

LOUISIANA Agriculture

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Assuring Our Future Through Scientific
Research and Education

HEALTHY COMMUNITIES

AgCenter works to improve well-being,
health in Louisiana.
SEE PAGE 8.

'EVERYTHING IS AGRICULTURE'

Magazine Editor Linda Benedict Taught Us About Agriculture for Decades

By Kyle Peveto

For 25 years, Louisiana Agriculture magazine has been in the capable hands of Linda Foster Benedict.

As editor of the 65-year-old quarterly publication, Benedict has overseen 97 issues of the magazine, and she can't pick a favorite.

"Every issue that comes out is my favorite," she said. "I honestly think they get better every issue."

This spring, after finishing the winter issue of Louisiana Agriculture, Benedict retired after a nearly 50-year career in cooperative extension education and communications.

Benedict grew up in Waterloo, Iowa, and attended Iowa State University. She majored in home economics journalism and edited a magazine for the college of home economics.

After graduation, Benedict became a reporter for her hometown newspaper, The Daily Courier. She earned a master's degree in home economics education at the University of Northern Iowa and, as part of her thesis, created a game that taught children about nutrition.

Benedict then became an extension home economist for Iowa State University in her home county where, among her duties, she recorded one-minute spots featuring extension information on the local television station. This led to a full-time position as a communications specialist and assistant professor at Iowa State.

"That's when I got into extension communications, which I just loved," Benedict said. "It's helping people learn real stuff."

After six years at Iowa State, her husband was hired by the University of Missouri-Columbia to work in human resources. She continued her extension communications career at nearby Lincoln University, a historically Black 1890 land-grant institution, serving as the director of communications for extension and agriculture for four years. Then she moved to the University of Missouri, where she became an extension communications specialist and instructor of agricultural journalism.

At Missouri, Benedict earned a doctorate in journalism and was a visiting instructor in the University of Missouri School of Journalism. She also inaugurated the school's health and nutrition journalism program.

After moving to Baton Rouge in 1992, Benedict worked for Southern University before she was hired by the AgCenter Communications Department as editor for Louisiana Agriculture. Then she was promoted to assistant director in charge of news, video and media relations, eventually becoming associate director for the department.

Covering agriculture in Louisiana was exciting, she said. She enjoyed learning about crawfish, sugarcane and other crops she had not seen before.

"It's so much more interesting in Louisiana," she said. "I've worked in Iowa, where the whole state is a big corn field. Louisiana is just so much more fun. It's so diverse."

Leading Louisiana Agriculture magazine, Benedict stressed the importance of high-quality photos and color pages complementing well-written articles that explain the research of AgCenter scientists.

Writing about agriculture and leading the magazine never lost its appeal, Benedict said, because agriculture encompasses so much, from nutrition and health to crops and natural resources such as trees and wildlife.

"I have loved helping people just understand agriculture," she said. "Everything is agriculture."



Linda Benedict retired this spring after editing Louisiana Agriculture magazine for 97 issues. Photo by Kyle Peveto

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Kyle Peveto is the editor of Louisiana Agriculture magazine.

ON THE COVER: Jocinda Jones, LSU AgCenter Healthy Communities extension agent, leads kids through an obstacle course during a Play Street at the 2021 Juneteenth Empowerment Fest in Bastrop. Photo by D. Jones Visuals

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LSU AgCenter Teaches Animal Care in New Orleans

Orleans Parish 4-H agent Alisha Okoro and club leader Kim Beshears recently started the Orleans Wiggles and Wags Club. The club integrates fun, hands-on engaging activities with an animal science curriculum to teach youth how to properly care for dogs, basic dog obedience, proper animal nutrition and basic domestic small animal care.

"Since most New Orleanians don't have livestock, Kim Beshears and I decided to start a new club in Orleans, and we named it the Orleans Wiggles and Wag Club," Okoro said. "Wiggles and Wags is an animal husbandry club for students in grades four through six." **Johnny Morgan**



Orleans Parish 4-H members Addy Wilson and Brita Gray take a break from the heat to allow ferrets Jazz and Fefe to cool off during the recent Orleans Parish 4-H pet show that was held in City Park. Photo by Alisha Okoro

AgCenter Healthy Communities Initiative Wins National Award

An LSU AgCenter team recently received a national honor for its Healthy Communities initiative, which aims to increase access to nutritious foods and provide more opportunities for physical activity.

On May 5 at the National Health Outreach Conference in Kansas City, Missouri, the Jeanne M. Priester Organizational Culture of Health Award was presented to Denise Holston, AgCenter nutrition specialist and Healthy Communities principal investigator; Jamila Freightman, program manager; and Matt Greene, program evaluator. **Olivia McClure**

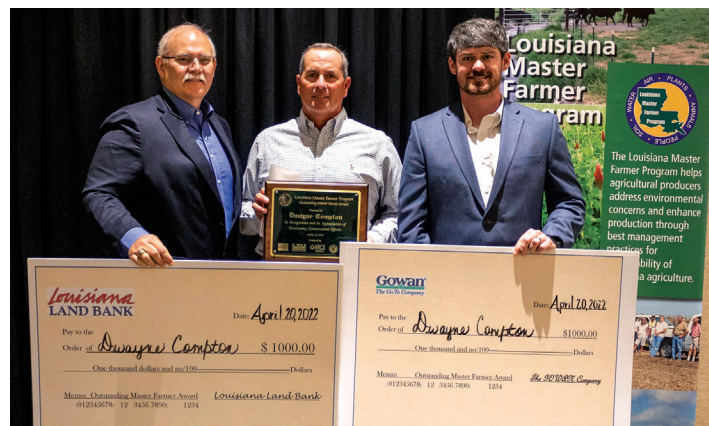


The LSU AgCenter School of Nutrition and Food Sciences team that leads the Healthy Communities initiative recently received the Jeanne M. Priester Organizational Culture of Health Award. Pictured, from left, are Jamila Freightman, CDC High Obesity Program manager; Denise Holston, assistant professor, nutrition specialist and principal investigator for the Healthy Communities grant; and Matt Greene, SNAP-Ed evaluation coordinator. Provided photo

Louisiana Master Farmer Awards Presented

Eight Master Farmer recertifications and the 2021 Louisiana Outstanding Master Farmer award were presented during a meeting of the Louisiana Association of Conservation on April 20 in Baton Rouge. The Louisiana Master Farmer Program is a multiagency effort led by the LSU AgCenter that teaches about conservation and environmental stewardship.

Dwayne Compton, who received the Outstanding Master Farmer award, is a rice and crawfish producer who has been active for more than 30 years in Jefferson Davis Parish. Compton was presented a plaque and two \$1,000 awards sponsored by the Louisiana Land Bank and Gowan Company. **V. Todd Miller**



Dwayne Compton, of Jefferson Davis Parish, was named the 2021 Outstanding Master Farmer. He is pictured with Stephen Austin from Louisiana Land Bank and Eric Bergeron with the Gowan Company, who each presented him with a check for \$1,000. Photo by V. Todd Miller

Three Inducted Into Louisiana Ag Hall of Distinction

Three icons of Louisiana agriculture were inducted into the Louisiana Agriculture Hall of Distinction during a ceremony in Baton Rouge on March 24. The new inductees are former director of the Louisiana Cooperative Extension Service and current chancellor of LSU Alexandria Paul Coreil, of Alexandria; longtime Louisiana Radio Network farm broadcaster Don Molino, of Baton Rouge; and Jim Monroe, of Pineville, former assistant to the president at Louisiana Farm Bureau, where Monroe worked for 47 years.

A joint effort of the LSU AgCenter, Louisiana Radio Network, Louisiana Farm Bureau Federation and Louisiana Department of Agriculture and Forestry, the Louisiana Agriculture Hall of Distinction honors individuals who have made significant contributions to agriculture or agriculture-related industries. **Craig Gautreaux**

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, Instagram and LinkedIn. **Join the conversation by following the LSU AgCenter.**

 **INSTAGRAM** | Follow the AgCenter at [instagram.com/LSUAgCenter](https://www.instagram.com/LSUAgCenter)

MAY 13 | Fresh blackberries are in season! They are native to Louisiana and many varieties are well-adapted to growing conditions throughout the state. Learn how to grow delicious blackberries with our new Blackberry Growing Guide! Link in bio for the guide. [#LSUAGCENTER](#) [#BLACKBERRY](#) [#LOUISIANA](#) [#BERRY](#) [#BLACKBERRIES](#) [#EXTENSION](#)



 **TWITTER** | Follow the AgCenter at twitter.com/LSUAgCenter

MAY 7 | Monarch caterpillars feed only on milkweed plants (Asclepias). Please, do not treat the aphids on the plant with insecticides, as this could become an issue for the caterpillars. [@MARGARETORR](#)



APRIL 29 | The roses are in full bloom at the LSU AgCenter Botanic Gardens in Baton Rouge! The gardens are open seven days a week from 8 a.m. to 5 p.m. Come explore! [@LSU](#) [@VISITBATONROUGE](#) [@LOUISIANATRAVEL](#)

 **FACEBOOK** | Follow the AgCenter on Facebook at facebook.com/LSUAgCenter

MAY 13 | The LSU AgCenter will evaluate 118 soybean varieties in the 2022 Official Variety Trial (OVT) and 31 varieties in the 2022 core-block on-farm demonstration plots across Louisiana to provide unbiased data to assist in soybean variety selection.



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

APRIL 6 | Bull thistle, *Cirsium horridulum*, also known as yellow thistle or chadron, is an edible weed. LSU AgCenter research associate David Sexton demonstrates how to forage for thistle and how to prepare it! CAUTION: Not all plants are safe to eat — some can harm or even kill you. That's why it's important to have positive ID on plants you're foraging for.



Four LSU College of Agriculture Students Recognized in LSU Tiger Twelve Class of 2022

Four LSU College of Agriculture students are part of the LSU Tiger Twelve Class of 2022. LSU's Tiger Twelve is an initiative that highlights a select group of undergraduate seniors who have contributed to LSU campus life and positively impacted the Baton Rouge community. Each spring, 12 distinguished LSU seniors receive this prestigious recognition. **Annabelle Lang**

JOSEPHINE ENGELMAN

MAJOR: Environmental Management Systems

CONCENTRATION: Resource Conservation

MINOR: Political Science

College of Agriculture

HOMETOWN: Queens, New York

ALEXIA LAGRONE

MAJOR: Natural Resource Ecology and Management

CONCENTRATION: Ecological Restoration

MINOR: Oceanography and Coastal Sciences

Ogden Honors College

College of Agriculture

HOMETOWN: Lafayette, Louisiana

MAIA WILLIAMS

MAJOR: Animal Science

CONCENTRATION: Science and Technology

College of Agriculture

HOMETOWN: Missouri City, Texas

TAYLOR PERRODIN

MAJOR: Agricultural Economics and Agribusiness

Ogden Honors College

College of Agriculture

HOMETOWN: Crowley, Louisiana



LSU Tiger Twelve Class of 2022 members were recognized at a ceremony hosted by LSU Campus Life. College of Agriculture members, from left to right: Maia Williams, Josephine Engelman, Taylor Perrodin and Alexia LaGrone. Photo by Alison Prez

College of Agriculture Counselor Named LSU Advisor of the Year

Jennie Sparks, academic counselor for the LSU College of Agriculture, has been honored with the LSU Advisor of the Year Award.

The LSU Advisor of the Year Award honors an individual who has made significant contributions to the improvement of academic advising on campus.

Sparks serves as the lead academic counselor for the Office of Student Services in the College of Agriculture, which provides academic advising for approximately 1,500 students.

"I enjoy what I do, and I enjoy seeing the changes in students," said Sparks. **Annabelle Lang**



LSU University College presented the LSU Advisor of the Year Award to Jennie Sparks, academic counselor for the LSU College of Agriculture, at luncheon on March 25. Provided photo

LSU Poultry Judging Team Wins National Contest

The LSU poultry judging team took numerous awards at the USPOULTRY Foundation Ted Cameron National Poultry Judging Contest held at the LSU Poultry Research Farm on April 6-8.

The national competition tests students' evaluation skills for egg production and breeding purposes. The competition's categories are production, breed selection and market products.

LSU placed first overall and first in the breed selection and production judging divisions as a team.

Members of the teams are Tristan Foret, Luke Comeaux, Grace Tassin and Gabrielle Davis. **Annabelle Lang**



The LSU poultry judging team accepts awards from USPOULTRY Executive Director Barbara Jenkins. From left to right, back: Dennis Ingram (coach), Tristan Foret, and Luke Comeaux; from left to right, front: Grace Tassin, Barbara Jenkins and Gabrielle Davis. Photo provided by Dennis Ingram

New Faculty PROFILE

DUHON RETURNS TO AGCENTER TO Lead Nutrition Efforts in Central Louisiana

Tobie Blanchard

Jennifer Duhon is leading the LSU AgCenter's effort to improve the health and well-being of central Louisiana residents.

Duhon, a registered dietitian, serves as the family and consumer sciences program coordinator for a 10-parish area and as a nutrition agent for Rapides and Avoyelles parishes.

She has more than 17 years of experience in clinical dietetics, nutrition education, food service management, and agricultural marketing and promotion. She previously worked as an AgCenter nutrition agent from 2012 to 2015.

Duhon has a Bachelor of Science in dietetics and a Master of Science in nutrition, both from the University of Louisiana at Lafayette.

"I've been able to work in many different arenas in nutrition and dietetics," she said. "I am excited to be back with the AgCenter and get to work with our clients."

One of Duhon's first big projects is a partnership with LSU Alexandria.

"We want to provide a Healthy Community program for students and faculty and help them see we encompass so much more than just nutrition and physical education," she said.

She also plans to do a "StoryWalk" — an outdoor reading experience with signs that tell a children's story along a path — at the Alexandria Zoo.

Nutrition agents in her area already have solid relationships with LSU Eunice and Fort Polk that she hopes to build on.

Duhon didn't follow a path to dietetics from the start. She knew she wanted to pursue a career in healthcare and thought pharmacy was the path she would take. In college, she soon realized there was little interaction with clients and patients, and with her outgoing personality, she knew she wanted to work directly with the public.

The career she was destined for was with her all along. Duhon's grandmother was a nutrition educator for the Women, Infants and Children (WIC) program for 40 years.

"I didn't connect it until I considered being a dietitian and realized I've been hearing these nourishing talks all of my life," she said. "I switched my major and fell in love with the patient-client connection."

Duhon's first job, which followed in her grandmother's footsteps, was with the WIC program in Alexandria. Her career also took her to the Acadian Medical Center and the National Dairy Council.

She said rejoining the AgCenter is like coming home, and she is excited about working with familiar programs such as Let's Eat for the Health of It and Dining with Diabetes as well as starting up new ones.

She said the influence of social media on health and wellness is a new challenge that wasn't as prevalent during her first stint at the AgCenter.

"We are having to fight to provide factual information about what is healthy," she said.

Duhon said she has a passion to help her clients understand the importance of science and research-based information and to not pick up on fads promoted by social media influencers.

Tobie Blanchard is the director of the AgCenter Communications Department.



Jennifer Duhon serves as the LSU AgCenter Central Region family and consumer sciences program coordinator and a nutrition agent for Rapides and Avoyelles parishes.

THE ST. HELENA FARMERS MARKET, a Small Oasis in a Rural Food Desert

V. Todd Miller

On a sunny, windy, spring Friday, the mood at the St. Helena Farmers Market was festive as residents and visitors perused fresh fruits, vegetables and proteins from local producers.

The market gives families healthful alternatives and community pride in one of Louisiana's numerous food deserts.

Food insecurity, defined as the lack of access to a reliable source of food during a given year, is high in St. Helena. The parish seat of Greensburg is home to the farmers market, which LSU AgCenter extension agent Marquetta Anderson said provides a fundamental service to the area.

"The food insecurity rate here is 32%. There are only two grocery stores nearby: one in town and another about 10 miles outside of town," Anderson said. "The farmers market is

an opportunity to supply individuals with fresh fruits and vegetables at a lower cost while keeping the money in the parish."

Anderson is part of the AgCenter Healthy Communities initiative funded by the Centers for Disease and Control High Obesity Program grant, which focuses on addressing the nutrition and physical activity environments in Louisiana through a systemic, community-driven approach to reducing obesity. The St. Helena Farmers Market is a key part of this program in the parish thanks to our essential partners at Southern University Ag Center and support from Louisiana Healthcare Connections.

The farmers market offers a SNAP matching program that gives customers who have electronic benefits transfer (EBT) a three-to-one match. For example, for every \$5 spent at the



LSU AgCenter extension agent Marquetta Anderson speaks with vendors at the St. Helena Farmers Market in Greensburg.

Photo by Olivia McClure

market using EBT, a customer can receive an additional \$15 to purchase more fruits and vegetables.

This type of benefit is crucial, especially with the current rate of inflation worldwide. The most recent census shows that an estimated 22.7% of parish residents live at or below the poverty line. The County Health Rankings website indicates St. Helena Parish currently ranks 57 out of 64 Louisiana parishes based on health outcomes and 58 of 64 based on health factors.

Sadly, St. Helena Parish is not alone in a lack of healthful food choices in the state, and adults aren't the only demographic at risk. According to the State of Childhood Obesity website, a 2019-2020 survey showed that 22.2% of Louisiana youth ages 10 to 17 are obese, ranking the state third in the nation, only behind Kentucky at 23.8% and Mississippi at 23.3%.

Denise Holston, registered dietitian and head of the AgCenter's Healthy Communities initiative, studies food insecurity and food environments in rural areas. Holston acknowledges that behavior change can be very difficult, even when people want to improve their food choices.

"If the local consumer food environment is not supportive of healthful choices where all community members have access to affordable, quality and culturally acceptable foods, regardless of income, then the choice to purchase unhealthful foods isn't really a choice. It's their only option," said Holston.

Aulton Cryer, of Cryer's Family Produce, has been a vendor at the St. Helena Farmers Market for approximately four years, and his family has been farming for more than 100 years, dating back to his grandfather. Cryer said customers are always welcoming and grateful for getting an economical alternative to fast food.

"It's so easy to go out and get Burger King or McDonald's, but for the same prices you might pay there, you could fix four meals with the things you find here," Cryer said. "It just costs less to cook at home."

Another vendor, Chris Muse, calls the St. Helena Farmers Market a "godsend" for his business. He is the co-owner and project manager of Muse 3 Farm, which raises grass-fed cattle on more than 100 acres in Greensburg.

"We can provide parish residents with fresh, ground beef, while other vendors provide fresh fruits and vegetables," Muse said. "While we have marketed our beef to local grocery stores and restaurants, we've found that the farmers market has been the best avenue to get our product out to the local community."

V. Todd Miller is an assistant communications specialist in AgCenter Communications.

HEALTHY COMMUNITIES

Healthy Communities is an LSU AgCenter initiative that aims to make Louisiana towns healthier places to live, work, learn and play. Local residents decide what the important issues are and come up with possible solutions. The community works together to make healthy foods accessible and affordable and ensures that outdoor physical activity is safe, accessible and fun for all.

According to America's Health Rankings from the United Health Foundation, Louisiana ranks last in the United States in terms of health outcomes. With an obesity rate of 35.9% and a physical inactivity rate of 31.9%, Louisiana's residents suffer disproportionately from preventable obesity-related diseases such as Type 2 diabetes, cardiovascular disease and certain cancers. These preventable diseases can negatively impact individuals' physical and mental health. The Healthy Communities initiative addresses the root causes of obesity to improve quality of life for all Louisiana residents.

Healthy Communities focuses on making policy, systems and environmental changes that will result in long-term, sustainable solutions to health challenges that Louisiana communities face. Some Healthy Communities projects include:

- Farmers markets.
- Healthy food retail programs.
- Healthy nutrition standards in schools, food pantries and churches.
- Community and school gardens.
- Exercise stencils and fitness signage in public spaces like parks, playgrounds and libraries.
- Local Complete Streets plans.
- Youth coalitions focused on community health.
- Walkability and bikeability improvements along routes to everyday destinations.



Chris Muse, co-owner and project manager of Muse 3 Farm, one of the vendors at the St. Helena Farmers Market, cooks up some meatballs for customers to sample.

Photo by V. Todd Miller

■ A MadHYPE (Madison Healthy Young People Empowerment) youth coalition member poses in an inflatable hamster ball during a Play Street at a community crawl in Tallulah.

Photo by Ruthie Losavio



PLAY WITH PURPOSE:

Building Healthy Communities Through Local Engagement

Jessica Stroope, Ruthie Losavio, Joy K. Sims and Denise Holston

Louisiana consistently has some of the highest rates of obesity and physical inactivity in the nation. Physical inactivity and obesity are linked to increased risk of developing health problems such as Type 2 Diabetes, high blood pressure and certain types of cancer. These health risks are especially high for limited resource communities, residents of rural parishes and communities with a greater proportion of racial and ethnic minority populations.

Being physically active not only reduces health risks, but also supports overall well-being, including improving brain function, reducing stress and im-

proving sleep quality. To improve Louisiana's health outcomes, it is essential to recognize that both physical inactivity and obesity have causes beyond individual choices. Access to walkable neighborhoods, safe and inviting parks and community opportunities for physical activity are all critical for thriving, active communities. That's why the LSU AgCenter Healthy Communities initiative focuses on making towns healthier places to live, work, learn and play by inviting Louisiana residents to identify key issues and come up with possible solutions. Two increasingly popular strategies for boosting physical activity

and gathering community input are Play Streets and StoryWalks.

Play Streets are popup play events that provide safe places for families to get moving. Equipment such as obstacle courses, kickballs, long jump mats, parachutes, inflatable human hamster wheels, bubble machines and music are set up to promote active play, particularly in communities with limited access to parks and safe places to exercise. StoryWalks are outdoor reading experiences where pages from a children's book are set up along a walking route. Both Play Streets and StoryWalks create safe, publicly accessible spaces for chil-

dren and adults to engage in active play. At the same time, using these community resources at events also provides an ideal opportunity to gather ideas from community members on how to make their town a healthier place.

"Play Streets and StoryWalks are great events to draw rural residents out into the community and provide an opportunity to get feedback on ongoing projects, present findings from recent research conducted locally and invite people to participate in other projects happening in the parish," said Denise Holston, LSU AgCenter Healthy Communities program director and LSU School of Nutrition and Food Sciences assistant professor.

At Play Street events, LSU AgCenter Extension staff partner with organizations like the Center for Planning Excellence (CPEX) to set up idea boards with sticky notes and maps of the town and invite adults and youth alike to point out concerns and brainstorm solutions. For StoryWalks, extension agents partner with local libraries to provide picture books to families who complete an evaluation survey, which prompts participants to suggest new books and locations for future StoryWalks.

"In the past, we mainly used community forums to get input from residents. But the people who come to community forums aren't always the ones most impacted by lack of walkability, bikeability and access to physical activity," said Jamila Freightman, program manager for the CDC High Obesity Program at the LSU AgCenter. "Play Streets are a great addition to fun, family-friendly events that allow us to get more equitable input from the community without making it feel like a chore for residents."

"Hosting Play Street events in the past has proven to be engaging for all members of the community," said Joy Sims, assistant nutrition agent for the LSU AgCenter in Madison and Tensas Parish. "At our St. Joseph pop-up park event last year, participation came from stakeholders at all levels of the community. Participating city leaders got to see exactly what their residents identified as barriers to their health and as a result have supported interventions with Healthy Communities to update not

just Seventh Street Park, but the entire Complete Streets* plan we've worked to build with them over the years. We've even partnered with the same entities to enhance the current StoryWalks trail in the City of St. Joseph. But the most unique part was that we may not have gotten such valuable input without the attention that Play Streets brought to the event. That's why we plan to keep using this method of engagement."

Play Streets and StoryWalks are powerful tools for community engagement and health promotion, especially in underserved rural areas of the state. The LSU AgCenter is committed to promoting health equity and engaging community members in problem

solving to increase physical activity. Want to help bring a Play Street event or StoryWalks to your community? Contact your LSU AgCenter parish office or email healthycommunities@agcenter.lsu.edu for more details.

*The Complete Streets plan prioritizes the needs of all road users and improves safety outcomes for everyone, whether traveling by car, foot, wheelchair or bicycle.

Jessica Stroope is the physical activity specialist for LSU AgCenter Healthy Communities. Ruthie Losavio is the communications coordinator for LSU AgCenter Healthy Communities. Joy K. Sims is an LSU AgCenter assistant nutrition extension agent in Madison and Tensas parishes. Denise Holston is an assistant professor in the LSU School of Nutrition and Food Sciences and is program director of LSU AgCenter Healthy Communities.



LSU AgCenter Healthy Communities physical activity specialist Jessica Stroope races a young participant through an obstacle course at a Play Street in St. Joseph. Photo by Jamila Freightman



StoryWalks encourage children to read and exercise. They can be placed in parks and other public areas where children have room to walk. Photo by Ruthie Losavio

FROM HALLWAYS TO REFRIGERATORS:

Healthy Communities Addresses Barriers to Distributing Healthy Foods in the Charitable Food System

Katherine Seals, Jamila Freightman and Denise Holston

In 2018, the LSU AgCenter entered into a five-year cooperative agreement with the Centers for Disease Control and Prevention (CDC) to address the nutrition and physical activity environments of six rural Louisiana parishes with an obesity rate over 40% (Assumption, St. Helena, Tensas, Madison, Morehouse and East Carroll). Through the AgCenter's Cooperative Extension Healthy Communities initiative, multilevel, community-driven approaches have been utilized to identify and implement policy, systems and environmental (PSE) change strategies with the goal of promoting healthy behaviors among residents and improving obesity rates and quality of life.

During the first two years of the program, the CDC Healthy Communities team conducted various assessments across food system sectors to better understand the local food system needs of each community. Extension agents

identified charitable food sites — food pantries, commodity distribution sites and prepared meal sites — in each CDC Healthy Communities parishes, and a needs assessment was conducted with each site to understand client needs and barriers to stocking healthy foods. Additionally, food procurement data provided by the Food Bank of Northeast Louisiana (FBNELA) was assembled to assess the healthfulness of foods procured from the food bank for three food pantries in the Northeast Region.

When assessments were completed in February of 2020, there were a total of 19 charitable food sites serving high obesity program (HOP) parishes, including food pantries, prepared meal sites and federal commodity distribution sites. Site administrators included mostly faith-based organizations, Councils on Aging, local nonprofits, community organizations and extension offices. Sites reported the number of clients



A refrigeration unit has been installed in a St. Helena food pantry with funding from the CDC Healthy Communities program. Photo by Marquetta Anderson



Garden beds have been installed in Morehouse Parish at a local food pantry. Photo by Cecilia Stevens

(people served) in terms of families and/or individuals. We found that a total of 4,242 individuals and 1,614 families were served every month by food pantries, meal sites and commodity distribution sites.

Most food pantries and commodity distribution sites were found to only operate once or twice each month, and most prepared meal sites were operational multiple times a month, with some open several days a week. Almost all food distribution sites relied on some form of volunteers to conduct site operations, such as delivery of food supply to sites and community members. About half the sites had paid employees or support from local police jury members.

Inventory data provided by the FBNELA revealed that meat and dairy products were the most procured items by the three pantries in terms of quantity. Healthfulness of the meat and dairy products varied from grilled chicken filets to pork patties and processed cheese loaves. We also found that only one of the three partner pantries had been procuring fresh fruits and vegetables regularly from the Northeast Regional Food Bank.

Sites were also asked to identify their three greatest needs. Refrigeration, storage and food were most frequently cited as a need. Volunteers, funding and nutrition education were also reported as needs; however, equipment and storage were the primary concerns. We found the COVID-19 pandemic exacerbated the need for more storage because many pantries were reporting an increase in the number of clients. In one community, we found that due to a lack of refrigeration units, one food pantry would often resort to storing food in hallways and turning down the air conditioning to keep foods fresh overnight for distribution day. Stories such as this highlight the barriers that the charitable food system must overcome in order to deliver quality, healthy foods to its community (to view the full [Food Systems Assessment report](#), visit bit.ly/FoodSystemsAssessment).

Guided by these results, the CDC Healthy Communities program sought to work with charitable food sites to identify solutions to increase capacity to procure and stock healthier food items. As a result of these partnerships, food pantry partners received shelving, commercial refrigeration units, commercial freezers and storage sheds to facilitate their ability to serve more clients and, thus, better respond to clients' needs. Seven food pantries have since increased capacity to procure healthier foods by installing new refrigeration and storage, and four food pantries have adopted policies to ensure healthfulness of donated and procured foods. To further our efforts, CDC Healthy Communities has provided technical assistance and developed resources related to client-choice model implementation, food safety and nutrition guidelines in food pantries. Since implementation, additional pantries have begun partnerships with the CDC Healthy Communities program to explore opportunities to improve healthfulness of distributed foods.

In addition to capacity expansion, strong partnerships have led to the creation of innovative solutions to address the healthfulness of the food served in the charitable food system. One food pantry in Morehouse Parish installed on-

site produce garden beds that can be harvested for distribution to pantry clients, and a new AgCenter pilot program in development, Grow a Row to Share, will allow local producers to donate a portion of their garden to local charitable food sites for distribution.

Formative data collection efforts proved to be a crucial step in establishing effective partnerships within the charitable food system. Data driven approaches allowed for each partnership to develop solutions that fit the specific needs of their site and have the greatest impact. Partnerships have led to increased storage capacity, adoption of nutrition policies and implementation of new interventions to connect locally sourced foods directly to community members.

Katherine Seals is a research associate for LSU AgCenter Healthy Communities, Jamila Freightman is an extension associate in the LSU School of Nutrition and Food Sciences and Denise Holston is an assistant professor in the LSU School of Nutrition and Food Sciences.



The Greater Food Bank of Baton Rouge supplied boxes of items for the St. Helena food pantry.

Photo by Marquetta Anderson

BREEDING RICE

for Latin American Export Markets

Brijesh Angira, Adam Famoso, Raul Guerra and Michael Deliberto

The development of improved rice varieties has been a primary goal of the LSU AgCenter H. Rouse Caffey Rice Research Station over the past 100 years. The research station has released more than 50 new varieties, and approximately 70% of Louisiana's rice acreage is grown with the varieties developed by the AgCenter. The primary focus in the development of new varieties is higher yield, improved grain quality and milling, herbicide resistance, disease resistance, early maturity, and lodging resistance or standability. The end goal of developing new rice varieties is to

increase the sustainability and profitability of the Louisiana and American rice industries. Recent advances in new technologies enable breeders to breed new varieties with specific qualities and traits with accuracy and speed.

The United States is the No. 6 rice-exporting country and the 12th largest rice-producing country in the world. Rice exports accounted for about \$1.9 billion in trade in 2020. The United States exports nearly 50% of the rice crop to more than 120 countries worldwide. Latin America is a primary export market, accounting for about 45% of

exports. However, the U.S. rice market share in the Latin American markets has been declining with increased competition from South American exporters. Although the United States remains the top supplier to the region, the trend is concerning in the broader context. From 2002 to 2006, on average, Costa Rica and Nicaragua imported 115,400 and 115,000 metric tons per year, respectively. However, the average U.S. rice exports from 2016 to 2020 to Costa Rica and Nicaragua declined to 50,800 and 49,800 metric tons per year, respectively. Thus, the United States lost 129,800

Addi Jo is a high-amylose long-grain variety released by the H. Rouse Caffey Rice Research Station.

Photo by Brijesh Angira



metric tons of the export market in these two countries. This equates to approximately 80,000 acres worth of rice per year, assuming an average yield of 6,500 pounds per acre and a 55% whole milling yield. Similarly, U.S. rice exports to Mexico have declined from 692,000 metric tons in 2016 to 561,000 metric tons in 2020. The preferred rice type by Latin American consumers is long-grain rice that cooks without a sticky texture. The existing long-grain U.S. rice varieties cook with a stickier texture than Latin American consumers prefer. However, there is a strong desire from Latin American importers to buy U.S. rice because of existing trade agreements with favorable tariff rates, as well as long-standing relationships with U.S. exporters. The United States has free trade agreements with Chile, Colombia, Costa Rica, Dominican Republic, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama and Peru. In addition, the United States signed the United States-Mexico-Canada Agreement in 2020, which provides long-term market certainty for U.S. exports to Mexico.

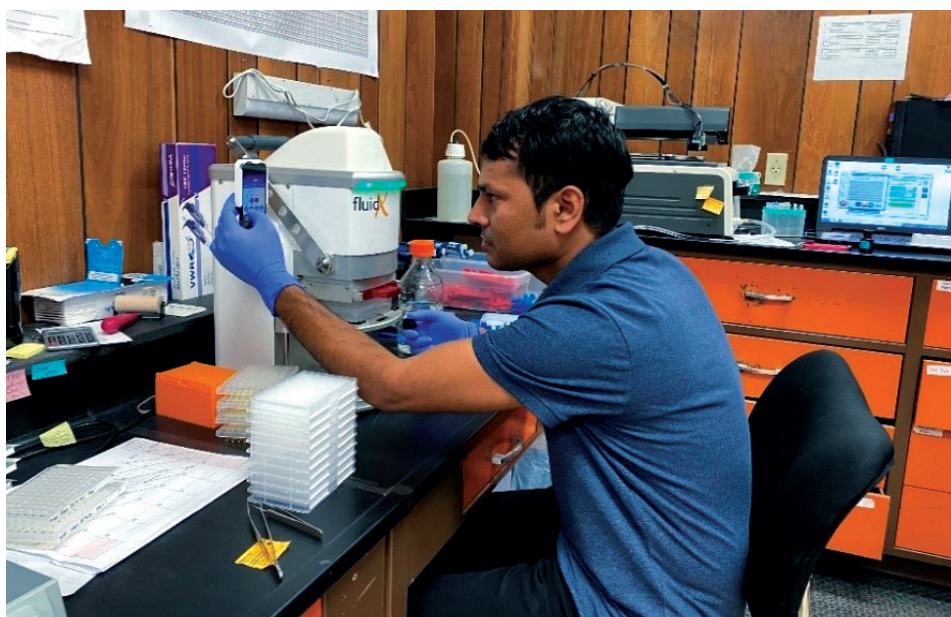
Feedback from Latin American importers and consumers has provided U.S. rice breeders clarity about the preference of nonsticky rice. However, it is challenging to start breeding efforts to develop rice varieties with the nonsticky cooking quality until breeders establish the standard reproducible methods to quantify or characterize the parameters of the preferred rice cooking qualities. To fulfill this objective, Raul Guerra, an LSU AgCenter graduate student in the rice-breeding program, has focused research efforts to understand the key cooking characteristics of popular Latin American and U.S. varieties. The results of this project characterized preferred Latin American rice varieties and elite U.S. varieties and concluded that the Latin American rice varieties have higher amylose compared to the existing U.S. long-grain varieties. This higher amylose in the preferred Latin American varieties contributes to the nonsticky cooking quality of rice. In addition to the high amylose, most of the preferred Latin American varieties exhibited a low gelatinization temperature. These initial results allowed researchers to define the breeding targets

and set the priorities to develop non-sticky long-grain rice varieties for Latin America. The rice breeding program is continuing its effort to understand the effect of low gelatinization temperature on cooking quality. In addition to high amylose and a low gelatinization temperature, researchers are also focusing on higher yield, disease resistance, early maturity, low chalk and higher milling qualities. The LSU AgCenter rice breeding program has also deployed and validated DNA markers for amylose and gelatinization temperature that facilitate the rapid and cost-effective selection of lines with the desired quality. This greatly reduces the cost and increases the throughput and numbers of lines that can be evaluated, allowing the breeding program to quickly and accurately screen large numbers of plants and select the preferred quality traits.

The U.S. rice industry and AgCenter rice breeders see an excellent opportunity to increase U.S. rice exports in the Latin American countries by developing preferred nonsticky and long-grain rice varieties. Through the support of a grant through USA Rice, the research team characterized the cooking quality parameters and set clear breeding objectives to develop new varieties focused on the Latin American export market. These efforts helped contribute to the development and release of Addi Jo, the first high-

amylose rice variety developed at the LSU AgCenter. Addi Jo is a long-grain conventional rice variety with a high-amylose grain type that cooks with the nonsticky texture desired by Latin American consumers. Addi Jo was developed by using a pedigree selection method. It was selected from a cross between Thad, a high-amylose and long-grain conventional variety released by the Mississippi Agricultural and Forestry Experiment Station, and Catahoula, a long-grain conventional variety released by the LSU AgCenter. Catahoula provided a broad-spectrum resistance to blast, a destructive disease caused by a fungus, while the high amylose was inherited from Thad. Addi Jo's cooking quality was exhibited to Latin American rice importers at the 2021 USA Rice Outlook Conference in New Orleans, where it received positive feedback. The AgCenter rice breeding program is continuing its efforts to develop more long-grain, nonsticky rice varieties to target the Latin American export market and increase sustainability and profitability to the Louisiana and U.S. rice industries.

Brijesh Angira is an assistant professor and Adam Famoso is an associate professor at the H. Rouse Caffey Rice Research Station in Crowley. Raul Guerra is a graduate research assistant at the LSU School of Plant, Environmental and Soil Sciences and the H. Rouse Caffey Rice Research Station. Michael Deliberto is an assistant professor in the Department of Agricultural Economics and Agribusiness in the LSU College of Agriculture.



Brijesh Angira, assistant professor of research at the H. Rouse Caffey Rice Research Station, prepares rice DNA samples to be tested to determine the amylose and gel temperature. Photo by Madeline Fruge

75 YEARS OF PRESERVING GENETICS:

From the Dairy Improvement Center to the Aquatic Germplasm and Genetic Resources Center

CENTER SAFEGUARDS THE VALUABLE GENETICS OF AGRICULTURAL AND RESEARCH ANIMALS

Terrence Tiersch, Jack Koch and Yue Liu

The year was 1947. America had returned victorious from World War II, and it was a time of national growth and investment. That year a 4,200 square-foot, state-of-the-art building was built adjacent to LSU surrounded by agricultural lands next to the Mississippi River levee. The building housed the LSU Dairy Improvement Center. In the following decades new additions to the center more than tripled its size, and additional facilities were built to improve the genetics and milk yield of dairy cattle.

In the mid-1990s Terrence Tiersch began work with dairy scientist John Chandler at the center to pioneer the freezing of fish sperm using established industrial approaches developed for semen of dairy bulls. This work in cryopreservation provided the foundation for shifting to establishment of programs and facilities called germplasm repositories or bio-banks. Germplasm is the genetic material of a species, such as sperm, eggs, embryos or tissues, that can be preserved. Surprisingly, dairy provided a great model for fish and shell-



The LSU AgCenter Aquatic Germplasm and Genetic Resources Center is where the LSU Dairy Improvement Center once stood. Today the facility is used to preserve the genetic material of aquatic species.

Provided photo

fish because it is a large, mature global industry based on protecting, shipping and selling valuable genetics in the form of frozen semen. Those are all activities that will be very important for eventual application of similar technology to aquatic species.

This focus on applying the results of research in the real world is intended to help multiple aquatic groups. For example, fish farmers (aquaculture), just like ranchers or crop farmers, need genetic improvement to ensure they can produce a high-quality product. Maintaining valuable breeder fish in ponds is expensive and risky. Freezing the sperm offers a way to preserve valuable genetics and easily use them in selective breeding programs. This kind of approach could help ensure the future of Louisiana oysters and support the farmers who grow them in response to problems such as low salinity or disease. Based on these needs the Aquatic Germplasm and Genetic Resources Center (AGGRC) was created in 2015 at the Dairy Improvement Center.

The facility became available at that time because, over the decades, the focus of dairy breeding shifted from university research farms to the private sector, and Dairy Science faculty retired or moved their work onto the LSU campus. Because of previous work there, Tiersch's group moved from the LSU AgCenter Aquaculture Research Station (5 miles from campus) to continue germplasm protection by converting the facility from work with bulls to work with fish, shellfish and other aquatic species. The mission of the AGGRC is devoted to assisting the development of germplasm repositories for aquatic species through interdisciplinary approaches and has four main programs: research, technology development, commercial-scale processing and outreach.

RESEARCH

Personnel at the AGGRC have performed research addressing repository development for hundreds of aquatic species for 30 years. This work has always included farm-raised species such as catfish and oysters. The work also includes animals that are used for research of human disease. Animals such as monkeys, dogs, rabbits, rats and mice share genetic traits with people and have been used to study human disease for the past century. Working with these animals is very expensive and often requires whole buildings with large staffs. In addition, social changes have made working with mammals such as these less acceptable. In response to these problems, aquatic species like fish, salamanders, frogs and sea slugs have been used over the past few decades in genetic studies. The National Institutes of Health (NIH) and other agencies invest billions of dollars into research using these animals, which are called "biomedical models." Because of their relative late entry into this area, most aquatic species do not have germplasm repositories or similar facilities to protect from losses of valuable genetics due to accidents or disease, and the resources are mostly maintained as live animals.

The most important biomedical aquatic species is the zebrafish. This fish has more than 60,000 different types (called "lines") that have been developed by researchers around the world. That is beyond the capabilities of even large facilities,

such as the Zebrafish International Resource Center (ZIRC, at University of Oregon), to maintain. Personnel at the AGGRC have assisted ZIRC in developing a repository with funding from NIH. Based on this success, the AGGRC has begun to expand efforts to the other research models that have NIH-funded national centers: salamanders (*Ambystoma*, at University of Kentucky), frogs (*Xenopus*, at Woods Hole Oceanographic Institute), swordtails and platyfish (*Xiphophorus*, at Texas State University, San Marcos) and sea slugs (*Aplysia*, at University of Miami). Although it may seem strange, aquatic animals such as these will play an ever-increasing role in disease research in the future, and they are already leading to breakthroughs in a variety of fields (Figure 1).

TECHNOLOGY DEVELOPMENT

Based on more than 15 years of interdisciplinary work, a unique technology program has been developed at the AGGRC. The goal is to provide innovative solutions to tackle real challenges encountered in germplasm repository development that otherwise would be difficult to be solved by traditional biological research. An example is open scientific hardware fabricated by more than 35 3D printers located throughout the facility. Additional examples include (Figure 2) devices operated with microcontrollers and mechanical components, sensing and monitoring platforms, and microfluidic systems. Collaboration among multiple disciplines is the core of this program, integrating the long-standing background of cryobiology and aquatic reproduction with expertise in fields within and outside the LSU AgCenter. This work also benefits greatly from close collaboration with the USDA National Animal Germplasm Program in Ft. Collins, Colorado. This is the leading animal germplasm repository in the world and includes aquatic species important to agriculture.

COMMERCIAL-SCALE PROCESSING

The AGGRC is a long-time leader in developing approaches to freeze, store and use samples for real-life applications where things like costs, time and sample quality become important factors. The AGGRC has automated equipment to rapidly fill, seal and label sample containers and large computer-controlled freezers. The center also has built a mobile cryopreservation laboratory using a custom-designed trailer for high-throughput freezing at other locations. This greatly improves accessibility to user groups and allows work with fish and samples that are freshly collected without the need for overnight shipping, which can reduce quality. Collaboration with industrial engineers at LSU has resulted in new uses of tools such as process mapping and computer simulation to help plan for scaling up cryopreservation for use in commercial settings. This work is aimed at establishing new business opportunities, such as new markets for genetic resources, and to support existing industries such as fish farming.

OUTREACH

The AGGRC is always involved in traditional outreach activities, such as teaching and training, including tours, hosting visitors and traveling to work with cooperators. Dozens of

undergraduates from across a wide range of departments at LSU have worked or researched at the center. The AGGRC also has active collaborations around the world. For example, a current project with Bangladesh Agricultural University is intended to help protect native fishes and provide food security to local people by development of repositories. In addition to regional, national and international cooperation, the center has developed capabilities such as digital photography and media studios to allow production of professional-quality manuals and videos needed for training and use of open hardware technology.

In summary, the AGGRC is proud to carry forward a 75-year legacy of addressing real-world problems as we move into the future. It has benefitted greatly by absorbing ideas from established industries like dairy and using those lessons to develop important new capabilities for fish and other aquatic organisms. It is extremely important as a nation and world that we develop the ability to protect the genetic resources of aquatic species. This is necessary to support aquaculture, which provides nutrition and economic development around the planet. It is also necessary to protect imperiled species from extinction, maintain strong populations of wild fisheries such as Louisiana fish and oysters, and enable biomedical research to improve human health. The AGGRC has emerged as a unique interdisciplinary facility with four interlocking programs designed to bring new approaches to large, global problems. This will create fresh opportunities and support the growth of lucrative markets and industries for protecting and distributing the genetic resources of aquatic species.

Terrence Tiersch is a professor in the LSU School of Renewable Natural Resources and director of the LSU AgCenter Aquatic Germplasm and Genetic Resources Center. Jack Koch is a postdoctoral researcher at the center and Yue Liu is a research assistant professor in the School of Renewable Natural Resources and assistant director of the AGGRC.

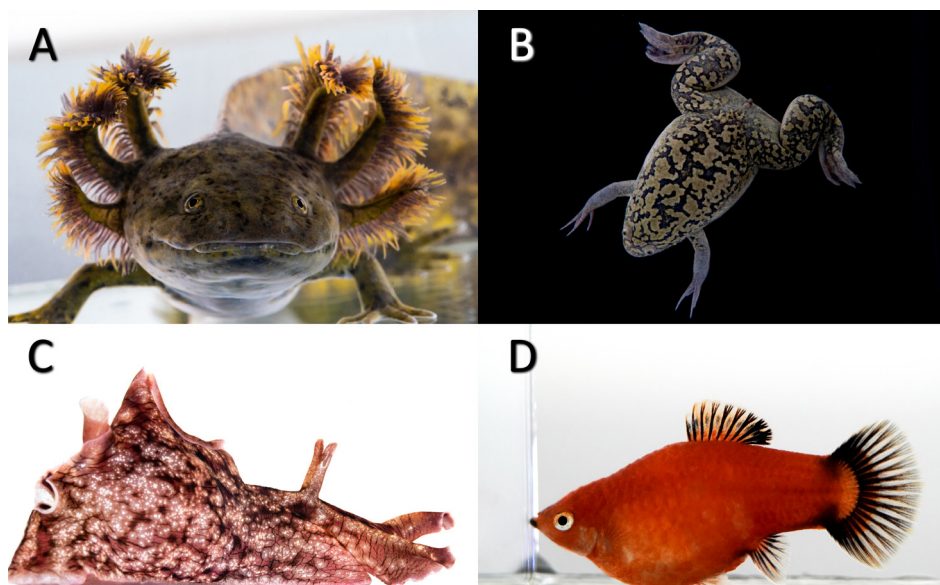


Figure 1: The AGGRC works to protect large investments in biomedical research by developing germplasm repositories for aquatic organisms such as axolotl salamanders (A), African clawed frogs (B), sea hares (C) and platyfish (D). These animals are used worldwide for study in areas such as cancer, nerve function, tissue regeneration and numerous diseases. Aquatic animals have begun to replace traditional research animals such as mice, rats and monkeys.



Figure 2: Innovative technologies are developed at the AGGRC in the form of open hardware that can be shared as computer files with user communities to support use of germplasm repositories. These devices address steps in sample processing, freezing and thawing, and are custom designed for fabrication by use of consumer-level 3D printers, electronics and microcontrollers.

A HISTORICAL REVIEW AND CURRENT EVALUATION of Soybean Planting Dates in Central Louisiana

David Moseley, Andre Reis, Manoch Kongchum, Rasel Parvej, Boyd Padgett, Thanos Gentimis, Brandi Woolam and Laura Lee

The early soybean production system (ESPS), proposed in the mid-1990s for the Southern United States, consisted of growing varieties with a maturity group of III and IV and a planting date between mid-April to mid-May. The traditional recommendation, planting a maturity group V-VII variety between May and June, was known as a full-season production system. Research indicated that the early soybean production system improves yield and stability, mainly by avoiding heat and drought stress during seed fill and late-season disease and insect pressure.

In 1998, Donald Boquet reported results from a planting date and maturity group research project conducted at the LSU AgCenter Northeast Research Station near St. Joseph. The research results supported the previous report of an equal or greater attainable yield with more stability with an early soybean production system than the traditional production system. Since 1998, soybean planting date and maturity group research across the Southern United States, including the northern region of Louisiana, has supported the early soybean production system with an optimal planting date around mid-April.

According to U.S. Department of Agriculture survey data, Louisiana soybean producers began to largely adopt the early soybean production system in 1999. Before that, soybean crops were planted earlier than May 1 only twice, in 1988 and 1994, when 1% and 5% of the soybean crop was planted by May 1, respectively. However, in the 1999 season, 19% of the soybean crop was planted by May 2. Since 1999, an average of 35% of the crop has been planted by the beginning of May. Based on an April planting date, the early soybean production system adoption rate increased annually from 1999 to 2017 by 1.74% with a maximum of 66% planted by the beginning of May in 2017.

A planting date, maturity group and variety trial was conducted at the AgCenter Dean Lee Research Station in 2021 to determine how the shift to earlier maturing varieties affected the vegetative development rate and timing of growth stages. In addition, the research was designed to revisit the reported yield advantage of an early soybean production system indicated across the Southern United States.

Warmer temperatures increase the soybean growth rate, and shorter daylengths can decrease the number of days to the beginning of the reproductive stages. The planting date trial at the Dean Lee Research Station was designed to determine if a maturity group III-IV variety planted in April is the optimal practice in central Louisiana. Also, soybean plots were

planted in March to determine if soybean plants would respond favorably to an extremely early planting date.

The overall average yield of all 12 varieties (all three maturity group sections), was the highest for the April 6 planting date (57.4 bushels per acre). The average yield decreased for the March and late April to July planting dates. There was a 9%, 4.7%, 5.1%, 8.1% and 16.3% drop in yield compared to the April 6 planting date for the March 22, April 29, May 31, June 11 and July 1 planting dates, respectively. In 2021, the drop in yield potential for a late May to July planting date seemed to be lower than historical observations. This may have been from less heat and drought stress throughout the growing season. However, the highest yield from an early to mid-April planting date is consistent with previous planting date trials across the Southern United States.

The attainable yield of a soybean crop can be higher when the plant canopy is closed by the beginning pod development growth stage, called R3, to full pod development, or R4. The average percent canopy coverage at R4 across all 12 varieties was 52.5% and 55% at a 38-inch row spacing for the March 22 and April 6 planting dates, respectively. The average canopy coverage at R4 was the highest at 77.7% for the April 29 planting date.

In 2021, the optimal percentage of canopy coverage at R4 and highest yield potential combination was from a planting date between April 6 and April 29. Although this was a one-year trial of 12 varieties split evenly across the maturity group sections III to V, the results indicate the optimal soybean planting date in the central region of Louisiana is between early to late April.

A decrease in yield potential and rate of canopy coverage does not support planting soybean in mid-to-late-March. In addition to lower yield potential, plants with slower vegetative growth will not shade out weeds as well.

The planting date research at Dean Lee Research Station indicates the early soybean production system is the optimal planting practice for central Louisiana. Data from 2021 support previous research results that suggest planting soybean earlier than May and June will maximize yield potential. However, planting earlier than April may reduce the maximum yield potential.

David Moseley is the state soybean specialist and an assistant professor, Boyd Padgett is a professor, Andre Reis is a soybean and sugarcane agronomist, and Brandi Woolam and Laura Lee are research associates at the Dean Lee Research and Extension Center. Manoch Kongchum is an associate professor at the H. Rouse Caffey Rice Research Station. Rasel Parvej is an assistant professor at the Macon Ridge Research Station. Thanos Gentimis is an assistant professor in the Experimental Statistics Department.

Mendel University faculty and students tour the Tabasco factory when visiting Louisiana for an in-person food symposium during their early learnings of Louisiana food industry.

Provided photo



LSU AgCenter Capitalizes on International Strategic Partnerships: LSU AGCENTER/MENDELU FOOD SYMPOSIUM

Ivana Tregenza and Maria Bampasidou

In 2014, the LSU AgCenter and Mendel University (MENDELU) in Brno, Czech Republic, established a strategic partnership with a goal to develop sustainable cooperation in research, extension and outreach, and education. The two universities have a strong presence in agriculture, offering quality programs that engage stakeholders and students and promote entrepreneurship. Their approach to food science in particular offers multiple possible cooperative actions and elevates the quality of both programs in research and tech-

nology — through sharing of cheese formulas, for example — and education by the offering of joint courses. The two institutions have participated in faculty and student exchanges and offered a joint agricultural economics course, and teams from both are working on collaborative projects on curbing food waste and improving farm-to-table programs. Additionally, cooperation with the LSU AgCenter Food Innovation Institute (FOODii) resulted in a number of food products produced at MENDELU, such as baked goods, pasta products and

cheeses, making their way to student cafeterias.

The partnership offers exposure to an international forum, an opportunity to work within international networks on global agricultural issues and a chance to share cultural experiences. As a result, faculty have participated in exchange programs, presented relevant research and published in quality journals. Similarly, students have engaged in research projects of common interest, exchanging knowledge and expertise, and engaging in research early in their programs. Moreover, the two universities have explored opportunities of study abroad and campus visits. As such, the partnership allows for an impactful international exposure adding to other high-impact learning activities, such as study abroad programs, semester abroad and internships.

In March 2021, the two institutions organized their first joint symposium focusing on food-related topics. The areas of food science, human nutrition, food technology and food safety have deep roots in both universities. While MENDELU is highly focused and successful in food production, which includes meat products, baked goods, pasta, beer, wine and dairy, much of LSU's food production is housed in FOODii, which supports small Louisiana startups.

Due to the pandemic, the 2021 MENDELU/LSU AgCenter Food Symposium went virtual. With almost 450 registered participants, interest was piqued among the faculty and students. Research sessions focused on best practices in horticulture, food technology, food safety and food waste with experts from both universities presenting on timely topics and research applications. Student-oriented sessions included the first joint LSU–MENDELU course comparing food systems in each region and a discussion session allowing students to directly engage and exchange information on academic programs and student life. Such events might have been the first exposure to international cooperation for LSU College of Agriculture students and faculty, considering the pandemic.

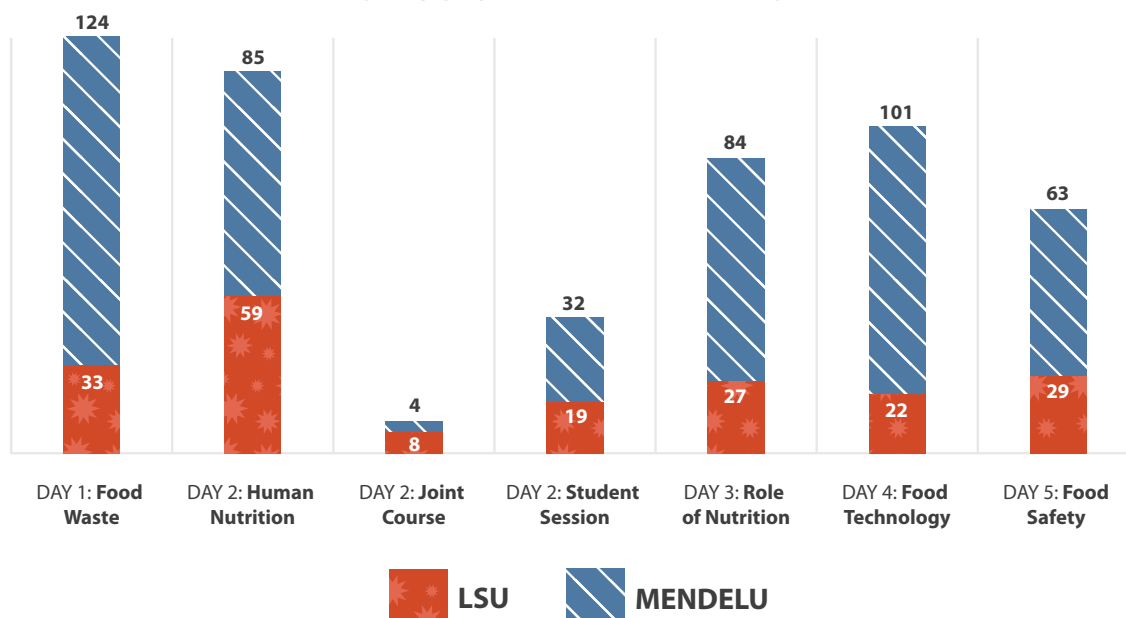
The graph below depicts the Food Symposium structure and attendance per day. Student interest was overwhelming. Remote participation negated the need for travel arrangements and concerns of time differences and alternating host universities. Because of this flexibility, a hybrid mode was proposed for future events.

Food Symposium 2.0 was hosted by MENDELU between Feb. 28 and March 4, 2022. Registration increased to 535, with participants from 18 additional partner institutions. For four days researchers, students and extension agents had the opportunity to present their research, discuss ongoing projects between the two universities — some of which formed during the 2021 symposium — and network. Building on last year's recipe, food science-related presentations were complemented with presentations on economics on labor relations in agriculture and guest worker programs and new trends in food science, such as 3D printing of food. These presentations nurture multidisciplinary collaborations. Moreover, recognizing the importance of providing opportunities to students to present their work at an international event, a session of the symposium was fully dedicated to student research presentations. Nine students had a chance to present their results and projects, receiving attention from faculty and mentors.

While the LSU AgCenter–MENDELU Food Symposium 3.0 is still a year away, the organizational team is already identifying topics valuable to both Louisiana and the Czech Republic. In the meantime, students and faculty of both universities will be welcomed to the International Summer School at LSU for a two-week, hands-on agricultural experience in Louisiana in July.

Ivana Tregenza is the director of the LSU College of Agriculture International Relations and is associate director of the LSU AgCenter Global Network. Maria Bampasidou is an assistant professor in the LSU AgCenter Department of Agricultural Economics and Agribusiness and a member of the planning committee for the LSU AgCenter Global Network.

LSU – MENDELU 2021 FOOD SYMPOSIUM STRUCTURE AND ATTENDANCE



HELPING LOUISIANA'S SHRIMP INDUSTRY During the Pandemic

Albert Gaudé

Among the many issues emerging from the COVID-19 pandemic was the distribution of food to the population suffering economic hardships. The pandemic made their dependence on subsidized food sources even more critical.

Beginning in 2020, the Agricultural Marketing Service (AMS) branch of the U.S. Department of Agriculture (USDA) increased its purchase and distribution of food products by \$159.4 million. Along with legumes, dairy products, fruits and nuts, the USDA included the largest purchase of American seafood in our nation's history in that effort. Embedded in the seafood purchase was the first-ever inclusion of wild-caught American shrimp, never before considered eligible for the USDA/AMS program.

Much of this achievement was encouraged by the American Shrimp Processors Association (ASPA) working with Louisiana's congressional delegation. The Louisiana shrimp industry was economically depressed because of the collapse of restaurant patronage during the pandemic, leading to huge frozen inventories without a retail outlet. To make matters worse, the Louisiana shrimp season was about to open, and the frozen surplus inventory foretold

a collapse of the commodity's price structure, which would in turn impact shrimp harvesters. For more than 2,000 licensed shrimpers in Louisiana, this spelled catastrophe, further intensifying the impacts of COVID-19 on harvesters' families.

Dealing with shrimp products was novel to USDA/AMS. But partnering with LSU AgCenter/Louisiana Sea Grant personnel to develop workable guidelines for the purchase and distribution was a natural choice. Several Louisiana Sea Grant fishery agents hail from shrimper families. Agents like Thu Bui, who is based in Franklin and St. Mary parishes, immediately set about streamlining the cost-effective solicitation, bidding and ultimate shipment of excess Louisiana shrimp inventories, thus creating storage space for the new season's harvest and resulting in needed capital for the fair market purchase of harvester's new catch.

However, as they say, "the devil was in the details." Due to the restaurant trade's traditional shrimp packing preferences, and differing preferences of the USDA for food distribution protocols, much of the surplus inventory was being held in forms that were initially ineligible for AMS purchase. By quickly as-

sembling an appropriate task force with members of Louisiana Sea Grant, USDA, National Oceanic and Atmospheric Administration (NOAA), Louisiana Department of Wildlife and Fisheries (LDWF), ASPA and Louisiana Department of Agriculture and Forestry, Bui and her fellow Sea Grant colleagues were able to negotiate a packaging solution for AMS nationwide distribution of shrimp.

"It was truly a team effort," said Bui. "Each one of the team members had a substantial role in getting the job done. It was all great leaders and no worker drones in the group. We were determined to help the shrimp industry and are proud of what we accomplished."

The result of this quick Sea Grant mobilization was \$50 million in cash from the USDA infused into the shrimping industry, and 7.6 million pounds of Louisiana shrimp taken out of inventory and distributed nationwide. Distribution outlets, like food banks, were delighted to offer their participants Louisiana shrimp for the first time. Just one of many, the Second Harvest Food Bank of Louisiana (the largest in the nation) was appreciative of Louisiana Sea Grant efforts stating, "The USDA shrimp was a wonderful opportunity and a highly valued addition to our clients' diets. We're grateful to everyone at Sea Grant who played a role in that." The shrimp purchase program continues as of this writing.

Sponsored by the U.S. Department of Commerce through NOAA, Louisiana Sea Grant works closely with the LSU AgCenter as its coastal counterpart, using extension, outreach and research to best guide the wise and appropriate use of natural resources.

Albert Gaudé is an LSU AgCenter area Sea Grant fishery agent based in Jefferson Parish.

**Fresh-caught
shrimp is
weighed at
the dock in
Delcambre.**

File photo by
Bruce Schultz



What's Driving FARM AND RETAIL FOOD PRICES?

Michael Deliberto

For each dollar a consumer spends at the supermarket, that entire dollar does not go directly to a farmer. Soybeans, corn, wheat, rice and other raw commodity inputs move along the food supply chain from farms to collection and storage facilities and then processors. The commodities pass on to wholesalers, and once processed and packaged, they move to the retail market. Along the way additional costs are layered on top of the price received by the farmer. These are composed of marketing costs from handling, sorting, cleaning, processing and packaging a product. The costs also include product transportation and storage charges and expenses related to the insuring, financing and retailing of that product, including store maintenance and utilities, refrigeration, labeling and shelf display and advertising and promotional costs.

Proceeds from each food dollar expenditure are divided into two subcomponents of market value: farm share and the marketing bill. Farm share measures the proceeds of farm commodity sales tied to a food-dollar expenditure and sold to nonfarm establishments. In economics, the marketing bill is a term used to describe the market value added to farm commodities embodied in a food-dollar expenditure and is measured as \$1 minus the farm share. For calendar year 2019, the farm share was 14.3 cents of each food-dollar expenditure, and the marketing bill was 85.7 cents, accounting for the remainder of the food dollar.

The COVID-19 pandemic led to a shift in consumer demand from food consumed away from home toward food consumed at home. As this shift was occurring, retail food demand soared. Although similar food products are consumed in and out of the home, products normally sold to restaurants and food service operations cannot be sold to retailers without incurring additional production costs.

The U.S. Department of Agriculture estimates prices for food for at-home consumption are expected to increase between 3% and 4%, while prices for food purchased away from home are predicted to increase between 5% and 6%. Impacts from the conflict in Ukraine and the recent increase in interest rates by the Federal Reserve are expected to put pressure on food prices.

Retail food prices partially reflect farm-level commodity prices, but packaging, processing, transportation and other marketing costs, along with competitive factors, play an integral role in determining prices on supermarket shelves and restaurant menus. Retail food prices are less volatile than farm prices. Retail food prices increased by 3.5% in 2021, equal to the rate in 2020 and greater than the 2000 to 2019 historical

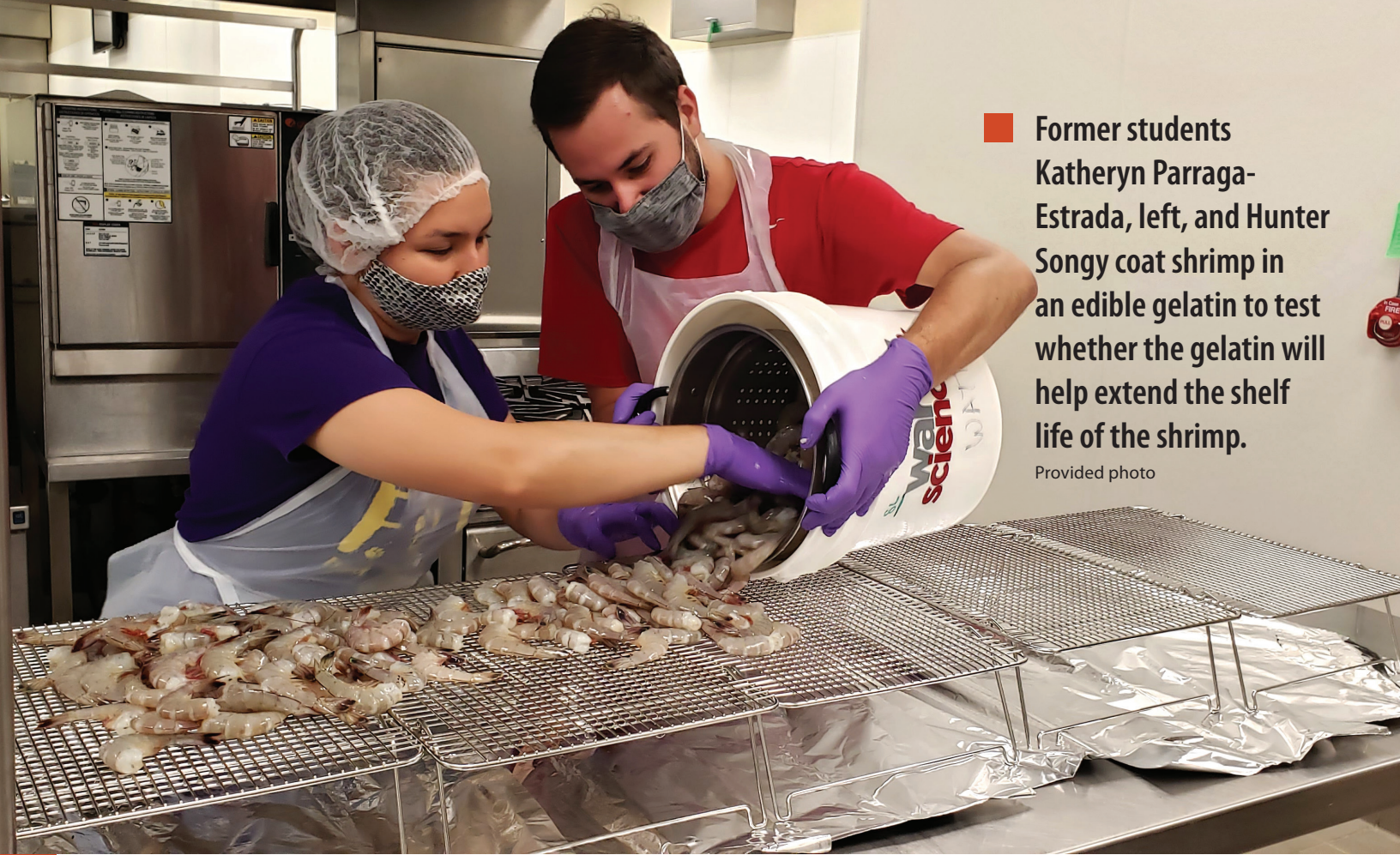
annual average of 2%. Inflationary pressures differ by food category. Food price increases in 2020 were primarily a result of shifts in consumption patterns and supply chain disruptions related to COVID-19.

For instance, meat prices have increased due to strong demand, higher feed costs and supply chain disruption. Winter storms and drought affected meat prices in the spring. Forecasts for U.S. farm income in 2022 expect reduced margins due to retreating commodity prices and rising input costs. Crop prices are projected to decline from 2021-22 peaks to levels more consistent with pre-COVID-19 prices. In 2021, commodities such as corn, soybeans and cotton rose to record high levels amid soaring export demand and strong domestic demand and tight stock availability. The economic outlook for rice is forecast to improve in 2022. Favorable production conditions for sugarcane and sugar beets in 2021-22 have been met with stable sugar prices in the market.

Prices for inputs, such as fertilizer, have significantly increased year-over-year, as supply chain disruptions, energy price hikes and geopolitical tensions threaten to keep prices elevated. Freight transport disruptions have affected supply chains, and bottlenecks in ports from longshoremen and truck driver labor shortages have hampered the throughput of agricultural goods. This has affected both retail food prices and the availability and price of raw ingredients, such as proteins primarily used in animal feed and chemicals used to control weeds in row crops. Producers are also finding it difficult to find repair parts for machinery.

The USDA points to a number of factors over the last 18 months that sent global agricultural commodity prices to near-record levels. Russia's invasion of Ukraine was only the latest development to push commodity prices higher. Other factors affecting global markets, which date back to late 2020, include increased global demand led by China; drought-reduced supplies; tightening wheat, corn and soybean stocks in major exporting countries; high energy prices pushing up the costs of fertilizer, transportation and agricultural production; and countries imposing export bans and restrictions, further tightening supplies. In summary, as agricultural goods leave the farm gate, extraneous factors can affect retail prices paid by the consumer. When combined with retail challenges and macroeconomic conditions, such as inflation, it should be borne in mind that farmers are not able to benefit directly from downstream price increases.

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



■ Former students Katheryn Parraga-Estrada, left, and Hunter Songy coat shrimp in an edible gelatin to test whether the gelatin will help extend the shelf life of the shrimp.

Provided photo

AGCENTER RESEARCH SUPPORTS the Increase of Market Opportunities for Louisiana Seafood Industry

Evelyn Watts

Seafood is an important part of the United States and Louisiana economy. According to National Oceanic and Atmospheric Administration (NOAA) 2020 commercial landings, Louisiana ranks second in metric tons of seafood landed and fourth in dollar value in the country. The increasing demand for seafood and its characteristic high perishability make handling, processing and packaging practices key to ensure a high quality to meet consumers' expectations. Seafood is key in the global economy as it is recognized for its health benefits of high-quality protein, vitamins, minerals and

essential amino acids. A total of 1 billion people depend on seafood as a source of protein. However, because of its large unsaturated lipid composition, seafood is known to be highly perishable with a relatively short shelf life. Deterioration of seafood begins immediately upon harvesting and quality depends directly on handling, storage and processing conditions.

While Louisiana seafood is famous countrywide, rapid quality deterioration limits market opportunities for the local industry. The Seafood Quality Laboratory at the LSU AgCenter sup-

ports the local industry conducting research activities to help the industry enhance seafood quality, expand shelf life and enhance co-product recovery. The seafood laboratory research work focuses on evaluating different chilling methods, antimicrobials applications, packaging and co-product recovery.

Different technologies have been used to chill seafood. In Louisiana, the most common process utilized is flake ice. In contrast, slurry ice is an innovative chilling system prepared from marine water that can reach subzero temperatures, which provides a good

application to store aquatic food products compared to flake ice or refrigerated seawater. It reduces physical damage, limits microbial growth and increases shelf life. Research conducted at the seafood lab found that the use of a nano-size slurry ice allows for faster cooling rates compared to flake ice currently used by the seafood industry. This nano-size slurry ice allows the storage of whole fish for a longer period compared to flake ice. In addition, the application of organic acid enhanced the nano-size ice slurry in the chilling step delayed bacterial growth. Furthermore, a study evaluating crawfish shelf life using lactic acid during the chilling step after cooking expanded crawfish tail meat microbial stability from 10 to 12 days. Charts and graphs further explaining research results can be viewed at bit.ly/LouisianaAgricultureMagazine.

In addition to using processing interventions to improve seafood shelf life, packaging also plays an important role in protecting the product to preserve quality and safety. Thus, the primary functions of packaging can be defined as containment, protection, convenience and communication. Development of packaging technologies and materials is extensive. A large variety of packaging materials and technologies exist now that allow for a better quality and a convenient product. Modified atmosphere packaging (MAP) is a technology widely used in meat and poultry products; however, in recent years, market trends are demanding this technology application in seafood products. The seafood lab completed a study evaluating the shelf life and quality of black drum comparing three different packaging technologies and comparing two MAP gas combinations and their effect on shelf life. Microbial growth was reduced in fish stored in MAP at refrigeration temperature for up to 20 days. No difference was observed between different MAP gas combinations.

The seafood lab is currently evaluating the effect of gelatin extracted from fish skin in the shelf life of different seafood products. Gelatin is being enhanced with different antimicrobials and applied as an edible film. Research is still ongoing, but some promising results have been observed in the extension of shelf life.

Findings from research completed at the LSU AgCenter Seafood Quality Laboratory allow the local industry to implement technologies available in the market to enhance the shelf life of their product, meeting consumers' expectations and being able to market to a regional and national level.

Evelyn Watts is a seafood extension specialist for the LSU AgCenter and Louisiana Sea Grant.



The Seafood Quality Laboratory is testing whether an edible gelatin made from fish skins can extend the shelf life of the shrimp.

Provided photo



■ Louisiana has 587 certified nursery operations that raise plants for consumer horticulture.

Provided photo

LOUISIANA NURSERIES:

A Growing Industry Dealing With Labor Shortages

Maria Bampasidou and Jeb S. Fields

It's springtime and the nurseries are buzzing with activity. As suppliers of flowers, shrubs, trees, seasonal vegetables and fruit, as well as other necessary garden supplies, nurseries are a popular destination as the weather improves. This season nursery products are in high demand for landscape contractors, landscape architects, and people working on their yards and gardens. Nurseries also supply wholesale and retail distribution firms, such as garden centers, home stores and distribution centers. For Louisiana, the nursery industry is one of the strongest economic factors in the central and southern regions of the state. Although many Louisianians appreciate the end products and services of nurseries, the challenges of the industry to keep up with increasing demand are hidden.

With a total of 587 certified nursery operations in Louisiana, the nursery industry had a value of \$178.57 million in 2019, according to the 2019 LSU AgCenter Ag Summary, and earned \$107.8 million in sales, according to the 2019 U.S. Department of Agriculture Census of Agriculture. The industry is growing rapidly. Prior to the pandemic, national surveys showed the Louisiana nursery industry moving from 24th to 16th in state rankings for nursery production in 2018. The

pandemic added more stress to local nurseries, which have seen an increased demand for their products coinciding with stay-at-home orders, social distancing regulations and fragmented supply chains. With so many residents forced to stay at home, the demand for improved landscapes skyrocketed. Many people turned to gardening as a hobby or a way to cope with stress.

Major suppliers have estimated that new gardeners number over 15 million nationally since the COVID-19 pandemic. The Louisiana nursery industry recorded record sales in 2020, and then broke those records in 2021, with many nurseries reporting selling their entire inventory. These record years have seen nurseries continue to expand and increase production year-round to keep up with growing demand. As they push forward with increased production this year, nurseries are coping with limited access to growing media and containers and other resources, persisting supply chain disruptions, price fluctuations caused by energy prices and other rising costs, and increased labor costs.

While the nursery industry is spread throughout the state, Rapides, Tangipahoa and St. Tammany parishes have

the highest concentration of nurseries. The nursery industry employs about 50,000 people each year. Nursery production is incredibly labor intensive, with few tasks able to be automated. As such, labor costs are always one of the largest expense categories in a nursery. These labor-intensive tasks include blending, mixing and testing growing media and applying fertilizers; transplanting, weeding, thinning or pruning crops; applying pesticides; organizing, spacing and moving containers; and cleaning, grading, sorting, packing and loading harvested products. Though tasks are performed year-round, peak production season for the Louisiana nurseries typically occurs from March to May.

Access to labor, particularly skilled labor, is always discussed as a top priority among members of the nursery industry. Many nurseries in Louisiana, particularly the larger nurseries, have turned to the H-2A temporary agricultural worker program to secure labor during peak seasons. The H-2A program allows agricultural employers to hire workers from other countries for short-term work that lasts 10 months or fewer if those jobs cannot first be filled by American workers. The majority of H-2A workers are employed for about 10 months at a time. Employers must provide housing for these workers, and they must pay a wage at least equal to the federal adverse effect wage rate of \$12.45 per hour in Louisiana, according to the U.S. Department of Labor. In fiscal year 2020, 275 workers were employed by 30 nurseries, and in fiscal year 2021 there were 517 workers employed in 35 nurseries. Data for fiscal year 2022 are not yet indicative of demand because the timing of the hiring starts in the second and third quarters of the fiscal year.

Labor shortages associated with the seasonal nature of employment in the nursery industry were exacerbated

during the pandemic. The pandemic affected demand and supply of labor and changed labor conditions in all industries. During the pandemic, nursery employees were deemed essential, and a struggle began to secure labor and provide safe working conditions for employees. Sanitation and protective equipment, such as masks and dividers, are some of the added costs to labor expenses the industry faced. Hiring and maintaining workers added a financial cost to businesses with the implementation of distancing and contact-tracing guidelines. Nurseries had additional challenges to address: Keeping on payroll and accommodating the same number of employees and allowing a two-week quarantine time, sickness benefits, and time off caring for family members. As measures and restrictions were lifted and businesses reopened, there was still a shortage in labor that can be attributed to low wages and competition for unskilled labor, despite numerous businesses offering higher wages.

Labor issues in the nursery industry are not easily solved, considering the nature and seasonality of employment and competition from other industries. Despite the benefits associated with the H-2A guest worker program, particularly securing seasonal workers in times of need, which allows nurseries to cope with labor shortages, few Louisiana nurseries rely on the H-2A program. The cost of the program and the bureaucratic hurdles are commonly mentioned as barriers for applying to the program by industries. Moreover, prolonged impact of the pandemic also raises concerns on ways the industry needs may change and how it will affect securing labor.

Maria Bampasidou is an assistant professor in the LSU AgCenter Agricultural Economics and Agribusiness Department, and Jeb Fields is an assistant research coordinator and extension specialist at the LSU AgCenter Hammond Research Station.



Megan Garcia, a worker from Honduras who came to Louisiana through the H-2A temporary agricultural worker program, makes cuttings of azalea plants at Windmill Nursery near Franklinton. Photo by Kyle Peveto



Nursery workers distribute trees at LaCroix nursery near Kentwood. Most nurseries in Louisiana rely on temporary agricultural workers from other countries to fill their labor needs. Provided photo

PHOSPHORUS NUTRITION ON CORN: Its Essentiality, Supply and Management Practices

Marilyn Dalen and Brenda Tubana

Phosphorus is one of the three primary nutrients commonly found in fertilizers along with nitrogen and potassium. Phosphorus occurs naturally in soil, but it is usually in forms unavailable for plant uptake. Plants require phosphorus to grow, which is why farmers have been feeding it to their crops for centuries. Proper management and application of phosphorus is critical because overloaded phosphorus in the soil can runoff into water supplies and become a major pollutant, and there has been a phosphorus fertilizer shortage due to depleted sources of phosphate rocks. Many of the 550,000 acres of corn grown in Louisiana are cultivated on the alluvial plain of the Mississippi River. Phosphorus deficiency symptoms on corn seedlings are common and most pronounced on these sandy loam and silt loam alluvial soils.

As part of a study of how phosphorus nutrition affected corn crops, soil samples were collected from a greenhouse pot experiment conducted in 2011 at LSU. In this study, corn seeds were sown on potted Commerce silt loam and Perry clay soils and grown until harvest. A phosphorus fertilizer, triple superphosphate (TSP, 46% P_2O_5), was applied at rates of 0, 26, 53, 80 and 120 pounds per acre (0, 30, 60, 90 and 120 kilograms P_2O_5 per hectare). Soil samples from individual pots were obtained 30 days after phosphorus application or prior to sowing and after harvest and tested.

This study revealed that the two alluvial soils, Commerce silt loam and Perry clay, tested in low to medium levels for extractable phosphorus but responded differently with phosphorus fertilizer application. Grain phosphorus uptake and yield of corn grown on Perry clay increased with the phosphorus rate but not in Commerce silt loam soil (Figure 1). The application of 120 kilograms P_2O_5 per hectare or 107 pounds P_2O_5 per acre obtained a grain yield of 90 grams per pot while the check plot obtained 28 grams per pot. This represents a 62 gram per pot increase in yield. However, the increase in grain yield was notably not proportionate with the phosphorus rate. For example, pots that received 30 kilograms P_2O_5 per hectare (27 pounds P_2O_5 per acre) obtained a higher grain yield of 71 grams per pot more than pots that received 60 and 90 kilograms P_2O_5 per hectare or 54 and 80 pounds P_2O_5 per acre (51 and 56 grams per pot), respectively. Furthermore, the phosphorus application also affects the quality of the corn grains. The check pots, which have no phosphorus fertilizer applied, had empty corn cobs compared with the phosphorus-treated pots. This means that regardless of the phosphorus rate, phosphorus fertilizer application improves the yield of the corn. The grain phosphorus uptake for both soils showed similar patterns and responses to phosphorus appli-

cation as grain yield. It is important to note that even if the soil test phosphorus levels are below the critical phosphorus level in a specific region, the crop response to phosphorus applications is not always certain. The reason why these two soils respond differently might be explained by different soil properties. The results showed that the unutilized phosphorus fertilizer was transformed into calcium-bound phosphorus (Ca-P) in Commerce silt loam soil, while in Perry clay soil it was transformed into iron and reductant-phosphorus. The results also showed that the inorganic phosphorus pools for both soils decreased at harvest. This means that the corn plant was able to take up the phosphorus in the soil.

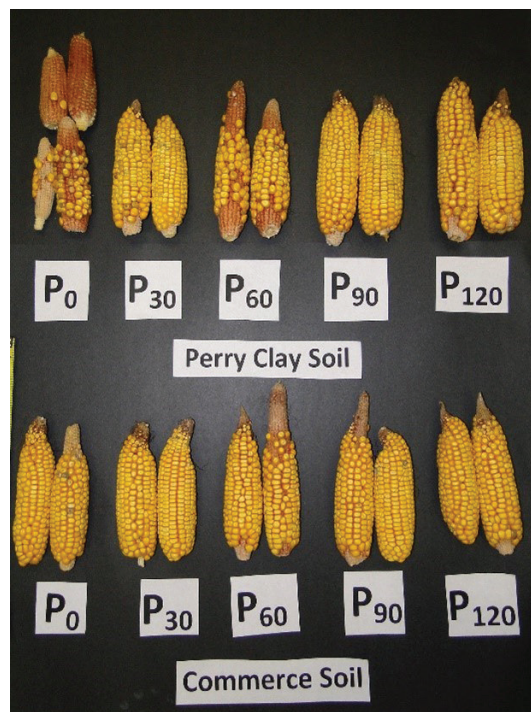
Root growth is another factor that will affect phosphorus availability and uptake. Both the phosphorus fertilizer rate and placement method influence the pattern of corn root growth. The phosphorus band is applied by placing the fertilizer 2 inches to the side and 2 inches below the seed. Applying phosphorus in a band is advantageous when the soil test level is low and there is a tendency to "fix" phosphorus in unavailable forms. Fixation happens when phosphorus reacts with other minerals and forms insoluble compounds, which become unavailable to crops. The broadcast method involves placing the fertilizer in the top 6 inches of the soil surface with subsequent mixing. This method produces the most uniform phosphorus distribution within the root zone and provides more root contact with phosphorus. However, it also maximizes contact between the soil and fertilizer so the opportunity for fixation is higher. The deep subsurface placement is the application of fertilizer 6 inches below the soil surface.

For the phosphorus band application, corn roots mostly concentrated at the top 6 inches of the soil. For the broadcast phosphorus application, the roots grow until 10 to 12 inches deep. With the deep subsurface-applied phosphorus, roots grew beyond 15 inches deep. Furthermore, broadcast-applied phosphorus, regardless of the rate, showed different patterns of corn root growth in Perry clay soil that were not observed in the Commerce silt loam soil. The corn roots grown in the check pot were more plentiful and denser compared to the corn roots grown on the phosphorus-treated pots (60 and 120 kilograms P_2O_5 per hectare or 54 and 107 pounds P_2O_5 per acre). This shows that the corn roots explore the entire soil of the check pot to take up phosphorus available in the soil.

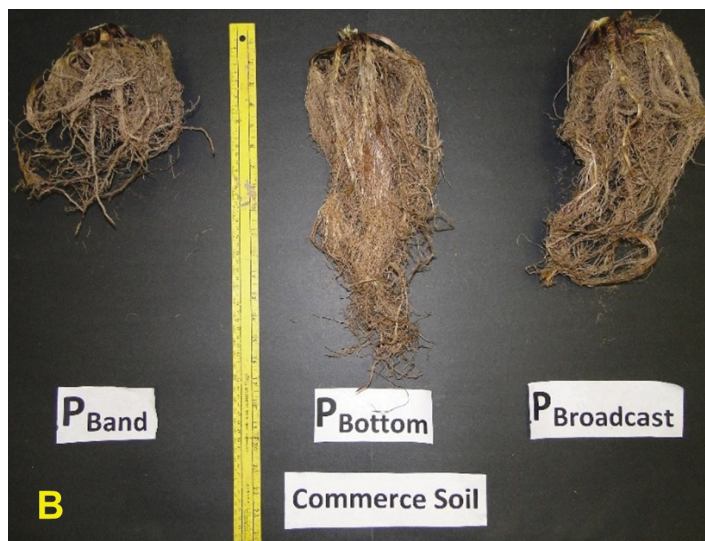
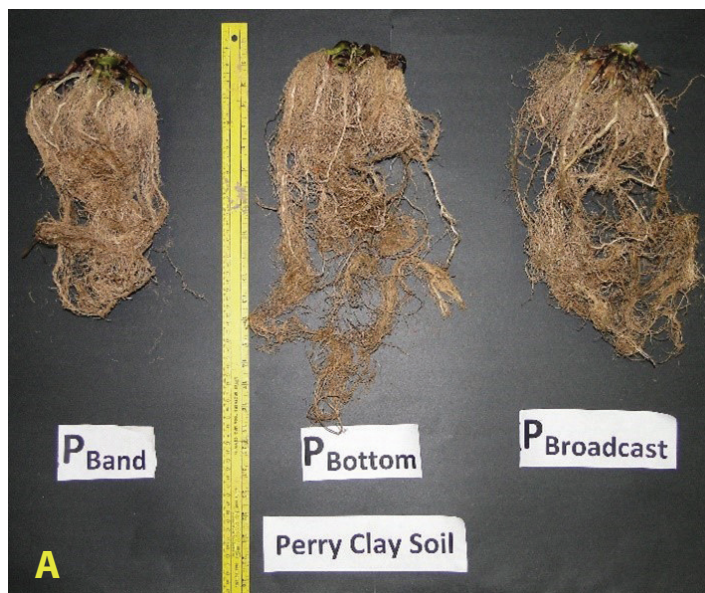
The outcome of this study shows that corn, a high-yielding row crop, requires an adequate supply of primary nutrients like phosphorus throughout the rooting zone for good growth and high yield. With the increasing demand for

the same amount of production area, farmers should maintain soil productivity, such as fertilizer application, incorporation of plant residues or manures and minimum tillage, to maximize yield potential through an effective nutrient management approach. Therefore, it is very important for producers to know the right source of fertilizer, right amount to apply, the right application method, and the right time to apply the fertilizer.

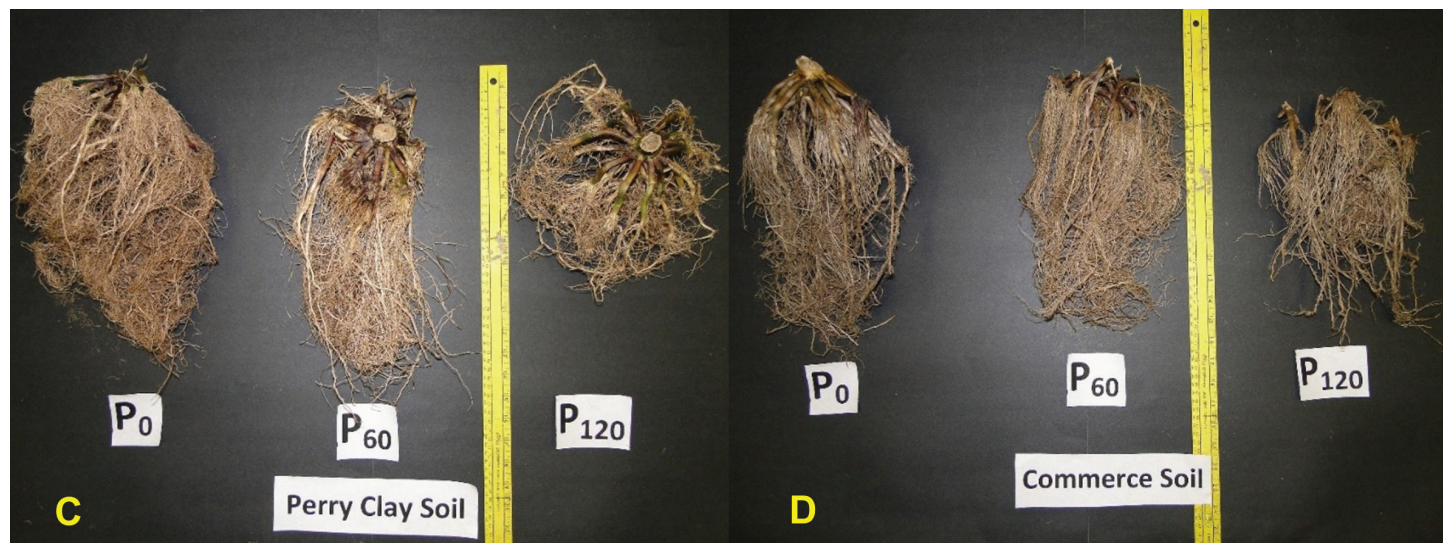
Marilyn Dalen is a postdoctoral researcher in the LSU School of Plant, Environmental and Soil Sciences. Brenda Tubana holds the Jack E. and Henrietta Jones Professorship in the LSU School of Plant, Environmental, and Soil Sciences.



Corn grain grown on Commerce silt loam and Perry clay soils in response to different phosphorus fertilizer rates. Photo by Marilyn Dalen



Corn roots grown on Perry clay soil (A) and Commerce silt loam (B) in response to different phosphorus fertilizer placement methods. Photo by Marilyn Dalen



Corn roots grown on Perry clay soil (C) and Commerce silt loam (D) in response to different phosphorus fertilizer rates applied through broadcast method. Photo by Marilyn Dalen



LSU AgCenter horticulturist David Picha demonstrates equipment used to shrink-wrap citrus fruit.

Photo by Olivia McClure

Satsuma Fruit Market Life Extended With POST-HARVEST TECHNOLOGIES

David Picha

Citrus is the leading fruit crop category in Louisiana in terms of production area. Satsuma mandarins (*Citrus unshiu*) constitute over three-fourths of all Louisiana citrus acreage and are commercially grown on approximately 500 acres in multiple south Louisiana parishes. Recent economic reports indicate satsuma production in the state generates a total farm gate value of \$6.5 million (Louisiana Summary, Agriculture and Natural Resources, 2019). In addition, numerous southern Louisianians and residents of the southeastern U.S. have one or more satsuma trees on their property.

Consumer demand in the U.S. for specialty citrus, particularly easy-peel seedless mandarins, has increased sig-

nificantly in recent years. Extending the duration of fresh satsuma fruit availability by proper post-harvest care and packaging is important in order to maximize the marketing period and value of the fruit. LSU AgCenter post-harvest studies were initiated to determine the additional market life extension and fruit quality that can be obtained for satsumas by using proper post-harvest temperature management and individual shrink-wrap packaging.

Initial tests were conducted to determine the suitable film type and thickness for maximizing the post-harvest market life of individually shrink-wrapped Owari satsuma fruit. Three polyolefin-based shrink-wrap films

(Cryovac D955, Clysar HPG and Clysar ABL) of different thicknesses (45 and 100 gauge) were evaluated at storage temperatures of 4 and 21 degrees Celsius (39 and 69 degrees Fahrenheit). Individual fruits were inserted into a film sleeve and heat sealed on both ends with a manual L-bar sealer. The wrapped fruit was then placed in a heat tunnel to shrink the film tightly around the peel surface. Following film wrapping, the fruits were held under refrigerated storage at 4 C and at room temperature, which was 21 C with about 50% relative humidity to simulate commercial storage and marketing conditions. Individual fruit weight loss measurements from 40 fruits were taken weekly until

loss of fruit marketability due to excessive peel shriveling or post-harvest decay.

At the end of the marketable storage duration for each treatment, the squeezed juice from four replications of 10 half-fruit per replication was analyzed for the percentage of soluble solids, which is one measure of sugar content; individual sugars; pH, which is a measurement of how acidic or basic the liquid is; titratable acidity, which is a measurement of acids in the juice; and individual organic acids.

The post-harvest market life for individually shrink-wrapped Owari satsumas stored at 4 C was extended to 20 weeks, compared to only seven weeks for unwrapped fruit. This represented a market life extension of up to 13 additional weeks over unwrapped fruit. The average weight loss from shrink-wrapped Owari satsumas stored for 20 weeks at 4 C was only 2%. This was in contrast to a 20.8% weight loss for unwrapped satsumas after reaching their marketable limit of seven weeks at

4 C. The market life of wrapped Owari satsumas held at 21 C was 18 weeks, with a weight loss of approximately 7.5%. The market life of unwrapped fruit held at 21 C was only two weeks, with a weight loss of 22.7%. Shrink-wrapping extended the market life of Owari satsuma fruit held at 21 C for an additional 16 weeks.

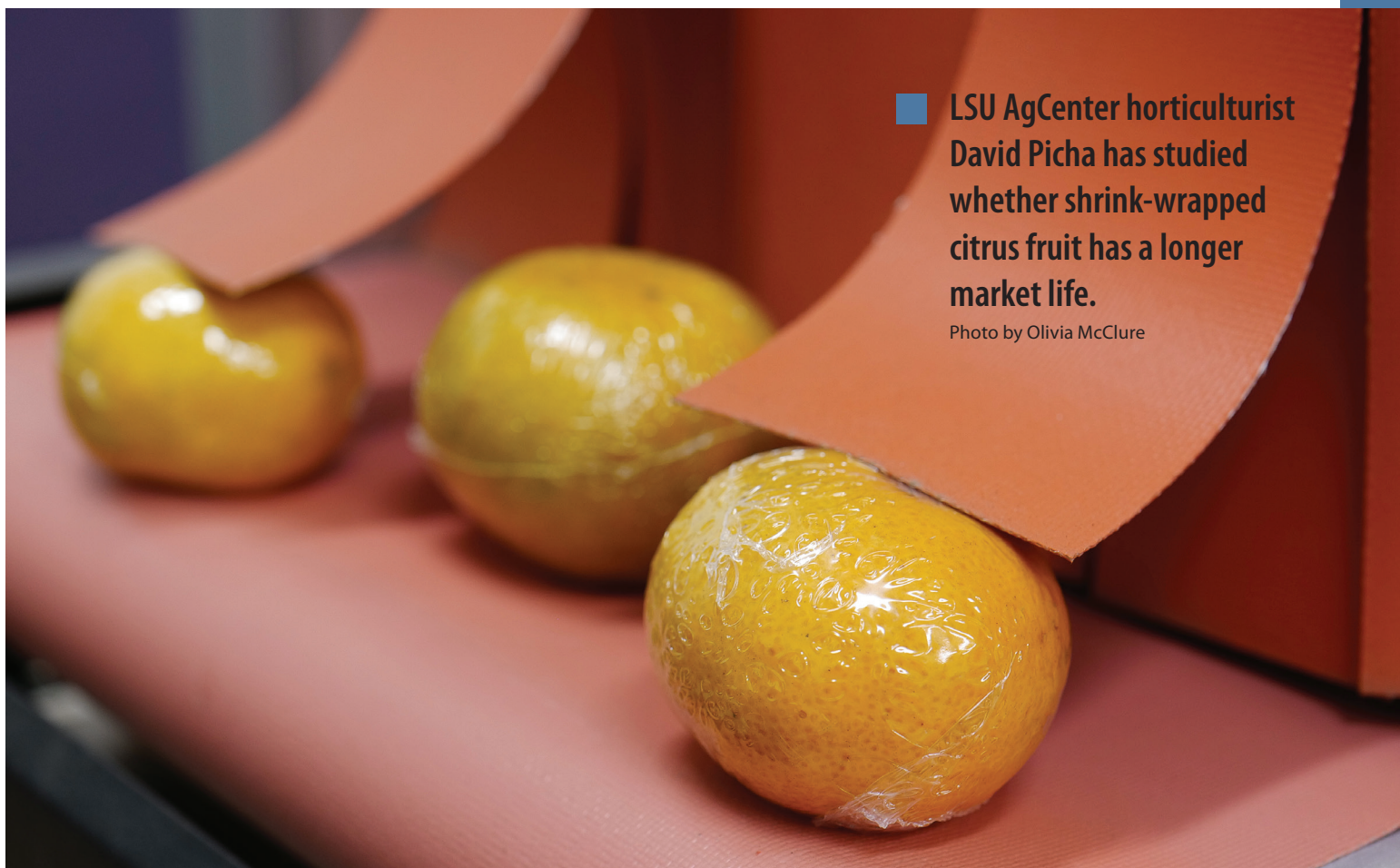
Increasing the film thickness from 45 to 100 gauge slightly reduced the amount of fruit weight loss after extended storage times. The reduced amount of moisture loss and absence of peel shriveling in the shrink-wrapped fruit after extended holding periods resulted in a much better external appearance compared to unwrapped fruit. Fruit soluble solids content was similar or slightly higher with storage time. Fruit pH increased with time, while titratable acidity decreased. The concomitant increase in the sugar to acid ratio after extended storage times resulted in very good edible quality fruit. No significant difference was found in fruit composition or edible quality between

fruit from the different shrink-wrap treatments.

The use of individual fruit shrink-wrap packaging can significantly extend the marketing period of satsumas. External appearance and the edible quality of shrink-wrapped fruit remained acceptable after extended storage durations. Utilization of the proper post-harvest storage temperature of 4 C in combination with shrink-wrap packaging will allow Louisiana satsuma growers to significantly extend their marketing season into the early spring months and potentially obtain higher market prices. In addition, the improved post-harvest treatments will provide consumers with longer availability periods of nutritious high-quality Louisiana citrus fruit.

View additional photos and a chart at the [Louisiana Agriculture magazine website, bit.ly/LaAgMagazine](https://louisianagriculturemagazine.com/bit.ly/LaAgMagazine).

David Picha is a professor in the LSU School of Plant, Environmental and Soil Sciences.



■ **LSU AgCenter horticulturist David Picha has studied whether shrink-wrapped citrus fruit has a longer market life.**

Photo by Olivia McClure

Inside:

The Louisiana plant nursery industry employs about 50,000 people annually. In recent years the industry has had trouble recruiting workers, so many nurseries now use the federal H-2A program to recruit short-term international employees.
See Page 26

Researchers with the LSU AgCenter Seafood Quality Laboratory are studying the best ways to freeze shrimp and other seafood. These scientists are studying whether an edible film made from fish skins can extend the shelf life of shrimp.
See Page 24

A deep cooperation exists between the LSU AgCenter and Mendel University in the Czech Republic. The two institutions have worked together on several projects and now lead a food symposium to further research into food science, nutrition, technology and food development.
See Page 20

Soybeans are planted earlier in Louisiana and the South than in many other soybean-growing states in the U.S. Researchers have studied exactly how much that improves the yield of soybeans grown in central Louisiana.
See Page 19



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