greatly facilitated coordination with farmers and were a big help in executing trials.

Results from the on-farm experiments confirmed that QoI materials are no longer a viable option for managing aerial blight in some areas. Further, results from multiple experiments over locations and years implicate several succinate dehydrogenase inhibitor (SDHI) fungicides as viable alternatives for QoI-resistant aerial blight management. Properly timed applications of SDHI fungicides at appropriate water volumes resulted in significantly less aerial blight damage and preserved yields (Table 1).

Although helpful, the identification of alternative fungicides for aerial blight management is a relatively short-term solution. Fungicides with very specific modes of action historically have been short-lived in their usefulness, and it is only a matter of time before fungal pathogens develop resistance. Future research should continue to focus on experimental fungicides and commercial fungicide use patterns as well as identification and development of soybean varieties resistant to aerial blight.

Acknowledgments: Louisiana soybean farmers for allowing research on their farms and the Louisiana Soybean and Grain Research and Promotion Board for financial support

Trey Price is an associate professor based at the Macon Ridge Research Station, Winnsboro, Louisiana; Boyd Padgett is a professor based at the Dean Lee Research and Extension Center, Alexandria, Louisiana; Myra Purvis and Dustin Ezell are research associates at the Macon Ridge Research Station; Dustin Harrell is a professor and research coordinator at the H. Rouse Caffey Rice Research Station, Crowley, Louisiana; James Leonards is a research associate at the H. Rouse Caffey Rice Research Station; Fred Collins and Laura Lee are research associates at the Dean Lee Research and Extension Center; Jeremy Hebert is an extension agent in Acadia Parish; and Jimmy Meaux is an extension agent in Calcasieu Parish.



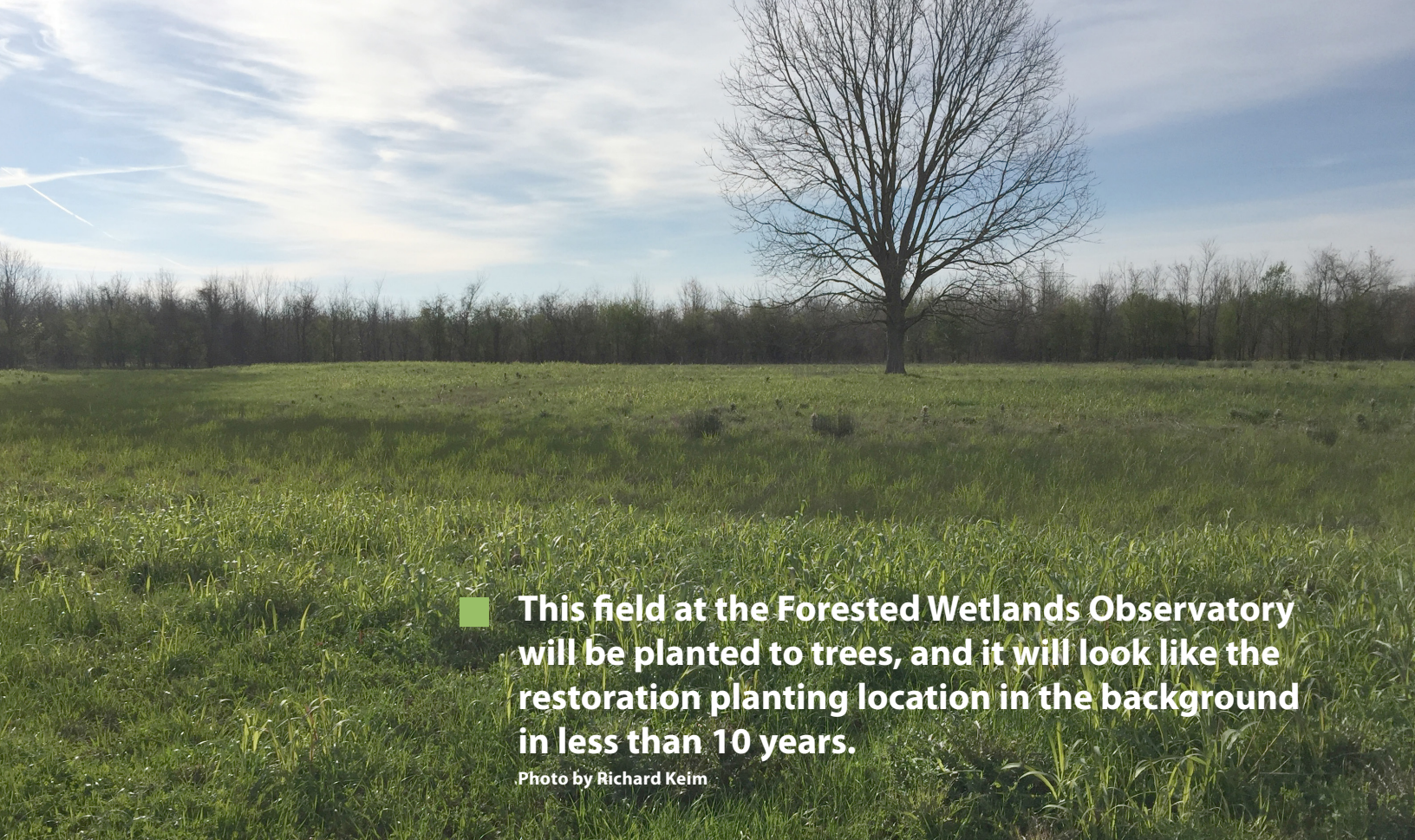
Figure 1. Aerial blight of soybean.



Figure 2. Sheath blight of rice.



Figure 3. Sclerotia (survival structures) of *Rhizoctonia solani*, causal agent of soybean aerial blight.



■ **This field at the Forested Wetlands Observatory will be planted to trees, and it will look like the restoration planting location in the background in less than 10 years.**

Photo by Richard Keim

Improving Science and Management of Louisiana's Forested Wetlands

Richard Keim

Wetlands are a prominent part of Louisiana and managing them well is critical for the future. The School of Renewable Natural Resources has a leading role in supporting management of forested wetlands of the state through research, teaching and extension. Two recent events — establishment of the Forested Wetlands Observatory and the Louisiana Coastal Forest Workshop — promise to be landmarks in progress toward improving science and management in forested wetlands.

FORESTED WETLANDS OBSERVATORY

The Forested Wetlands Observatory is a public-private partnership dedicated to research, teaching and

extension on topics of importance for forested wetlands. It is being created on an 1,100-acre site at the LSU Ag-Center Central Research Station in Baton Rouge, which was formerly used for pasture. The project was initiated with a call for proposals from candidate private partners in November 2018 and the signing of a contract with the successful bidder, Spanish Lake Restoration LLC, in February 2020.

Through the private partner, most of the site will be restored to forested wetlands by reestablishing the forest and restoring the hydrological conditions that existed prior to artificial drainage for row crops and pasture. Accompanying the restoration work will be the research, teaching and extension observatory. Researchers will evaluate

efficacy of restoration treatments and use those treatments to test hypotheses about how forested wetlands function. The site will continue to be used as a field laboratory site for classes in the School of Renewable Natural Resources and other units in the LSU College of Agriculture, as it has been for many years. The observatory will also be an extension resource, where landowners and natural resource professionals can observe forested wetland management, ecology and hydrology.

The Forested Wetlands Observatory is being funded by a public-private partnership — the first of its kind in Louisiana — as a wetland mitigation bank, in which restoration treatments will generate wetland restoration “credits” to be sold to local land developers,

who require them to offset permitted wetland degradation elsewhere. This system of mitigation banking has been established by the U.S. Army Corps of Engineers, who uses it to provide flexibility for land development, while simultaneously achieving the goal of no net loss of wetland functions as required under the Water Quality Act. Wetland mitigation allows landowners to retain ownership and some uses of their land, and also is extremely important in urbanizing south Louisiana, where most development includes at least some wetlands. The public-private partnership structure of the observatory allows professional wetland mitigation bankers to perform the necessary regulatory and financial services, while the AgCenter and LSU focus on science, teaching and extension.

The legal structure of the mitigation bank is a lease by the private partner on the observatory land. The lease provides an annual payment to the AgCenter and, thus, a baseline funding source. Additionally, the wetland mitigation process requires inventory and monitoring of basic ecosystem structure and processes by the private partners, who are sharing those data with the observatory. This foundation of infrastructure, data and revenue is providing a platform for multiple external, competitive grant proposals.

LOUISIANA COASTAL FOREST WORKSHOP

The Louisiana Coastal Forest Workshop, co-organized with the Pontchartrain Conservancy, brought together scientists, managers, planners and advocates for science-based management of coastal forested wetlands in October 2020. This workshop built upon the 2005 “Science Working Group” landmark science-policy project led by the School of Renewable Natural Resources, which reviewed the scientific understanding of coastal forested wetlands to support urgent policy and planning needs by state agencies and private landowners.

The workshop focused on coastal Louisiana but also on other coastal forests in the southeastern U.S. Presenters highlighted ecological processes, such as responses of coastal forests to sea

level rise and saltwater intrusion, and current management issues, such as integration of forests into coastal restoration. One theme is that coastal forests are often intermediate cases that face management issues similar to both upland forests and coastal marshes, but also distinct from either.

The 2020 workshop represents a re-invigoration of this community of scientists, managers and policymakers in coastal forested wetlands. The Forested Wetland Observatory is expected to play an important role in the continuing leadership by the AgCenter. The entirety of the workshop was live-streamed on Facebook and can be viewed at the School of Renewable Natural Resources Facebook page.

Richard Keim is a professor in the School of Renewable Natural Resources



A water monitoring station emerges from receding floodwaters. Extensive instrumentation will make the Forested Wetlands Observatory an attractive site for a range of scientific objectives. Photo by Richard Keim



MEETING THE CHANGING NEEDS of the Specialty Crops Industry with Soilless Substrates

Jeb S. Fields

The specialty crops industry — which includes ornamentals, fruits, nuts and vegetables — is transitioning from field production to more container production and use of soilless substrates (growing media) to allow for more control. Soilless substrates, which are often byproducts from other industries, such as pine bark from the timber industry, consist of relatively large particles to provide ample drainage. Although soilless substrates have been used for years in ornamental plant production, they are new to other specialty crops, which have different needs.

The LSU AgCenter is leading an international team of seven universities and federal institutions that is assessing

the current and future state of soilless substrates. Specialty crop growers and allied suppliers across crop types and production systems participated in a three-phase assessment. The first phase involved a survey of more than 300 growers and suppliers to identify immediate needs and knowledge gaps when using or supplying soilless substrates. In the second phase, focus groups of growers from different geographical regions provided a deeper understanding of research wants and foreseeable opportunities when producing small-fruit, ornamentals, tree-fruit, nuts and vegetables using soilless substrates. In the third phase one-on-one interviews were conducted with 12 representatives of

regional, national and global suppliers, processors and harvesters of soilless substrates, which include pine bark, peat moss, coco coir, perlite and wood fiber. These sessions allowed researchers to gauge the substrate-related needs of growers and suppliers separately, without influencing or biasing any feedback through expectations.

Many traditional in-ground growers have or are considering shifting to soilless production, at least on some of their acreage. Soilless culture allows more control over cultural practices. This increased precision in production can allow for earlier or increased yield or output per area or per natural resource (land, water, fertilizer, etc.). However,



These are piles of soilless substrates separated by particle size for research purposes at the LSU AgCenter Hammond Research Station. Photo by Jeb S. Fields

“ The LSU AgCenter is leading an international team of seven universities and federal institutions that is assessing the current and future state of soilless substrates. ”

with this transition arises new complications. Soilless substrates currently in use are designed to “finish” crops uniformly and in a relatively short timeframe. Many transitioning specialty crops that yield fruits, nuts or vegetables can require much more time in production to be viable. Moreover, the goal of fruit crops is yield, while the goal of ornamentals is to finish. These two processes can potentially be supported differently by different substrate properties.

Growers and suppliers alike indicated that they need more in-depth and targeted information. They want support in soilless substrate research, especially in regard to decision-making tools, water and fertilizer management,

and more regionally specific solutions.

New or transitioning soilless growers were interested in return on investment and logistics of shifting to soilless production, while current and advanced soilless growers wanted more information on engineering and designing substrates with specific properties. It was widely desired that online tools or informational guides be developed for the different regions and individual specialty crops.

The industry identified education aimed at growers and suppliers as a primary need, with university research and extension being relied upon for support. New and alternative materials were also discussed in the supplier interviews,

as well as continued support of trade organizations, regional associations and research conferences.

Soilless substrate science is necessary for the continued growth and development of the specialty crop industry. Soilless substrates can allow for increased sustainability and environmental stewardship while providing new opportunities for continued expansion and profitability.

Acknowledgement: The U.S. Department of Agriculture National Institute of Food and Agriculture’s Specialty Crop Research Initiative (Award 2020-02629).

Jeb S. Fields is an assistant professor and extension specialist at the Hammond Research Station, Hammond, Louisiana.



This group of people in Solitude, a community in West Feliciana Parish, were instrumental in obtaining a \$30,000 grant for playground equipment for two new green spaces in the parish as part of the Healthy Communities program. They worked with LSU AgCenter area nutrition agent Layne Langley. They are, left to right: Pat Gilmore, Sara Wilson-Rogers, Laura King, Gloria Tate, Jessica Gilmore, Shieda Perkins, Khalil Buckmire, Jesse Gilmore (pastor at the Galilee Baptist Church where they are meeting), and Clara Williams. Photo by Layne Langley

LSU AgCenter Helps People Overcome Obstacles to a Healthier Lifestyle

Tobie Blanchard

Changing health behaviors in a population is no small task, but the LSU AgCenter has been working diligently in communities across the state to lower obesity rates and improve quality of life by increasing access to healthy foods.

In 2018, the AgCenter entered a five-year agreement with the Centers for Disease Control and Prevention for a High Obesity Program to address the nutrition and physical activity environments of six rural Louisiana parishes with an adult obesity rate over 40%.

Denise Holston, AgCenter nutrition specialist and principal investigator for the project, and her team have completed food systems assessments of the six parishes, which include Assumption, Tensas, St. Helena, Madison, East Carroll and Morehouse.

"The purpose of these assessments was to understand the local food system and food access needs of High Obesity Program communities in Louisiana," Holston said.

The assessment focused on retailers that accepted Supplemental Nutrition Assistance Program (SNAP) and Women, Infants and Children (WIC) benefits, food pantries, recreational facilities, early care and education providers, transportation services and community input.

Some of the key findings from the deep dive into community assets included:

- All six parishes had an abundance of community assets related to the food system, with the potential to expand or improve their offerings of healthier foods.
- Food distribution sites were found to have a high need for equipment and supplies to facilitate acquiring and stocking healthier food options.
- Dollar stores, which are common in the parishes, were considered an important food access point because there are few food stores in these parishes; Dollar stores can have food that may be lower cost than the grocery stores in the parish but scored low for available healthy food options.
- Residents often shopped outside of the parish because of poor quality and high prices in their parish. Higher rates of homes with no vehicles in five of the six parishes complicated the ability to access better quality food.
- A strong network of community farmers and food producers were identified in all six parishes.

Based on the assessments, Holston and her team made recommendations for each parish. They also used grant funds to help some parishes acquire items to improve food access, such as refrigerators at food pantries.

Some of the recommendations included:

- Enhance capacity of food distribution sites to enable procurement and storage of healthier items.
- Connect food pantries with local producers in each parish.
- Implement client choice models and nutrition standards at food distribution sites to improve access to and sustainability of healthful foods. The client choice food pantry model allows those seeking food assistance to choose for themselves what products they receive. Client choice food pantries can resemble small grocery stores, or they allow patrons to select their desired foods from a list and create food packages based on preferences and availability.
- Expand SNAP acceptance at local food outlets already selling fresh fruits and vegetables, such as farmers markets and produce stands.
- Target local grocery stores for healthy retail initiatives focused on connecting local producers to food retailers and making the healthy choice the easy choice for customers.
- Increase ridership and awareness of transportation services to improve communitywide access to available healthy foods.
- Establish local and regional food policy councils to connect key food system stakeholders and ensure the sustainability of access to healthy foods in the community.

Holston said each parish has a coalition made up of community members and partners familiar with the challenges the community faces. Coalitions meet regularly to make actionable plans to address those challenges.

Cecilia Stevens, AgCenter food systems coordinator in northeast Louisiana, is organizing a food policy council in her region that consists of farmers, retailers and nutrition educators.

"We are trying to keep this sustainable by empowering people in the community to get the resources they need to make these improvements," Stevens said.

In Morehouse Parish, a community garden is being added to a community center. Stevens said it will allow 4-H'ers and other youth groups to learn about vegetable production or work with mentors. Extra produce will be sent to a homeless shelter.

Stevens also helped organize a farmers market vendor training to help growers understand how they can participate in local markets and increase farmers market participation in northeast Louisiana.

Another success from the program is the St. Helena Farmers Market, which operates through a partnership among the LSU AgCenter, Southern University Ag Center and St.

Helena Healthy Communities Coalition.

Burnell Muse, Southern University Ag Center horticulture agent, worked with growers in the area, many of whom were mainly growing for their own consumption, to bring their extra produce to market.

"This has brought in cash for them, and they've started planting extra with the market in mind," Muse said.

Cooking demonstrations at the market have helped introduce the community to vegetables such as kale that they may not have been accustomed to eating. Greens cooking contests have shown ways to cook vegetables more healthfully.

Tobie Blanchard is the director of LSU AgCenter Communications.



These people are some of the vendors at the St. Helena Parish Farmers Market, which operates through a partnership among the LSU AgCenter, Southern University Ag Center and St. Helena Healthy Communities Coalition. Photo by Marquetta Anderson



Customers are able to exchange SNAP tokens for fresh product at the St. Helena Farmers Market in Greensburg. The market began using funds from the U.S. Department of Agriculture Gus Schumacher Nutrition Incentive Program (GusNIP) to match \$3 in free tokens for every \$1 spent on eligible foods using SNAP/EBT benefits. Photo by Marquetta Anderson

LSU AgCenter Takes Virtual Nutrition Education to Limited Resource Audiences

Sandra May, Sharman Charles and Denise Holston

Before the COVID-19 pandemic, LSU AgCenter family and consumer sciences nutrition agents across Louisiana taught nutrition education classes to adults and children face-to-face in their communities and in schools. But because of the pandemic, in-person classes were halted in March 2020. To continue their outreach, the agents from the Supplemental Nutrition Assistance Program Education (SNAP-Ed), the Expanded Food and Nutrition Education Program (EFNEP) and the Flavors of Health program worked together to develop a virtual nutrition education program. With rising unemployment and an increase in the number of individuals and families needing supplemental food and benefits, it was imperative to reach those in need with practical, research-based nutrition information.

Based on the LSU AgCenter's "Let's Eat for the Health of It" curricula, the team developed a series of 25- to 30-minute interactive presentations to help people gain confidence and skills in making healthful food choices, being physically active, managing their food dollars and keeping their food safe.

To reach youth audiences, the agents produced videos for use in schools that did not allow visitors on their campuses during the pandemic. These videos were also posted online by teachers for students who were learning from home. Because participants must attend all eight classes to complete each of the programs, videos of the adult lessons were produced and shared with participants to use as makeup lessons when classes were missed.

The team also began developing a strategy for recruiting new participants and retaining enrolled participants. One of the challenges they faced was reaching specific target audiences: limited-resource individuals and families

who qualify for the SNAP-Ed or EFNEP programs.

To reach these audiences, the AgCenter agents collaborated with community partners, such as local libraries, Head Start, WIC clinics and schools. Virtual programs were advertised via Facebook, where participants could register online. Promotional videos featuring SNAP-Ed and EFNEP nutrition agents were produced to explain the benefits of attending the classes and how to register. These videos were posted on social media as well. For federal reporting purposes, a screening process was put in place to determine eligibility for SNAP-Ed; however, all those who enrolled were able to attend classes.

Typically, the nutrition lessons are about 50 to 60 minutes. The virtual lessons were shortened to no longer than 30 minutes. The team took into consideration participants who may have limited minutes on their cellular plan and for the home environment in which other family members may be online. Results from pre- and post-program evaluations indicated the participants gained knowledge about nutrition.

Over time, EFNEP and SNAP-Ed nutrition agents and educators embraced virtual programming and were able to recruit and deliver nutrition education programs from their homes or offices. Some conducted virtual food demonstrations and encouraged participants to cook along with them.

The benefit to offering virtual nutrition education classes was that AgCenter agents could remain visible in their community and still connect with their audiences while remaining safe during the pandemic. Also, it allowed nutrition programs to explore alternative ways to reach audiences who may not be able to attend in-person classes.

Sandra May is an instructor and curriculum coordinator; Sharman Charles is director of the Expanded Food and Nutrition Education Program (EFNEP); and Denise Holston is an assistant professor and extension nutritionist, all in the School of Nutrition and Food Sciences.

LSU AgCenter Agents Teach Nutrition Through Snacks

Elizabeth Martin and Leona Camel-Clinton

LSU AgCenter agents with the Expanded Food and Nutrition Education Program (EFNEP) led a surprise "Snack Pack Cooking Class" for students at North Highlands Elementary School and Oak Park Microsociety Elementary School in Shreveport, Louisiana, in April and May of 2021.

The AgCenter agents provided each student with a box of ingredients, a paper cookbook with recipes and handouts, and a paper chef's hat. Students prepared turkey ranch wraps, which served as the after-school snack, and an under-the-sea snack mix, which the students took home.

The classes allowed for a hands-on, interactive experience, while adhering to COVID-19 guidelines. The students had to identify each food's category using the MyPlate guideline for nutrition. Of the 52 students, 50 reported that they tried a new vegetable because of the class.

These two schools have participated in EFNEP nutrition lessons during after-school activities during this past school year hosted by the Fully Devoted Developers of Children (FDDOC) Winners' Circle, a nonprofit group in Shreveport that partners with the AgCenter. This group provided funds for the classes and purchased picnic tables for the two schools.

Elizabeth Martin is an assistant extension agent and Leona Camel-Clinton is a nutrition educator in Caddo Parish.

4-H'ers Learn About Agriculture Through Seed-of-the-Month Club

Esther Boe, Brooke Lafargue, Brandi Frey and Lisa Benoit

The COVID-19 pandemic presented many challenges for the LSU AgCenter 4-H program. To meet social distancing guidelines and ensure the safety of youth and agents, many of programming efforts transitioned to a virtual format. However, the need remained for hands-on learning opportunities. 4-H programming is driven by the motto "learn by doing," and it was paramount that agents provide purposeful and engaging activities.

The 4-H Seed-of-the-Month Club is a project club that emerged to meet that need. Agents created a nine-month seed subscription made available to youth across the region beginning in August 2020. With this project, participating youth were provided seeds of various plants, including pine seedlings, rainbow carrots, easter egg radishes, lettuce, green beans, okra, squash and coneflowers. Agents used the LSU AgCenter Louisiana planting guide to select the seeds to offer each month.

4-H agents distributed seeds either through pre-packed mailers or youth collected the seeds from their local extension offices. Youth were also provided information on how to plant, maintain and harvest the plants. The agents worked as a team for each featured plant to create a monthly publication for youth to refer to as they navigated through each stage of planting, maintaining and harvesting the respective crops.

More than 300 4-H'ers in fourth through 12th grades participated in this opportunity while buckling down at their homes during the pandemic. Youth learned many new skills and had more meaningful contact with their families. One participant noted that what he liked best about the project was "working with my pawpaw." Youth learned where their food comes

from and how it's produced. Extension agents also benefited from this project club because they turned their attention to working on virtual platforms and learning new editing software to communicate and collaborate on the project each month.

A member survey revealed that from participating in the club, members learned how to grow a variety of vegetables and that different vegetables have similar needs to thrive. Members said they had fun, learned about responsibility and thought growing their own food was rewarding.

When asked what service they provided by growing the produce, respondents noted that they consumed the produce with their family and shared with others. One mentioned that they fed their livestock the produce that was not edible for the family.

Members reported that they were excited to receive something new each

month. Highlights of the experience included learning the steps involved in prepping, growing, harvesting and cooking the food and working with their family on the project.

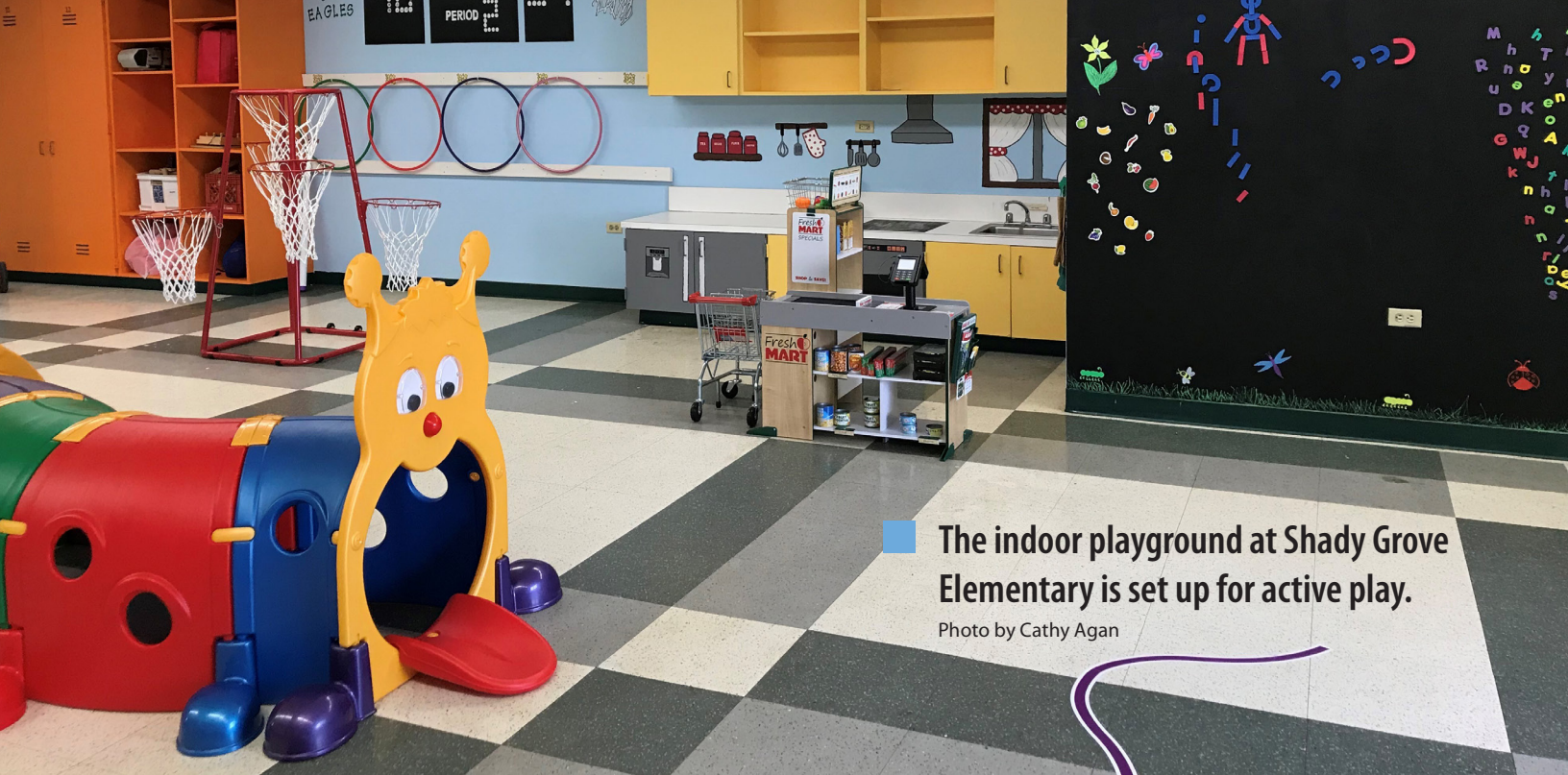
In the future, agents and youth alike have expressed an interest in continuing to provide horticulture opportunities through the delivery mode of the Seed-of-the-Month Club. Participants were asked to provide top choices for their gardens by receiving carrots, lettuce and green bean seeds for the future.

Acknowledgements: The project would not have been possible without donations from the Louisiana 4-H Foundation, Master Gardeners, local farmers and private donors.

Esther Boe is an extension agent and 4-H regional coordinator, Central Region; Brooke Lafargue is an associate extension agent, Allen Parish; Brandi Frey is an assistant extension agent, Pointe Coupee Parish; and Lisa Benoit is an associate extension agent, St. Landry Parish.



Anneliesa Dufour, 9, left, and sister Addyson Miller, 6, pull weeds out of a patch of corn plants while their dad, LSU AgCenter agent Justin Dufour, gives instructions to sister Stella Dufour, 5, in their home garden in Avoyelles Parish. The girls are 4-H members participating in a Seed-of-the-Month Club that provides youth a different type of seed to plant each month. Photo by Olivia McClure



The indoor playground at Shady Grove Elementary is set up for active play.

Photo by Cathy Agan

Ouachita Parish School Adds Indoor Playground As Part of Healthy Communities Program

Cathy Agan

It is no secret that obesity is a problem for the state of Louisiana. The obesity prevalence in Ouachita Parish is 40.3% compared to the national median of 33%. Many children do not get enough physical activity or eat a healthful diet on a regular basis. Children who are obese have an increased risk of Type 2 diabetes, asthma, joint problems and poor self-esteem.

In Ouachita Parish, Shady Grove Elementary School partnered with the LSU AgCenter as a Healthy Communities school. Healthy Communities is an effort by AgCenter extension agents and researchers, along with many partnering organizations, to improve the health and nutrition status of Louisiana residents. Ouachita Parish is one of 20 parishes in the program.

A community forum was held at the school to identify actions that could be taken to implement policy, systems and environmental changes at the school. The decision was made to provide a place for active recess play even on bad weather days.

An empty classroom was transformed into an indoor playground that includes stations for basketball, active games and fitness. The walls were painted with colorful murals to make the space fun and inviting, and an existing counter space in the room was turned into a play kitchen. A pretend grocery store was placed close to the kitchen so children could “shop for food” and then “store and prepare” it in the kitchen. A

blank wall was painted with magnetic primer and chalk paint. Large floor stickers were installed to create spaces for hopscotch and movement. A large caterpillar crawl-through sits in the center of the room. Other equipment includes balls, trikes and hula hoops.

Community engagement is also a goal of the Healthy Communities program, and volunteers donated time and resources to clean, paint and organize the play area. One teacher said her students love to go to the indoor playground. She loves the way it encourages them to be active. Teachers, students and the principal have all praised the indoor playground. The principal, Angela Spivey, said the indoor playground has motivated the teachers to make their classrooms more fun and colorful for the students.

“You have really started something with the indoor playground. After teachers saw the new indoor playground, they became inspired to make their classrooms more colorful and appealing. Teachers have been painting and sprucing up their rooms. The school is no longer drab. It is looking great,” Spivey said.

A teacher reported that it is making a huge difference in student behavior and attention on bad weather days because the students get an opportunity to burn off energy and have fun, even when they can’t go outside for recess.

Cathy Agan is an area nutrition agent in Ouachita Parish.



LSU AgCenter area nutrition agent Cathy Agan watches children enjoying play time in the indoor playground at Shady Grove Elementary. Photo by Karol Osborne



Children pretend to shop for food in the indoor playground at Shady Grove Elementary. Photo by Karol Osborne

Open-Source Devices to Help Protect the Genetic Resources of Louisiana Fish and Shellfish

Hamed Shamkhalichenar, Jin-Woo Choi and Terrence R. Tiersch

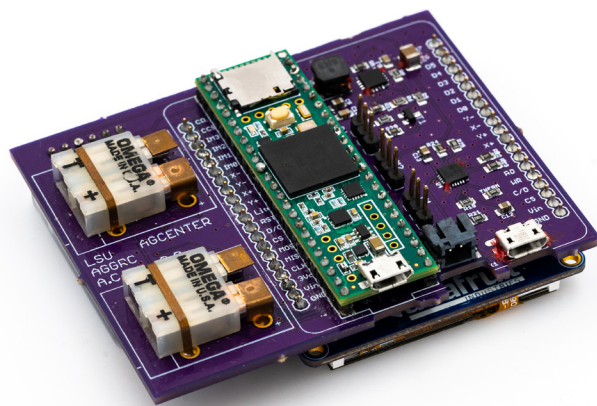
Oysters and fish represent the vibrant heritage of the Gulf Coast and a traditional way of life for the people of Louisiana. It is important to keep oyster and fish populations healthy and growing in the estuaries and along the Gulf Coast. The genetic resources of these fish and shellfish are what makes them suited for life here in Louisiana, and those genetic resources need to be protected.

Germplasm repositories for fish and shellfish preserve sperm, eggs or embryos and vital information about the species. These repositories are one of the best ways to protect genetic resources of aquatic species, including support of fisheries; improvement of aquaculture, which is also known as fish farming; and conservation of endangered species. Cryopreservation is a vital technique to protect genetic material by freezing at ultra-low temperatures. However, the survival rate of the genetic material depends on processing, freezing and thawing conditions. As a result, numerous specific protocols have been reported for cryopreservation of aquatic species because of their broad biodiversity. Unfortunately, there is almost no standardization in these protocols, and it is very difficult to repeat or evaluate them. This has prevented the large-scale development of repositories for fish and shellfish and leaves them unprotected.

Also, research equipment, such as programmable freezers, can cost tens of thousands of dollars and are too bulky to be used in the field, greatly limiting the adoption of cryopreservation by many user groups. One way to overcome these barriers is to use electrical engineering to provide technology-based solutions for improvement of reliability and accessibility of cryopreservation. Monitoring other factors in addition to temperature during cryopreservation can provide additional information that can be used to assist a comparison of protocols and help us gain a better understanding of the complex dynamics of cryopreservation.

The Aquatic Germplasm and Genetic Resources Center of the LSU AgCenter was created in 2015 at the location of the former LSU Dairy Improvement Center to address the problems of repository development for aquatic species through interdisciplinary collaboration, such as between engineers and biologists. We have developed customized sensors to monitor the changes in temperature and electrical properties of samples during cryopreservation. When combined with a user interface and data storage and transfer capabilities, these systems can provide valuable information about freezing and thawing that can be used by the cryopreservation community to improve efficiency and reliability.

If we want these sensors to be widely used, they should be adaptable to a variety of user requirements. For example, different containers are used for freezing of samples ranging from straws to tubes and glass vials, and our sensors should be compatible with all of these. To do this we have incorporated



The sensors are part of custom-made monitoring systems. Devices such as these combine 3D printing and custom printed circuitry with widely available off-the-shelf components. These devices are much cheaper and more flexible than commercially available instruments, are custom designed for work with species such as oysters, can record data, and users can input sample information through a touch screen. The data can be transferred to a cellphone, laptop or a database using Wi-Fi or Bluetooth. Design files for these devices can be easily shared on the internet as open hardware to greatly expand their use to assist protection of genetic resources in repositories. Photo by Jonathon Lai

Yue Liu, postdoctoral research associate at the Department of Biological and Agricultural Engineering and the Aquatic Germplasm and Genetic Resources Center, is inserting a sensor, fabricated by use of a printed circuit board, into a standard cryopreservation straw. A customized system with a user interface (touch screen) and data storage and transfer capabilities can provide valuable information about freezing and thawing that can be used by the cryopreservation community to improve efficiency and reliability. Photo by Olivia McClure



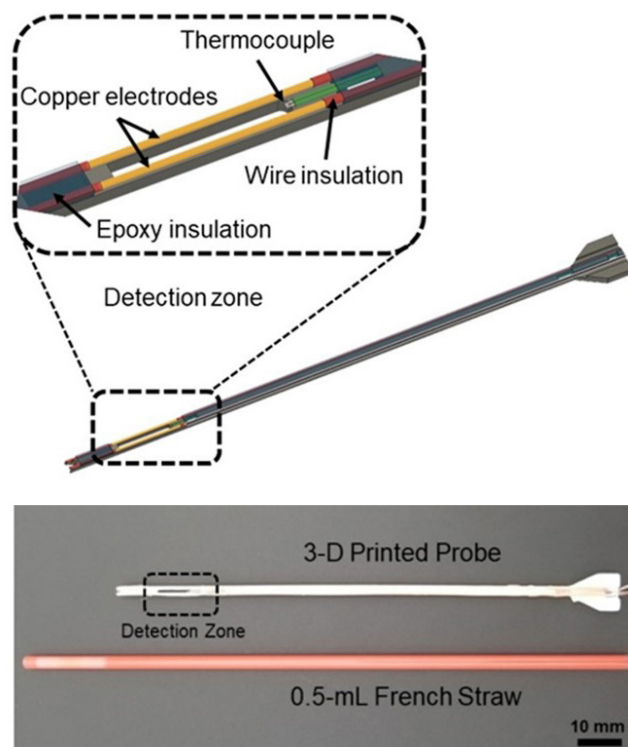
fabrication methods, such as 3D printing and printed circuit board technology, to make customized sensors based on user needs. At present, consumer-level 3D printers are widely available across the world at a low cost. The instruction files used by these printers can be shared over the internet, and different user groups can use them to print sensors or modify them based on their requirements. Likewise, printed circuit board sensors can be fabricated or modified using design files through widely available manufacturing services. Because this technology is widely used to fabricate electronic components, the presence of many competitive fabrication services has reduced its cost drastically. This process of sharing design files across user communities is called open technology, and a great example is the sharing of files used to 3D print personal protective equipment, such as face shields, during the early stages of the COVID-19 pandemic.

In addition to sensing, we have developed low-cost portable monitoring systems to perform measurements and record and transfer data for storage. For example, we designed electronic circuitry to perform simultaneous precision measurements of temperature and electrical properties during the freezing process. In addition to the data from the sensors, these systems enable users to input and store information through interactive interfaces, such as liquid-crystal display, or LCD, touchscreens. Most importantly, we can include Wi-Fi and Bluetooth capabilities for data transfer to cellphones, laptops or cloud-based databases. This assists data management, such as quality control and quality assurance, which are essential for reliable handling of large numbers of samples in repositories.

To make sure these devices are widely accessible to the repository community, we use open-fabrication methodology in the design, prototyping and fabrication stages as we move through our alpha and beta testing process. In addition to our custom-made electronic boards, we also provide design files and fabrication instructions based on Raspberry Pi microprocessor boards and Arduino microcontroller boards and other off-the-shelf modules. These are inexpensive, consumer-level products that are widely available but are very powerful. This allows users with minimal experience in electronic systems to replicate devices with instructions or after watching YouTube tutorials. More advanced users can modify the devices to simplify designs or add more capabilities.

We are using this combination of sensors, monitoring and data management systems to facilitate standardization of cryopreservation in aquatic species. This will greatly assist protection of genetic resources of fish and shellfish, such as Louisiana oysters, in germplasm repositories. In addition, using these systems with our custom freezing devices will greatly reduce equipment costs and allow work in the field, which will expand the availability of cryopreservation and production of high-quality samples for repositories.

Hamed Shamkhalichenar was a postdoctoral researcher at the LSU AgCenter Aquatic Germplasm and Genetic Resources Center and is now an electrical engineer at Casana, a health care and technology company in Rochester, New York. Terrence R. Tiersch is a professor in the LSU AgCenter School of Renewable Natural Resources and is the director of the Aquatic Germplasm and Genetic Resources Center. Jin-Woo Choi is a professor in the LSU School of Electrical Engineering and Computer Science.



A design diagram (upper panel) and actual (lower panel) 3-D printed sensors used to measure temperature and electrical properties of samples during cryopreservation.



Novel sensors for measuring electrical properties of samples during cryopreservation have been custom designed using printed circuit board technology, which makes them cheap and widely available. Photo by Jonathon Lai



Researchers from the Aquatic Germplasm and Genetic Resources Center developed customized sensors to monitor the changes in temperature and electrical properties of sperm samples during cryopreservation. The figure shows sensors fabricated by use of printed circuit board being inserted into a standard cryopreservation straw and vial. Photo by Olivia McClure

RESEARCH MILESTONE: Horses Treated to Ovulate Early Give Birth to Healthy Foals

Kyle Peveto

For decades, LSU AgCenter researchers have sought to alter female horses' reproductive cycles to help them become pregnant earlier and give birth at the beginning of the year to meet the needs of the competitive racing and show horse industry.

While Erin Oberhaus, an equine physiologist with the AgCenter, had successfully caused mares to ovulate and become pregnant months ahead of Mother Nature's schedule, no foals were born using these methods until February of 2021.

In February, the first four foals were born using the method Oberhaus and her team developed. The foals were born in cooperation with Timber Creek Veterinary Hospital in Canyon, Texas, and with the help of a graduate student at nearby West Texas A&M University.

"As researchers, we were definitely convinced by data," Oberhaus said. "But industry stakeholders, they want to see that there are live, healthy offspring as a result of this research."

Or, as Gregg Veneklasen, veterinarian and the owner of Timber Creek, told Oberhaus, "You can show me all the data you want, but I have four feet and a nose."

Many racing and show horse breed registries institute a Jan. 1 birthday for all foals born within a year. In competitive events involving younger horses, this creates a significant advantage for horses born at the beginning of the year, Oberhaus said.

"They're the same age according to their breed registry, and they're competing against each other," she said.

However, a mare's natural cycle leads to foals being born later in the year. In south Louisiana, mares will usually enter a period of anestrus — when they cannot ovulate and conceive — from October to early April. Because a mare's gestation period lasts 330 to 345 days, they usually give birth no earlier than March.

In the past, breeders have changed the cyclicity of mares to allow them to ovulate and become pregnant earlier by using artificial lighting, which has proven expensive and laborious.

AgCenter researchers have been working to alter this natural cycle in other ways since the 1990s, when Don Thompson, a now-retired equine physiologist, found that the hormone prolactin could help horses end anestrus and begin ovulation.

Oberhaus studied with Thompson while completing her doctoral work, and they tested other ways of stimulating the hormone in mares so the horses could begin ovulation earlier. They found that types of drugs known as dopamine antago-

nists could stimulate prolactin, causing follicles to grow and accelerating ovulation.

The opportunity to use these methods to produce live foals came last year when Veneklasen contacted Oberhaus about inducing ovulation in mares at his embryo transfer facility at Timber Creek Veterinary Hospital, where he often works with quarter horses and rodeo bucking horses.

Oberhaus and her research team drove 800 miles to Canyon, outside of Amarillo, to treat 32 horses on a cold day in late January. Of those, 28 ovulated early, and 10 had already been selected to receive embryos and become pregnant. A graduate student at nearby West Texas A&M University, Jessica Looman, assisted them and monitored the horses. Looman studied the process for her master's degree and traveled to the main LSU campus in Baton Rouge to analyze blood samples from the horses.

The mares carried the foals through a normal pregnancy, and they needed no supplemental progesterone, a hormone produced by the ovaries, to carry to term. Seven foals from that group have been born this year.

"That was great to know, that this was a normal ovulation that was capable of sustaining pregnancy," Oberhaus said.

Interested in furthering Oberhaus' work, Veneklasen offered his assistance and a stable of mares.

"This is real world," Veneklasen said. "The babies that have been born from this project are \$30,000 to \$100,000 babies."

Now Oberhaus is studying why some mares do not respond to the treatments to induce early cyclicity. She has studied some causes, including breed, age, weight and body condition, and none appears to be a factor.

Oberhaus and her collaborators are encouraged to see foals born from their research.

"This is something that's been in research for several decades now, and foals are actually starting to be born as a result of the research," she said. "That's been exciting."

Kyle Peveto is an assistant communications specialist with LSU AgCenter Communications and associate editor of Louisiana Agriculture.



Jessica Looman, a West Texas A&M University graduate student who oversaw research on inducing early ovulation in horses, stands with a foal born in the research. Photo by Darcy Lively, West Texas A&M University

Lost LSU Plant Varieties Rediscovered

Kerry D. Heafner

The Calhoun Research Station was established as the North Louisiana Research Station in 1888 in the village of Calhoun in western Ouachita Parish. It was closed in 2011 due to budget cuts. But while operational, the Calhoun Station was home base to agricultural research vitally important for Louisiana's northernmost parishes, ranging in scope from poultry husbandry to dairy cow research to fruit variety development. Locally, there is still fervent interest in vegetable varieties developed at the Calhoun Station. But these varieties have fallen into functional extinction. An LSU AgCenter project is underway to relocate these and other heirloom varieties and get them back into circulation to both home and commercial growers.

The project started with a Master Gardener seminar. In January 2019, the Northeast Louisiana Master Gardeners Association hosted legendary seed saver John Coykendall as keynote speaker for their annual gardening seminar. Coykendall is the focus of a documentary produced by Louisiana Public Broadcasting (LPB) titled "Deeply Rooted: John Coykendall's Journey to Save Our Seeds and Stories."

Coykendall has personally found and saved seeds of hundreds of heirloom vegetable varieties and reintroduced them to new generations of growers. Many varieties in Coykendall's collection come from Washington Parish, where numerous farming families have shared their seeds and the stories behind them with him.

After the 2019 seminar, requests came into the Ouachita Parish Extension Office from clientele asking where they might obtain seeds of the Calhoun Purplehull field pea. A literature review revealed that LSU's field pea breeding program was housed at the Calhoun Research Station and work resulted in other field pea releases like Louisiana Purchase, LA Green and Calhoun Crowder. Calhoun Purplehull, formerly known as Variety L-19-25, was released in 1967.

A search of USDA's Germplasm Resources Information Network (GRIN) revealed Calhoun Purplehull to be one of hundreds of legume crops held in their seed repository in Griffin, Georgia. It is a vining pea and, according to locals who remember it, has a flavor far superior to that of the more commonly grown Pinkeye Purplehull. Pods of Calhoun Purplehull average 8 inches long and are slightly curved. Flowers are white when fully open. It seems all varieties of the Calhoun peas have become scarce for one reason or another, presumably because growers prefer top-pick varieties that are easier to harvest among various other reasons.

As word about the reintroduction of nearly lost varieties like the Calhoun Purplehull pea and the Red-N-Sweet watermelon has spread, gardeners in Winn, Union and Lincoln parishes have come forward with seeds and information on several varieties of corn, field pea, English pea and collard green that were not developed by LSU. This is significant because

some sources estimate as much as 94% of food crop diversity worldwide has already been lost. Reasons for this vary from families transitioning from a rural to an urban lifestyle, to railroads and other forms of mass transit making shipping foods long distances easier, to the advent and use of hybrid varieties. Each functionally extinct variety recovered represents a reservoir of genetic diversity for that species that would otherwise be lost. And, with renewed interest in local foods, local culinary talent will potentially have a broader palette of flavors to draw from for inclusion in their gastronomic creations.

Seeds of these and other heirloom varieties have been sent to locations throughout Louisiana and to other states as far away as Kentucky, Ohio and even Cornell University in New York. An heirloom collard from Union Parish has been shared with the Utopian Seed Project in Asheville, North Carolina. These varieties represent northern Louisiana's rich agricultural history. The goal of this project, tentatively called the North Louisiana Seed Preservation Program, is to collect and house seeds of these nearly lost varieties and make them available again to both home and commercial growers.

Kerry D. Heafner is area horticulturist in Morehouse, Ouachita and Union parishes and the Northeast Region horticulture and Master Gardener coordinator.



Calhoun Purplehull vines like a butterbean. It was developed at the Calhoun Research Station and was released in 1967. Photo by Kerry D. Heafner



Red-N-Sweet watermelon pieces wrapped in heritage breed prosciutto, drizzled with olive oil and sea salt, and served over a bed of baby greens. Preparation and photo by Delia Simpson



The Red-N-Sweet watermelon has dark red, sweet flesh. It was the last watermelon released from the Calhoun Research Station. Photo by Kerry D. Heafner

A Fruitful Encounter

Serendipity plays no small role in finding old seeds. After speaking to the Marion Garden Club in Union Parish last year, I was approached by Mrs. Lula Shurtleff who told me she had been given some watermelon seeds some years ago, and that she thought the watermelon had been developed at the Calhoun Station. That got my attention because numerous enquiries about seeds and plants of the Calhoun Sweet watermelon have come into the office every spring since I've been an extension agent. Mrs. Shurtleff's seeds turned out to be those of Red-N-Sweet, a variety that followed the Calhoun Sweet by 36 years.

Red-N-Sweet was released in 1987 and was the last Calhoun watermelon. It is a striped melon with dark, red flesh and a thin rind. Plants were grown last summer from seeds saved in 2001, 2003 and 2006. The six largest melons ranged in weight from 30 to 46 pounds and had sugar contents measuring 12- and 13-degrees Brix, where 1 degree Brix is 1 gram of sucrose in 100 grams of solution. Calhoun Sweet, a Black Diamond-type melon, and Calhoun Gray, a cross between Calhoun Sweet and Charleston Gray, have also been located, and attempts are being made this year to grow them out for seed stocks. **Kerry D. Heafner**

Inside:

The former LSU AgCenter Food Incubator has been rechristened as the Food Innovation Institute — known as FOODii. Its goal is to support Louisiana food entrepreneurs as well as create new foods in new ways, such as with 3D printing.
See page 2

Taking advantage of the beneficial effects of soil microorganisms, such as fungi and bacteria, and using them as preventive treatments on seed instead of chemicals is the topic of research at the LSU AgCenter.
See page 12

LSU AgCenter researchers are studying silica solubilizing bacteria in bagasse, a byproduct of sugarcane production, and rice hulls from rice production to see how these bacteria can be used to improve soil health and promote crop production.
See page 14

The LSU AgCenter has garnered federal funding to conduct a years-long effort to help people living in rural Louisiana overcome the many obstacles to a healthier lifestyle. Researchers and extension specialists are attacking the issue on many fronts.
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