

LOUISIANA Agriculture

Assuring Our Future Through Scientific Research and Education

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Louisiana Master Gardener Program
evolves and expands

page 8



LSU AgCenter's Therapeutic Cannabis Program

Ashley Mullens

In 2015, the Louisiana Legislature passed the Alison Neustrom Act, which paved the way for the production, recommendation, and use of therapeutic cannabis. The LSU AgCenter is currently operating its Therapeutic Cannabis Program under one of the two licenses in Louisiana.

After a lengthy and rigorous selection process, the LSU AgCenter selected GB Sciences Louisiana, LLC, as partner to cultivate and produce therapeutic cannabis products for patients with specific conditions. GB Sciences is a cannabis company focused on biopharmaceutical development and has filed patent applications for use of cannabis therapies with neurodegenerative disease, chronic pain and heart therapies, as well as arthritis, Crohn's disease, inflammatory bowel disease and asthma. In September 2017, with the approval of the LSU Board of Supervisors, the AgCenter finalized its agreement with GB Sciences Louisiana, LLC. Under the terms of the agreement, the LSU AgCenter will receive \$3.4 million or 10 percent of gross revenue, whichever is greater, over five years and an annual research investment.

In compliance with the Act, approved physicians will oversee patients with debilitating conditions. The list of qualifying conditions was expanded by the Louisiana Legislature in May 2018 and includes cancer, positive status for human immunodeficiency virus, acquired immune deficiency syndrome, cachexia or wasting syndrome, seizure disorders, epilepsy, spasticity, Crohn's disease, muscular dystrophy, multiple sclerosis, glaucoma, Parkinson's disease, severe muscle spasms, intractable pain, post-traumatic stress disorder, and autism spectrum disorder. Patients who have exhausted all other medical options without a positive result may be recommended therapeutic cannabis by their practitioner. The Louisiana State Board of Medical Examiners has developed stringent guidelines for doctors to recommend therapeutic cannabis, including regular follow-ups and reporting.

The distribution of therapeutic cannabis will be done through nine licensed pharmacies that have been selected by the Louisiana Board of Pharmacy. The pharmacies will be located across the state in nine previously established health regions. Louisiana law does not allow for any product to be inhaled, raw, or smoked/vaped. Delivery methods are limited to oils, solids, liquid, or edible dosage forms, topical applications, transdermal patches, and suppositories.

As the licensee, the LSU AgCenter is authorized to conduct research on therapeutic cannabis. The potential for research in both genetics and planting breeding in addition to extraction, formulation and compounding processes are important elements in the initiative. The LSU AgCenter intends to apply its vast scientific knowledge and experience with existing technologies currently utilized on other agricultural commodities to the cannabis plant. Research will likely include tissue culture propagation, variety development, growth management practices, extraction techniques, compound identification and isolation, drug delivery methods, and efficacy testing. In addition, the LSU AgCenter has had preliminary discussions with Pennington Biomedical Research Center and the Health Sciences Centers in New Orleans and Shreveport on opportunities for research collaboration and clinical trials. GB Sciences Louisiana will support LSU AgCenter research through an annual monetary contribution for research initiatives and through the construction and equipping of a state-of-the-art research laboratory space.

For more information, visit www.lsuagcenter.com/agmedical.



Ashley Mullens is the coordinator of the LSU AgCenter Therapeutic Cannabis Program.

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ON THE COVER: Cherries Jubilee is a variety of camellia japonica that blooms in the winter. Many people consider the camellia japonica a harbinger of spring. Photo by Igor Kamalov

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Kids flock to AgCenter exhibits at Ag Expo in West Monroe

A host of agricultural exhibits featuring farm animals, garden plants and Louisiana field crops offered the 8,000 visitors to the annual Ag Expo in West Monroe, Louisiana, an array of hands-on activities at the LSU AgCenter Ag Alley exhibits and AgCenter Square. Both events were held Jan. 16-19.

"Agriculture is the largest industry in Louisiana, so we emphasize the importance of agriculture to everyone, focusing on youth education for Ag Alley school days and information for adults and families at AgCenter Square during Ag Expo," said Richard Letlow, extension agent in Morehouse Parish.

AgCenter experts answered questions about cotton and corn, bees and horticulture, and nutrition and fitness.

"Interest in our zoysia grass turfgrass samples at the booth opened opportunities to connect visitors with our northeast Louisiana sod farmers that grow several zoysia grass varieties," said Ron Strahan, AgCenter turfgrass specialist.

Extension agriculture specialists provided recommendations and information on many topics, such as insects in the garden and recreational ponds and their maintenance. AgCenter nutrition experts shared the latest publications on diet and health and distributed meat thermometers, pedometers and other health-related items that encourage healthy decision making.



LSU AgCenter extension agent Kylie Miller shows fourth-graders how cotton by-products are found in many food products used for livestock and human consumption during Ag Alley in West Monroe, Louisiana. Photo by Karol Osborne

Six youth earn Premier Exhibitor awards at Livestock Show



First-place winners of Premier Exhibitor Awards at the 84th annual LSU AgCenter Livestock Show were presented belt buckles at a ceremony on Feb. 16. From left, Eric Lane, of Gerry Lane Enterprises, which sponsors the awards; beef exhibitor Mary Claire Istre, of Calcasieu Parish; sheep exhibitor Ethan Coker, of Claiborne Parish; swine exhibitor Josie Purvis, of Livingston Parish; dairy exhibitor Owen Brouillette, of West Feliciana Parish; goat exhibitor Sarah Tarver, of Pointe Coupee Parish; poultry exhibitor Claire O'Neill, of Tangipahoa Parish; and LSU Vice President for Agriculture Bill Richardson. Photo by Olivia McClure

AgCenter conducts food safety workshops

LSU AgCenter food safety specialist Achyut Adhikari shows fruit and vegetable growers how to use a sanitation station in the field during the Louisiana Fruit and Vegetable Growers Association field day on Jan. 29 at the Botanic Gardens in Baton Rouge. Photo by Johnny Morgan



Controlling drift, volatility key issues for herbicides

"Every year we get more cases documenting weed resistance in herbicides," said LSU AgCenter weed scientist Donnie Miller, speaking to agriculture industry leaders at the Louisiana Ag Industry Association held in Marksville, Louisiana, on Jan. 22-23. Two key challenges with any herbicide application are controlling drift and volatility, he said.

Miller served with a panel of experts from BASF, the Louisiana Department of Agriculture and Forestry and Bayer Crop Science to discuss issues related to new herbicide technologies, specifically dicamba-resistant crops.

While all herbicide applications can drift when applied incorrectly, only some have the potential to volatilize, changing form and

moving off target, Miller said. Education and training can help mitigate drift issues, but Mother Nature pulls the strings when environmental conditions change and volatility issues arise.

Citing research from Tennessee, Miller said the addition of glyphosate to dicamba formulations has been shown to decrease the pH of the spray solution, increasing the potential volatility and resulting in recommendations to avoid adding glyphosate to tank mixes with dicamba formulations.

"We are not making this recommendation in Louisiana as of yet," he said, adding that the information may be helpful for some producers in dealing with this issue.

2018 sugarcane harvest grinds to a successful halt

The 2018 Louisiana sugarcane harvest resulted in record yield in terms of tonnage but a reduced sugar recovery from last year. "When it's all said and done, we should make the same amount of sugar, which was a record last year," said LSU AgCenter sugarcane specialist Kenneth Gravois.

The grinding season usually ends in early January, but mills went as much as two weeks later. The cane yield was around 38.8 tons per acre, compared to 36.6 tons last year. Sugar recovery this season will be approximately 217 pounds per ton of cane, he said. Last year's recovery was 242 pounds per ton.

Mud from a wet fall and winter complicated the harvest, and it resulted in a long processing season. More mud and leafy material had to be removed in the sugar-making process, which slowed down grinding. "Mud means more wear and tear on equipment," Gravois said.

A somewhat dry spell in January allowed some farmers to get into fields that had been too muddy for harvest earlier, he said. Some farmers in the southern part of the sugarcane-growing area were unable to plant all of their crop at the usual time in late summer, and

some farmers were planting in October and November, he said. The sugarcane crop in central Louisiana had some issues with long dry spells last summer, and that affected yields there.

With the end of the season, mills will have to start working on maintenance to get ready for the next harvest, and farmers will have to repair their rutted fields. The 2018 crop at 459,000 acres was an increase of about 19,000 acres, and next year's crop is expected to be even larger with expansions in the northern and western parishes of the sugarcane belt.



A harvester cuts the last row of sugarcane in a field near St. Martinville on Jan. 18, the final day of a long, difficult harvest of the 2018 crop. Photo by Bruce Schultz

Three AgCenter scientists receive top honors

Chris Clark, Daniel Stephenson and Dennis Burns have been recognized as three of the LSU AgCenter's top scientists. Clark, a professor in the Department of Plant Pathology and Crop Physiology and expert on sweet potato diseases, received the National Research Impact Award from the National Sweet Potato Collaborators Group. Stephenson, a weed scientist based at the Dean Lee Research and Extension Center in Alexandria, Louisiana, was named Soybean and Corn Researcher of the Year at the National Conservation Systems Cotton and Rice Conference. Burns, an extension agent who specializes in agricultural technology and serves in Catahoula, Concordia and Tensas parishes, was honored by the Louisiana Agricultural Consultants Association as County Agent of the Year.



Chris Clark



Daniel Stephenson



Dennis Burns

Rice Research Board gives \$1 million for endowed chair

The Louisiana Rice Research Board has given \$1 million to fund an academic chair dedicated to rice research in the LSU AgCenter. The presentation was made on Jan. 9 at the annual joint meeting of the Louisiana Rice Council and the Louisiana Rice Growers Association. The board has pledged to provide an additional \$500,000 later this year for the Louisiana Rice Research Board Chair for Excellence in Rice Research, with the hope of more allocations in the next

few years to growing the chair over time. The money is coming from funds obtained through the Colombian Free Trade Agreement. Interest from the funds is dedicated solely for research purposes.

"The research that has come out of the LSU AgCenter over the years has certainly helped the Louisiana rice industry, but it has also supported and fed the world," said board chairman Richard Fontenot.

Roseau cane scale research gets boost

Congress passed a federal appropriations bill that includes an additional \$1 million in funding for research on the roseau cane scale, which may threaten Louisiana's coastline and the Mississippi River shipping channel. With the additional funding, AgCenter researchers will look at varieties of roseau cane resistant to the scale, land loss impact, environmental conditions and erosion from storm events.

The Mississippi River Delta is a complex hydrological region with large fluctuations in water level, sediment deposition, wave action and other factors. Researchers do not know how the cane varieties will respond to different salinity levels, water depths, pathogen loads and other changes, making this research essential to final recommendations.

LSU AgCenter entomologist Rodrigo Diaz said by understanding the factors and mechanisms of stress on roseau cane, researchers hope to develop restoration plans tailored to specific regions in the delta.

Diaz and the AgCenter team of researchers have collected data that shows a variation in the health of roseau cane stands throughout the delta. The researchers believe resistance to the cane scale in some varieties might be partly responsible for these variances.

Funding for research on varieties that are believed to be resistant are necessary before a final recommendation can be made on the widespread planting of these varieties in a potential restoration project.



Roseau cane scale damage. Photo by Rodrigo Diaz

Noah Harper receives national scholarship

Noah Harper, a College of Agriculture sophomore majoring in plant and soil systems, is the recipient of a national agricultural scholarship. Harper received the National Alliance of Independent Crop Consultants' Foundation for Environmental Agriculture Education Jensen Memorial Scholarship. The \$3,000 scholarship commemorates Richard Jensen, one of the early members of the consultants group.

Harper, of Franklin Parish, spent his summers working with plant pathologists at the LSU AgCenter Macon Ridge Research Station in Winnsboro, Louisiana, while in high school. He would scout fields for pest problems.

"Ever since I was little, I knew I wanted to work in agriculture," Harper said.

Harper is a student worker in the entomology department, where he works mainly with sugarcane. He also helps with student recruiting, campus tours and service projects as a member of Les Voyageurs, the college's student ambassador group. He said joining Les Voyageurs has helped him become more connected to the college.

"I thought I wouldn't be comfortable at LSU coming from a small town, but I've found so many friends," he said. "My professors and advisors know me, and it really is a family and personalized atmosphere in the college."



Noah Harper

Fashion Association at LSU gives back with hearts

The Fashion Association at LSU partnered with the American Heart Association for the 2019 Hemline for Hearts event. Students in the College of Agriculture Department of Textiles, Apparel and Design constructed outfits using red and white paper hearts during the association's Go Red for Women luncheon at the Baton Rouge River Center.

Students submitted their original fashion designs, and representatives with the American Heart Association chose five designs to be built. Participants included four students with a concentration in apparel design: seniors Natalie Welch, Ingrid Sjunnesen and Vanessa Barrios, and sophomore Olivia Lapuyade. Brielle Pourciau, a senior with a concentration in merchandising, was the fifth participant.

Barrios won first place with her dress inspired by "business going into evening wear." Second place was earned by Pourciau, who designed a "strapless cocktail dress inspired by the boning in corsets." Welch took home third place with her design in which she incorporated a plunging V-shape neckline, a Bertha collar and two side cutouts that "mimic the shape of a heart."



First-place winner Vanessa Barrios designed a dress for business and evening wear.

Les Voyageurs use MLK weekend for service, learning

The Les Voyageurs spent Martin Luther King Jr. weekend in New Orleans doing service projects and participating in tours. The group volunteered at the Second Harvest Food Bank's community kitchen, where they packaged more than 500 meal and snack boxes for students. At KIPP Believe Primary school, they conducted Ag in the Classroom activities with second-graders. They also volunteered at ARC of Greater New Orleans, which provides jobs to intellectually disabled individuals, where they helped sort

Mardi Gras beads and trinkets.

The tours were to the Port of New Orleans, where they learned about the agricultural commodities that pass through the port, and to the New Orleans Saints practice facility. College of Agriculture alumna Jamie Meeks showed the group around the Saints' facility and talked about her role as director of sports nutrition and how she works to ensure the professional athletes for the Saints and Pelicans follow a nutritionally adequate diet.



Les Voyageurs Kacie Martin, Brooke Comeaux, Bianca Jones, Trista Galivan, Katie Costanza and Colt Hardee participated in a spring service and professional development retreat. They helped sort Mardi Gras beads at the ARC of Greater New Orleans.

Savoie Industries creates internship endowment

Savoie Industries LLC has created an endowment to support an LSU College of Agriculture intern at the LSU AgCenter Sugar Research Station. Mike Daigle, Savoie CEO, said his family wanted to support the future of the sugar industry with its donation.

"The lifeblood of the sugar industry is research. Without research we would not be here today," Daigle said.

Savoie Industries is a family-owned, land-holding company based in Assumption Parish with ties to the sugarcane industry dating

back generations. Daigle said the company's board of directors decided to support an intern after discussing ways they could give back. They felt funding an intern could benefit researchers at the station who need more help, promote the sugar industry to students and secure the industry's future.

Savoie Industries board of directors includes chairman Don Savoie, Rufus Savoie, Chuck Savoie, Danny Savoie, Tommy Savoie, Will Daigle, CJ Daigle, Tom Cancienne, Ed Cancienne and Daniel Mattingly.

Faculty PROFILE

Lane Foil furthers science with numerous research grants over 40-year span

Rick Bogren

Lane Foil joined the LSU AgCenter Department of Entomology in 1980 with a specific mission: to study horse flies.

Foil subsequently spent his career studying insect vectors as disease carriers and their economic costs. He started with horse flies as a vector of diseases — anaplasmosis in cattle and equine infectious anemia, or “swamp fever,” in horses. “Cattlemen wanted information about the transmission of the pathogens causing these diseases, so the AgCenter created a unique position dedicated to groups of flies,” Foil said.

When he first came to the AgCenter, Foil asked experiment station director Doyle Chambers about applying for a U.S. Department of Agriculture grant. Chambers told him not to bother because the AgCenter had plenty of research funding. Foil applied anyway and got the grant. Since then, he’s obtained more than 30 competitive grants totaling approximately \$7.7 million — \$5 million as a principal investigator — which provided funding that facilitated studies that led to his hundreds of scientific communications including more than 150 in peer-reviewed journal articles.

Foil learned early that writing successful grant applications is important to pursuing science. One year, in fact, he was working with funding from the National Science Foundation, National Institutes of Health, Department of Defense and U.S. Department of Agriculture.

The virus that causes swamp fever is related to human immunodeficiency virus, or HIV. So over time, Foil included medically important insects to his research. This led to more grant opportunities and expanded his scope of work.

Success has been based on two things, Foil said. “One is honesty. That’s something that never bites you. The other is adaptability. Providing what the employer wants and serving the needs of Louisiana producers. These define adaptability. We’re sometimes working on the shoulders of the mainstream to learn and add to our reputation.”

Since 2012, Foil has been conducting research on hemorrhagic disease in deer at the Wildlife Research Institute at the Bob R. Jones-Idlewild Research Station in Clinton, Louisiana. In 2013, he was named to the Pennington Chair for Wildlife Research, which was funded by a gift from the Irene W. and C.B. Pennington Foundation.

The research station has captive herds of white-tailed deer and red deer along with cattle and wild deer. There, Foil is focusing his research on developing solutions for problems that affect the health and abundance of Louisiana wildlife.

His first wildlife project was hemorrhagic diseases in deer — the blue tongue virus and the epizootic hemorrhagic disease virus, known by its initials EHDV. The viruses are in the genus orbivirus, which can infect and replicate within a wide range of insects and mammals. The viruses Foil is studying may infect deer, cattle, sheep and goats. Because of the presence of the viruses in the U.S., cattle cannot be exported to other countries where the viruses aren’t present.

Over time, the horse fly brought Foil’s research full circle. His most recent endeavors include studying population genetics of the greenhead horse fly along the Gulf Coast. Knowing the biology of the horse fly, Foil and collaborator Claudia Husseneder have used the greenhead horse fly to measure the effects of insect populations following the Deepwater Horizon oil spill in 2010. The research started with a grant from the Gulf of Mexico Research Initiative and the National Science Foundation. “We know oil had an impact on the species,” Foil said. “We want to find out now if these environments are recovering.”

Foil said one of his greatest achievements was receiving the Doyle Chambers Research Award in 2006. The award, in honor of Chambers, who was director of the Louisiana Agricultural Experiment Station from 1964 to 1985 and vice chancellor of the AgCenter from 1979 to 1985, is for meritorious contributions to agriculture. Foil was recognized for a career marked by a sometimes “unconventional approach” to research that has yielded practical solutions that have been adopted across the globe.

Rick Bogren is associate editor of Louisiana Agriculture and professor in LSU AgCenter Communications.



Lane Foil. Photo by Olivia McClure



■ Washington Parish Master Gardeners
visit Schilling's Greenhouses in
Bogalusa, Louisiana.

Photo provided by Henry Harrison

Louisiana Master Gardener Program Past, Present and Future

Sara R. Shields

Volunteers are at the heart of the Louisiana Master Gardener program. The whole idea for having a Master Gardener program as part of the Cooperative Extension Service began at Washington State University in 1971 with the concept of a home horticulture training series to develop volunteers. A training curriculum focusing on horticulture-based subject matter — including culture of ornamental plants, lawns, vegetables and fruits; control of plant diseases, insects and weeds; and safe use of pesticides — was developed for use with the first training series held in the spring of 1973. Sessions were eight hours per day, one day a week, for five weeks. At the end of the training, volunteers were required to pass subject matter exams as well as an exam for pesticide licensing by the Washington State Department of Agriculture. Master Gardeners were then committed to volunteering

a specified number of hours working with the gardening public. The Master Gardener program was so successful in the state of Washington that it spread to neighboring states and across the country and is now in place in 49 states and several Canadian provinces.

In Louisiana, the first Master Gardener training series was implemented in Baton Rouge in 1994 as a means of extending the LSU AgCenter's educational outreach. The Louisiana Master Gardener Handbook and associated curriculum materials covered in the training series were adapted from existing Louisiana Cooperative Extension Service publications and materials collected from other states. The pilot program in Baton Rouge was considered a success, and in 1998, Master Gardener training programs were started in all the major metropolitan areas of the state.

“ It’s been said that volunteers do not necessarily
have the time; they just have the heart. ”

Elizabeth Shaw

A BOUNTIFUL HARVEST

Today, 29 parish-level Master Gardener programs cover 61 of Louisiana's 64 parishes and educate individuals to serve audiences across the state by providing horticultural information based on university research and recommendations. Based on the model created in the state of Washington, education and certification of new volunteers is a two-phase process: classroom training and volunteer service while in "apprentice" status. The idea behind classroom training is to introduce potential volunteers to subjects they will likely encounter during their volunteer service.

For the past 20 years, classroom training for those enrolled in the Louisiana Master Gardener program has been delivered in a traditional lecture format. Recently, the idea of a "flipped classroom" approach to educate volunteers was introduced to coordinators. This concept was tested in the spring and summer of 2018. Instead of listening to lectures during class time, program participants reviewed the material on their own before the class each week. This approach allows for hands-on activities to reinforce the materials covered in the presentations previously reviewed.

An additional training method was also piloted in 2018. The "hybrid" training model marries traditional lecture and flipped classroom approaches to offer training opportunities. While data analyses comparing student scores for the three educational models are still being calculated, initial feedback from Master Gardener coordinators, teaching and lab assistants and new students is overwhelmingly favorable for the flipped and hybrid approaches.

Regardless of classroom training method, the second phase of the training program involves completion of 40 volunteer hours through participation in current Master Gardener programs and projects. Upon completion of the second phase, the title of "certified" Louisiana Master Gardener volunteer is bestowed upon the individuals completing the program. After the initial certification, individuals are asked to donate 20 volunteer service and six continuing education hours back to the program to maintain active status.

Volunteer opportunities and projects vary across the state. Some of the activities Master Gardener volunteers help organize or assist with include garden seminars and symposiums; hands-on workshops; demonstration tables and exhibits at plant sales, garden shows and farmers markets; home garden tours; school and community gardens; school garden workshops; and maintaining demonstration gardens and variety trial gardens. They also directly assist the LSU AgCenter in other ways, including with upkeep of Burden Museum & Gardens and Hammond Research Station demonstration beds; maintaining Louisiana Super Plants demonstration gardens; assisting in the local extension office by writing news articles and answering home garden phone calls; and maintaining their program social media pages.

For volunteers seeking additional educational opportunities, the Advanced Louisiana Master Gardener program was introduced as a statewide initiative with the 2015-16 class. This program is open to Master Gardener volunteers who have been active in the program for three consecutive years and are con-



Young children make masks using seeds and leaves as a craft activity at Master Gardener events at the Garden on Marais in the New Orleans Upper 9th Ward. Photo provided by Joe Willis



LSU AgCenter extension agent Joe Willis, center with gray hat, gives instruction to a 2018 Master Gardener class at the New Orleans Botanical Garden. Photo provided by Chris Dunaway

sidered to be in good standing with their local coordinator. The advanced program is a deeper exploration of environmental sustainability through the topics of nutrient management, plant diagnostics, integrated pest management, and water quality and irrigation. Course electives are designed to cover additional horticulture content with an emphasis on conservation and sustainability. Seventy-one individuals obtained advanced status at the 2016 Louisiana Master Gardener Conference held in Kenner. The current advanced class finished core subject matter classes and will participate in electives throughout the spring and summer of 2019.

Louisiana Master Gardener and Advanced Louisiana Master Gardener volunteers, under the direction of local coordinators, complete tens of thousands of hours of volunteer service annually. For 2018, 1,407 volunteers logged a total of more than 17,800 continuing education hours. Volunteer service hours for 2018 totaled more than 77,000 hours, for an economic value of more than \$2.03 million.

2020 AND BEYOND: A GREENER TOMORROW

In the future, thanks to continued improvements in technology, Master Gardener training in urban areas will rely heavily on flipped and hybrid educational models. Using these methods allows potential volunteers to receive the horticulture training with the benefit of hands-on activities to

reinforce material presented in the recordings. Training programs in smaller, more rural areas will continue to use traditional or hybrid models because of the limitations in internet accessibility.

The current Advanced Louisiana Master Gardener training class is working on materials to support the Louisiana Yards and Neighborhoods program. Created materials will be available to volunteers statewide for use in local horticulture programming. These materials, along with others being developed by volunteers, will be available on the Louisiana Master Gardener website and through local coordinators. In the future, Louisiana Master Gardener volunteers will continue to sustain horticulture programming efforts in local communities.

Over the past several years, Louisiana Master Gardener programs have continued to expand volunteer recruitment efforts in terms of reaching a wider range of ages and ethnicities. Participation in the program offers something for everyone, and we welcome new individuals bringing unique perspectives into the mix. The Louisiana Master Gardener program is a place for volunteers to have a fun, educational experience while serving the community in which they live.

Sara R. Shields is the Louisiana Master Gardener state coordinator.



Master Gardener Tammany Baumgarten's award-winning exhibit at the 2008 Spring Garden Show in New Orleans. Photo provided by Chris Dunaway

A photograph showing a woman, CaCa Johnson, wearing a blue polo shirt with a 'Master Gardener' patch, assisting two young students in planting seeds. The students are wearing blue sweatshirts with 'CHALMETTE ELEMENTARY' printed on them. They are gathered around a black seedling tray filled with dark soil. A small aluminum cup containing seeds is visible on the table. The background is slightly blurred, showing other people and an indoor setting.

■ A volunteer helps students plant seeds at AgMagic on the River at Docville Farm in Violet.

Photo by Olivia McClure



Master Gardener Rosalind Rowell with students at the demonstration garden in LaSalle Park in Metairie, Louisiana. The garden, started in 2013, includes about 1,000 square feet of raised beds with fruit trees planted in the surrounding area and along the walkway. The main garden uses a mixture of raised and in-ground growing beds for seasonal vegetables. The Master Gardeners do all the planting and maintenance and lead tour groups. Photo provided by Joe Willis

Master Gardeners Truly Are AgCenter Hands and Feet

Joe Willis, Anna Timmerman and Christopher R. Dunaway

More than 200 active Master Gardeners in the Greater New Orleans area work to educate and inspire the residents of the four-parish metropolitan area along with visitors to one of the nation's great tourism hubs. These highly trained volunteers plant and maintain public gardens; teach classes; visit schools, nursing homes and juvenile detention centers; and raise funds to perpetuate the Master Gardeners' work. Master Gardener volunteers are in the community every day acting as the hands and feet — and the voice — of the LSU AgCenter.

EDUCATION

Education is an important aspect of the Master Gardener mission. One of the most prominent examples of Master

Gardeners teaching in the community is the New Orleans Spring Garden Show the first week of April each year. The show attracts from 5,000 to 9,000 visitors and would be a shadow of itself without Master Gardeners. More than 100 volunteers help garden staff prepare the beautiful 12-acre New Orleans Botanical Garden in City Park for the show and aid vendors, staff entrances, give educational talks and set up booths while also serving as greeters, guides and gurus.

The southeastern Louisiana Master Gardeners are also constantly requested to speak to civic organizations and schools. They maintain an active list of speakers, and anyone may visit online to schedule a presentation on any of the 50 available talks, including "Basics on Raising Backyard Chickens," "Home

Citrus Tips," or "Vegetable Gardening." To learn more, visit <http://www.mggno.com/speakers>.

Each May, AgMagic on the River is one of four annual AgMagic events in Louisiana. At Docville Farm in Violet, school children get the opportunity to explore and learn about agriculture, the environment, and the important role farms play in our lives. For many students, this is their first visit to a real farm. The Meraux Foundation donates the use of the farm, and more than 60 Master Gardeners work as tour guides and educators. In 2018, more than 2,192 children visited during the nearly weeklong event, watching baby chicks hatch, learning about farm animals, discovering facts about and touching Louisiana crops, and seeing Louisiana crawfish production. They also saw

Mississippi River traffic from an observation tower and touched real fish that swim our waters.

BEAUTIFICATION AND INSPIRATION

Across the four-parish New Orleans metropolitan area, Master Gardeners plant and maintain gardens in a variety of locations. In the historic French Quarter, they have designed and revitalized gardens and planters, often using historical plants that colonial New Orleanians used for cooking, medicines, decoration, dyes and scents. These plantings are found at National Park Service sites and other historic locations. Tour guides, the Master Gardeners of Greater New Orleans (MGGNO) speakers bureau, and National Park Service rangers are using the plantings as part of their narratives for tours and presentations.

Another location where Master Gardeners have contributed is the Lake Pontchartrain Lighthouse, where they planted erosion-controlling grasses and self-propagating native species to show visitors how people can work with the environment and still be aesthetically pleasing.

The Garden on Marais in New Orleans' Upper 9th Ward brings both the Master Gardener and 4-H programs together. This garden is a wonderland of chickens, garden plots, children's craft projects and even a large greenhouse. Master Gardener project leader Kayla Wilson leads a team of dedicated Master Gardener volunteers each Saturday when 4-H'ers gather to learn about urban gardening, animal husbandry, entomology, healthy lifestyles, and land stewardship. 4-H'ers make crafts and other items from the produce they have grown and sell these items at a Christmas market to raise funds to support the garden projects for the year ahead.

The Federal City Community Garden in Algiers is a community garden project in every sense. Constructed in raised beds on top of the abandoned tennis courts of the old Federal City U.S. Navy base, the garden was built in 2013 by community volunteers as a nonprofit garden helping

to promote healthy eating and local produce. Master Gardeners Charlotte Baham and Miranda Bashaw started the garden and continue to oversee it. The garden even boasts a vermicompost system, where worms break down the garden organic waste to recycle back into the garden, and a honeybee hive. Seeds are swapped and friendships are formed, building community through a shared love of gardening.

Master Gardeners and the Greater New Orleans Iris Society install and maintain Louisiana iris display and propagation beds at four different sites in and around New Orleans. Started and spearheaded by longtime Master Gardener Eileen Hollander, they lead tours and educate visitors about the unique beauty of our native irises. This work has also helped to preserve and revive the five native species that are "the Louisianans" — *Iris brevicaulis*, *Iris*

fulva, *Iris giganticaerulea*, *Iris hexagona* and *Iris nelsonii*.

At LaSalle Park in Metairie, the entrance walkway to the LaSalle Demonstration Garden is lined with satsuma trees growing in the native soil along with blueberry bushes in pots, kumquat trees in raised beds and, finally, an ornamental garden featuring Louisiana Super Plants. The main garden uses a mixture of raised and in-ground growing beds primarily devoted to growing seasonal vegetables. There is also an herb garden, a pomegranate tree, two fig trees, and two forms of composting on display. Master Gardener volunteers led by Greg Maurer are the driving force behind the success of the garden.

Joe Willis, Anna Timmerman and Christopher R. Dunaway are all extension agents in horticulture who work with Master Gardeners in the New Orleans area.



Master Gardeners Nell Howard and Joan Doyle complete plantings of marsh plants at the New Orleans Jazz Museum. Master Gardeners have designed and revitalized gardens and planters in the French Quarter of New Orleans. Photo provided by Joe Willis

Nitrogen-Rich Strip Can Be Used to Match Nitrogen Fertilizer Rates to Sugarcane Needs

Brenda S. Tubaña, Dennis Burns, Marilyn Dalen, Daniel Forestieri and Ralph L. Frazier Jr.

Nitrogen is one of the 14 mineral nutrients essential to plants. It is considered the most limiting among these nutrients mainly because plants’ requirement for nitrogen is high. On average, nitrogen makes up about 5 percent of total plant dry matter. It is required for the production of chlorophyll molecules, which are pigments that help harvest sunlight energy that is converted to chemical energy through photosynthesis. Plants also use nitrogen to produce amino acids, the building blocks of proteins. The pivotal role of nitrogen in plants is for growth and development of vital plant tissues and cells. This is why the symptoms of nitrogen deficiency in plants are evident, especially during the vegetative growth stage. Nitrogen deficiency in sugarcane leads to stunted growth with leaves that are pale green or yellow. This leaf chlorosis in a nitrogen-deficient plant begins at the lower canopy or older group of leaves.

Nitrogen availability in the soil can be compromised by several transformation processes. Many of these can lead to nitrogen losses to the atmosphere and to surface and ground water. For this reason, and knowing that the value of nitrogen in crop production is absolute, growers have used liberal applications of nitrogen fertilizer on many crops to avoid deficiency and yield losses. Apart from the fact that excessive nitrogen supplied to sugarcane can also result in yield reduction, such an approach is not economically and environmentally sustainable.



Keith Dugas was one of the sugarcane growers who allowed his field to be used in the demonstration trials. To his right is a five-row-by-600-foot nitrogen-rich strip that is noticeably greener in color than the other rows in his field. Photo by Marilyn Dean

About 2 pounds of nitrogen are taken up per ton of sugarcane stalks produced. Based on this removal rate, 60 to 120 pounds of nitrogen per acre are typically applied to meet the crop’s nitrogen requirement. Moreover, farmers’ standard practice is to uniformly apply the recommended nitrogen rate to the entire field. Research was initiated a few years ago to refine this approach by using the well-established concept of a plant’s quick and evident response to nitrogen. Using a nitrogen-rich strip as a diagnostic tool involves establishing a small portion of a field that is well-fertilized with nitrogen a few weeks before the scheduled application of fertilizer to the entire field.

Ideally for sugarcane, the nitrogen-rich strip should be established in early March or at least three weeks before the scheduled nitrogen application, which is commonly done during April. The photo below shows a five-row-by-600-foot nitrogen-rich strip in a producer’s field in Napoleonville, Louisiana, four weeks after it was fertilized with 120 pounds nitrogen per acre. The plants growing on the nitrogen-rich strip are greener than the rest of the plants, suggesting a low supply of nitrogen in the soil; therefore, sugarcane will likely benefit from applied nitrogen. On the other hand, if the nitrogen-rich strip is not visible, this suggests enough nitrogen may be present, and producers should consider reducing the rate of nitrogen fertilizer to be applied.

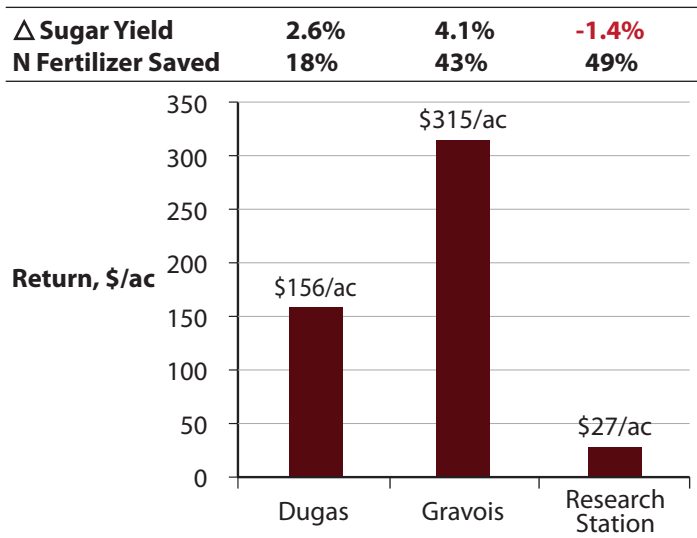


Figure 1. Change in sugar yield, amount of nitrogen fertilizer saved, and profit of sugarcane which received nitrogen recommendation from the nitrogen-rich strip and remote sensing technology. Data was averaged across 3 years and compared to farmer’s standard nitrogen practice.

■ Brenda Tubaña, professor in the School of Plant, Environmental and Soil Sciences, was the winner of the 2018 G&H Seed Company Research Award, which recognizes an LSU AgCenter researcher who has conducted exemplary work during the past five years.

Photo by Olivia McClure



The latter part of the research involved pairing a nitrogen-rich strip with remote sensing to develop the technology capable of applying nitrogen fertilizer on a plant-need basis. The nitrogen-rich strip provides the platform for estimating nitrogen available from the soil while the remote sensor gives corresponding values for what the soil can supply. These values are used together to estimate appropriate nitrogen application rates. Unlike the traditional soil and plant testing procedures, nitrogen recommendations from this technology are obtained from real-time, site-specific information.

Trials were conducted on producers' fields in Napoleonville and at the LSU AgCenter Sugar Research Station in St. Gabriel from 2013 to 2015 to compare the performance of this technology against the farmers' standard nitrogen practices. The remote sensor component of the technology takes the canopy readings, called normalized difference vegetation index or NDVI (Map a). The technology instantly computes the difference between the nitrogen-rich strip NDVI and the NDVI of the sugarcane from the rest of the field on-the-go. This approach accounts for variability in the field as opposed to the uniform nitrogen rate application under the farmers' standard practice and distributes different rates of nitrogen fertilizer based on NDVI values in the field (Map b).

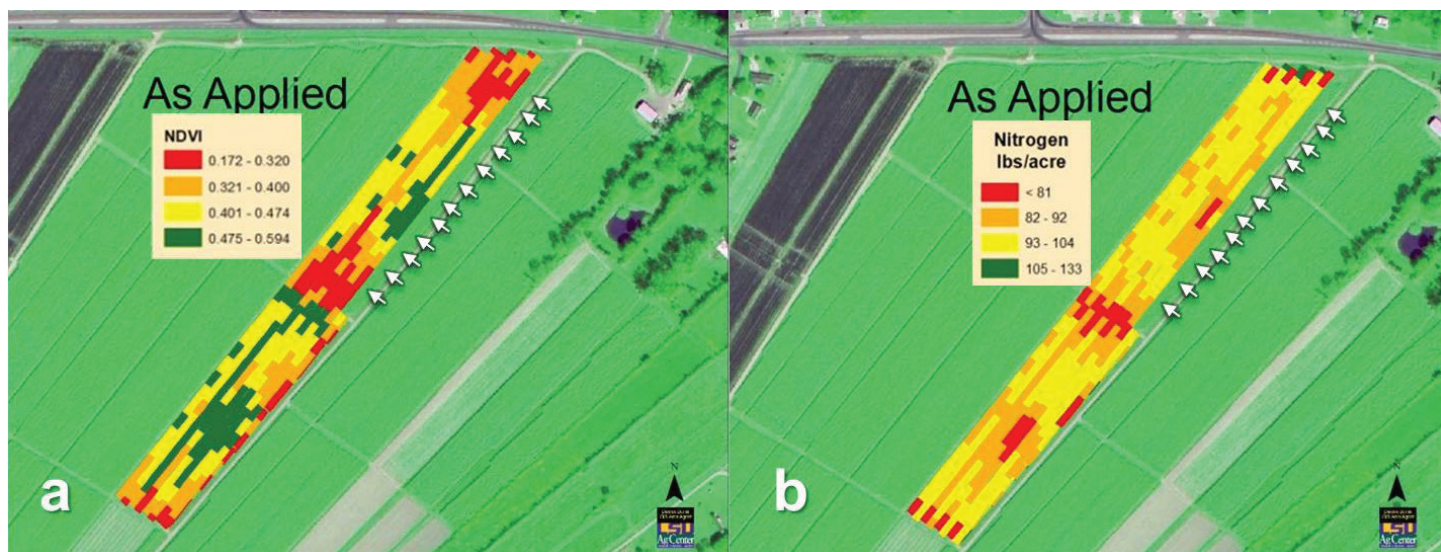
The trials showed the potential of the nitrogen-rich strip and remote sensing technology in improving both nitrogen fertilizer use efficiency and profitability in sugarcane production (Figure 1). Across the three cropping years, the reduction in applied nitrogen was 18 percent for the Dugas site, 43 percent for the Gravois site and 49 percent for the research station site. Overall, this is about a 36 percent reduction, which is equivalent to 40 pounds of nitrogen fertilizer saved per acre.

The 49 percent reduction in applied nitrogen at the research station rendered a 1.4 percent reduction in sugar yield. This loss was offset by the savings from applying less nitrogen fertilizer, making a positive net return of \$27 per acre. The Dugas site had a 2.6 percent increase in sugar yield, and the Gravois site had a 4.1 percent increase in sugar yield, despite reductions in applied nitrogen. This resulted in significant improvements in returns at \$156 per acre for the Dugas site and \$315 per acre for the Gravois site.

Applying excessive nitrogen fertilizer to compensate for any nitrogen losses that may or may not occur later in the season does not guarantee high crop yields. In sugarcane production, excess amounts of applied nitrogen often result in lower sugar yield because of reduced sucrose content, lodging, and increased pest and disease presence. For this reason, it is imperative that the appropriate amount of nitrogen is distributed where it is needed in the field to maximize yield and profitability, while minimizing nitrogen losses from the soil.

A nitrogen-rich strip is a stand-alone diagnostic tool to determine the soil's ability to supply nitrogen. When combined with remote sensing, the resulting technology can adjust the nitrogen fertilizer rate recommendation to meet plant needs. This technology is efficient and precise because it considers all the site-specific factors that are highly influenced by nitrogen dynamics in the soil.

Brenda S. Tubaña holds the Jack E. and Henrietta Jones Professorship in the School of Plant, Environmental, and Soil Sciences. Dennis Burns is an extension agent in Tensas Parish. Marilyn Dalen is a postdoctoral researcher in the School of Plant, Environmental, and Soil Sciences. Daniel Forestieri is a graduate student in the School of Plant, Environmental, and Soil Sciences. Ralph L. Frazier Jr. is an extension agent in Madison Parish.



Maps of normalized difference vegetative readings (a) and nitrogen fertilizer applied (b) to a sugarcane field demonstration trial in Napoleonville. White arrows point to the nitrogen-rich strip.

Insect Pests Drive Regional Differences in Rice Seed Treatment Use

Blake E. Wilson, James Villegas and Emily Kraus

The use of insecticidal seed treatments in rice is not a new pest management strategy, but the products have changed over the years. Insecticidal seed treatments are effective in managing early-season pests of rice including the rice water weevil (*Lissorhoptus oryzaophilus*), a damaging and ubiquitous pest that feeds on the roots of rice, and substantially reduces yields. Fipronil seed treatments were removed from the market in 2004, leaving growers with limited options to manage weevil infestations. Foliar applications of pyrethroids were used, but these products are highly toxic to crawfish, and many farmers were concerned about unintentional drift into crawfish ponds. When three new seed treatments were introduced in 2010, growers quickly adopted the new technology. Insecticidal seed treatments are now used on more than 80 percent of rice acreage in Louisiana. This high adoption rate is largely justified because the treatments provide economic returns in the vast majority of fields to which they are applied. The products effectively control the weevils as well as other insect pests, but the spectrum of pests controlled varies among products with differing modes of action.

While all rice farmers across the state are fighting the rice water weevil, secondary pests have the greatest influence on which insecticides are used.

Chlorantraniliprole seed treatments (Dermacor X-100 from DuPont) control caterpillar pests, including stem borers and fall armyworms. Two neonicotinoid seed treatments, thiamethoxam (CruiserMaxx from Syngenta) and clothianidin (NipsIt Inside from Valent) control grape colaspis, chinch bugs and thrips. The decision on which seed treatment to use must be made before planting. This means growers select the treatment based on anticipated pest problems from previous experiences. Recent surveys of rice growers and crop consultants across Louisiana indicate significant regional differences in insecticidal seed treatment use. Growers in the northeastern production region, where about 20 percent of Louisiana rice is grown, opt to use one of the two neonicotinoid seed treatments. Southwestern growers overwhelmingly use chlorantraniliprole (Figure 1). These differences are not just individual preferences but are driven by variations in pest complexes and production practices.

Stem borers are a much greater threat to rice production in southwest Louisiana than they are farther north. Three species of stem borers attack rice in Louisiana: the rice stalk borer (*Chilo plejadellus*), the sugarcane borer (*Diatraea saccharalis*) and the Mexican rice borer (*Eoreuma loftini*). Stem borers feed internally in rice stems, preventing the flow of nutrients in the plant and resulting in empty panicles or “whitehead.” Stem

borer populations have increased in recent years as the range of the invasive Mexican rice borer moved farther eastward into the state. Chlorantraniliprole effectively controls the rice water weevil as well as the three stem borer species.

Grape colaspis infestations in rice occur when rice follows soybean production the previous year, a common practice in northeast Louisiana. It is not a major pest in southwest Louisiana because colaspis larvae are soil insects that cannot survive the flooded conditions of rice and crawfish production. Damaging colaspis infestations are common in the northeast, and neonicotinoid seed treatments are the only chemical controls available to farmers.

As with other agricultural systems, rice pest complexes and available insecticides frequently change from year to year. The availability of multiple insecticidal seed treatment options gives Louisiana rice farmers the flexibility they need to manage whatever insect pests are problems in their unique situations.

Blake E. Wilson is an assistant professor at the Sugar Research Station in St. Gabriel, Louisiana. James Villegas is a research associate, and Emily Kraus is a graduate assistant in the Department of Entomology.

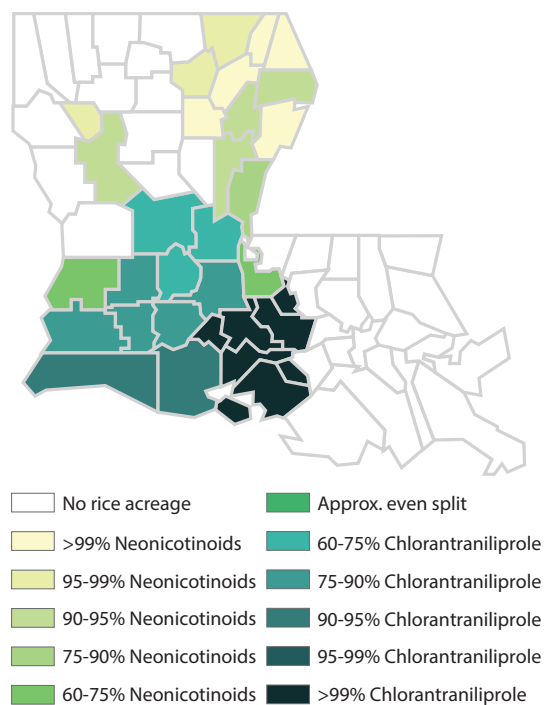


Figure 1: Geographic variation in insecticidal seed treatment use. Survey data reflect percentages of treated acreage. Untreated acreage is less than 20 percent across the study area.

Developing Rice Varieties Suitable for Alternative Irrigation Regimes in Louisiana

Niranjan Baisakh, Adam Famoso, Jonalyn Yabes, Rodante Tabien and Dustin Harrell

New varieties are the life blood of the Louisiana rice industry. Rice variety development is primarily focused on the enhancement of yield, grain quality, disease and insect resistance and production traits. Nearly 45 percent of all water used for global crop irrigation goes toward rice production, which is about 30 percent of the total fresh water. On average, 300 gallons of water are required to produce 1 pound of rough rice. Louisiana is blessed with enough irrigation capacity to meet this requirement. Irrigation expenses are significant and account for 26 percent of the total rice production cost. The average water requirement for rice in Louisiana ranges between 25 and 35 inches per acre each season. Prolonged depletion of freshwater resources could affect future generations.

Sustainability of irrigated rice production is threatened by shortages of fresh surface water and groundwater resources worldwide. In the U.S., the Mississippi River Valley alluvial aquifer has shown declines in Arkansas and Mississippi. Limited irrigation water following droughts in Texas in recent years has severely affected their rice industry. Louisiana may experience short-to-prolonged droughts during the growing season. Fresh water availability can be affected by storm surge or drought conditions in the south Louisiana canal system that can affect the quality of surface irrigation water by making it

temporarily saline or alkaline. Such scenarios are possible because of climatic uncertainties. Alternative water management strategies, such as semi-aerobic, alternate wetting and drying, and furrow-irrigated rice, are being adopted as promising strategies to combat future water shortages.

Aerobic rice, as coined by the International Rice Research Institute, is synonymous to the age-old technique of growing rice under rain-fed upland conditions where the soil is never flooded. Producing aerobic rice could reduce total water use by up to 50 percent and lower water loss from leaching, percolation and evaporation. However, studies show that rice grown in this way can have a yield reduction of up to 25 percent. The increase in the potential of diseases such as blast and the potential increase in herbicide use discourage many rice growers from adopting this water management strategy.

Another water-saving irrigation strategy the farmers could adopt is alternate wetting and drying. Low adoption of this technique may be because of its potential for reduced yield and increased management. In this system, a flood is maintained during critical growth stages such as flowering and grain filling to minimize potential yield losses. Under these conditions, little to no yield reduction has been reported.

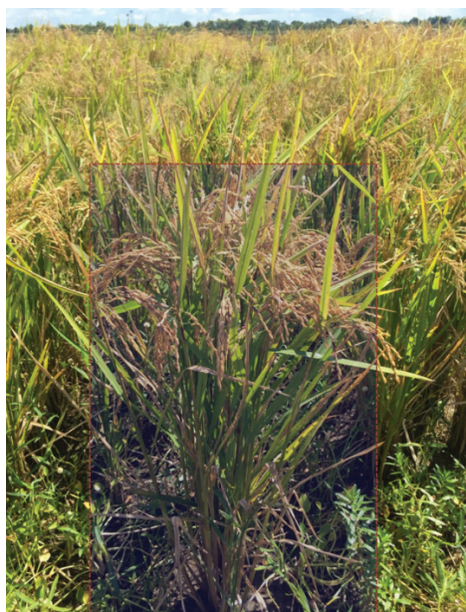
Furrow-irrigated rice production, also known as row rice, is becoming

more popular in some Louisiana parishes. This allows farmers to grow rice on fields traditionally not used for rice production because of the difference in elevations of lands.

For varieties to fit a semi-aerobic system such as row rice, they need to have improved water-use efficiency with the ability to tolerate high blast disease pressure. A few high-yielding temperate to tropical aerobic rice varieties with stress tolerance have been commercially released in the U.S. and globally. Hybrid rice varieties in the U.S. typically have strong resistance to blast disease and have been shown to work better with furrow-irrigated production in Louisiana. Breeding efforts to develop varieties for row rice are currently limited because drought tolerance traits are shown to have low heritability, and breeding for yield under drought is complex. Further, selecting for drought tolerance under field conditions is challenging and requires specialized infrastructures such as rain-out shelters that are used to shield research plots from natural rainfall. If significant progress is to be made in the development of varieties with increased water-use efficiency, a focused effort with significant resources will be necessary. The development of superior rice varieties with increased water-use efficiency could have a significant positive impact on the Louisiana rice industry by providing producers with varieties bred for improved



Screening of advanced-generation Louisiana-bred rice lines under semi-aerobic field conditions at the Rice Research Station, Beaumont, Texas. Photos by Chersty Harper



A few selected advanced-generation rice lines show good grain filling under field drought conditions at Crowley, Louisiana. Photos by Niranjana Baisakh

performance under alternative irrigation conditions.

Development of successful aerobic rice cultivars could be achieved by combining the high-yielding traits of irrigated rice with the drought-tolerance traits of traditional upland rice cultivars. Through funding by the Louisiana Rice Research Board, researchers initiated crosses with Cocodrie, a Louisiana-bred variety with the desired crop production and grain quality traits, with two drought-tolerant upland cultivars of Indian origin. Preliminary greenhouse-based screening of the early-generation progenies indicated the potential of some lines to survive drought with minimal reduction in grain yield compared to non-stressed conditions. Subsequent evaluation of advanced-generation progenies has identified potential lines with high water-use efficiency that can withstand periodic dry spells under field conditions at Crowley, Louisiana, and under

semi-aerobic conditions at Beaumont, Texas. Research is being undertaken to quantify their water-use efficiency and evaluate yield and other production traits of these lines for their suitability to alternative irrigation management schemes such as row rice. Upon yield testing of these lines to ensure adequate yield performance under favorable conditions, these lines could be useful as parents to be integrated into the routine breeding pipeline to incorporate water-use efficiency into new varieties.

Growing semi-aerobic rice is confronted with other problems that are characteristic of non-flooded field conditions. For example, weed control becomes challenging because weeds are otherwise smothered under conventional flooded conditions. Similarly, diseases seem to be more prevalent under semi-aerobic conditions. Rice blast disease, in particular, thrives under dry conditions. Therefore, breeding for

development of varieties for semi-aerobic row rice needs to take into consideration effective weed and blast management strategies.

Successful development of superior varieties to fit alternative water management schemes will reap far-reaching benefits to the Louisiana rice industry in the future. Reducing water use in growing these rice varieties under semi-aerobic, furrow-irrigated conditions would free up surface water for other uses, in addition to reducing greenhouse gas emission from rice fields.

Niranjana Baisakh is an associate professor in the School of Plant, Environmental and Soil Sciences; Adam Famoso is an H. Rouse Caffey Endowed Professor at the H. Rouse Caffey Rice Research Station; Jonalyn Yabes is a research associate in the School of Plant, Environmental and Soil Sciences; Rodante Tabien is an associate professor at Texas A&M AgriLife Research, Beaumont, Texas; Dustin Harrell is the Mosaic Company Professor at the H. Rouse Caffey Rice Research Station.



Advanced-generation Louisiana-bred rice lines at harvesting stage under semi-aerobic field conditions at the Rice Research Station, Beaumont, Texas. Photo by Niranjana Baisakh

Healthy Communities Initiative Works to Build Healthier Assumption Parish

Robin B. Landry



LSU AgCenter nutrition agent Robin Landry stands near a sign along the new walking path at Assumption Community Hospital in Napoleonville.

Photo by Olivia McClure

Louisiana has the sixth highest obesity rate for adults — and the fourth highest obesity rate for children — according to the State of Obesity report from the Robert Wood Johnson Foundation. To combat this negative trend, the LSU AgCenter Healthy Communities Initiative employs a community-driven approach to increase knowledge about healthful lifestyles and generate positive behavior changes related to nutrition and physical activity.

While the program is at work in parishes across the state, the Get Fit Ba-You

Healthy Communities Initiative in Assumption Parish is seeing its message reach both youth and adults. Students in the parish are gaining extra nutrition education, and a new walking path with signs touting the benefits of exercise was built with monetary help from community partners.

The ultimate goal of the program is to reduce obesity and to control or prevent chronic diseases, such as diabetes, heart disease and stroke, among residents. Area nutrition agents are working with local agencies, organizations and

communities across the state to build environments that help Louisiana citizens be healthy. The Healthy Communities Program engages the community in all aspects from planning and development to implementation through the use of community forums and work groups.

For the youth component of the Get Fit Ba-You initiative, nutrition lessons were adapted from a U.S. Department of Agriculture Team Nutrition curriculum, “Serving Up MyPlate,” and taught over a three-week period to middle school

students. P.E. teachers delivered the adapted Team Nutrition lessons, which included information on the MyPlate food groups: fruits, vegetables, grains, protein and dairy. Besides the technical material, students completed assignments by writing persuasive messages about healthful eating that were shared during morning announcements. They created challenges to encourage fellow students to try new, healthful foods they have never tried. During one lesson, they discussed how ads on television, the internet, food containers, newspapers and magazines can influence food choices.

Students also took part in food taste tests. They communicated what the food looks like, feels like when they hold it, smells like, tastes like and sounds like when they chew it. The curriculum encourages students to keep a

food journal of what they eat, which can lead to changes in their diet and a more healthful eating pattern. It can help encourage portion control and better nutrition and help to identify triggers to unhealthy eating. Throughout the three weeks, parents received hand-outs that correlate to what the students were taught in the classroom and were encouraged to discuss the information with their child.

In the adult component of the Get Fit Ba-You initiative, a walking path at the community hospital was established through a series of partnerships and collaborations. The well-lit walking path provides a safe environment for adults to be physically active. Signs were installed along the path explaining the benefits of exercise and warming up properly. The signs also explained the importance of staying hydrated and

included diagrams of easy park bench exercises and instructions on how to check and monitor heart rate. The signs include a feature called “SNAP IT” that encourages walking path users to take a picture of the information on the signs with their cell phones so that they can read it at their convenience. Exercise equipment is also located along the path to encourage those using the path to incorporate strength training.

The LSU AgCenter has partnered with various groups to obtain grants totaling \$70,000 to make the Get Fit Ba-You project successful. These partners include Assumption Community Hospital, Assumption Parish School Board, Assumption Parish Police Jury, Entergy and the LSU Department of Biological and Agricultural Engineering.

Robin B. Landry is an area nutrition agent based in Assumption Parish.



Assumption Community Hospital employees on a break take advantage of the new walking path on the hospital's grounds. Photo by Olivia McClure



Sign describing benefits of exercise along the new walking path at Assumption Community Hospital in Napoleonville. Photo by Olivia McClure

Agriculture Producer Concerns about Feral Hogs in Louisiana

Shaun M. Tanger, Michael Kaller and Richard Vlosky

Louisiana landowners, like those in other states, tend to have negative attitudes toward feral hogs. Surprisingly, those landowners with no economic losses had similarly negative attitudes to those landowners that did experience economic losses. This may be indicative of a risk perception (among those that have not experienced economic losses) that feral hogs will cause damage to their property in the future. LSU AgCenter researchers conducted a study to determine the connection between agriculture producer experiences with feral hogs and their concerns and opinions about the animals. The findings of this study can be used to develop educational programs about feral hog management and influence public policy decisions.

During 2014 and 2015, a questionnaire was mailed to more than 4,000 Louisiana agricultural producers with a response rate of 1,223 people, or about 30 percent. Study respondents were older than the national 2012 average, with 60 percent 65 years old or older and 5 percent under 45 years

old. Respondents were mostly Caucasian (95 percent) and male (79 percent). Household income was fairly well distributed across income categories, with 61 percent reporting an income greater than the Louisiana state median household income of \$58,964. Respondents were well-educated, with 24 percent having an undergraduate college degree and 13 percent having an advanced college degree, which is higher than the Louisiana statewide average. Farming or ranching was a primary occupation of 22 percent of respondents and a secondary occupation for the remainder. Forty-three percent had been farming for 40 years or more.

Nearly a third of the respondents said feral hogs were present on their land, and 23 percent said feral hogs had previously been present on their land. More than a third reported feral hogs had caused some type of property damage, and 18 percent reported damage had increased over the past three years. Seventeen percent said the population increased over this time period, while nearly half said the number remained stable. Respondents perceived that the main reason for the increase in feral hog populations was that they have multiple litters annually followed by lack of hunting pressure and illegal release or transfer.

A series of questions addressed economic, health and safety, environmental and management concerns. Of the respondents who said feral hogs were present on their land, 55 percent agreed they would interfere with their farming



operations and 50 percent agreed that addressing the problem would take time away from farm activities. In addition, half said they experienced crop damage because of the hogs in the past year.

Concerning health and safety, 43 percent of respondents agreed that feral hogs made them concerned for their own or their family's safety, while 34 percent also felt concern for their pets' safety. And 5 percent said they or a family member had actually been injured by feral hogs. In addition, 52 percent believed feral hogs transmit diseases to humans, and 56 percent believed that feral hogs transmit diseases to wildlife and farm animals.

When asked their perceptions regarding environmental impacts from feral hogs, 73 percent of respondents agreed that feral hogs damage wildlife habitat, 55 percent felt this was the case for soil quality, and 59 percent felt this was the case for water quality. Thirty-one percent agreed odor and air quality was an issue.

Regarding feral hog management, 78 percent of respondents believed that state eradication programs should be a priority. Fifty-seven percent agreed that feral hogs should be managed for hunting opportunities, and 27 percent agreed they should be managed for human consumption. When asked if feral hogs are being properly managed, only 13 percent felt this was the case for state officials and 11 percent felt this was the case for federal wildlife officials.

Despite the low frequency of reported feral hog presence or damage, respondents exhibited generally negative perceptions and experiences regarding feral hogs. This result supports recent findings in other studies that suggest attitudes toward feral hogs, at least among agricultural producers, are far more negative than in other stakeholder groups, regardless of prior interaction with feral hogs. These producers reflect a stakeholder group not frequently considered in nuisance wildlife policy decisions, yet it is a group that experiences substantial social and environmental harm. This research can be used to help LSU AgCenter educators develop programs for specific producer groups to convey information on feral hog biology, trapping, management and hunting. Policy makers can use these results to create effective programs and improve governmental response to the feral hog problem.

Shaun M. Tanger is an assistant professor in the Department of Agricultural Economics and Agribusiness; Michael D. Kaller is an associate professor in the School of Renewable Natural Resources and Department of Experimental Statistics; and Richard P. Vlosky is director of the Louisiana Forest Products Development Center in the School of Renewable Natural Resources.

Acknowledgment

This work is partially supported by the U.S. Department of Agriculture National Institute of Food and Agriculture, Renewable Resources Extension Act project 1011417.



■ Research is conducted on feral hog management and control at the Bob R. Jones-Idlewild Research Station in Clinton, Louisiana.

Photo by Olivia McClure

Economic Impact of Groundwater Salinity in Louisiana

Rajan Dhakal, Krishna P. Paudel, Matt Fannin and Naveen Adusumilli

Water and soil salinity affect food production and food security worldwide. Water salinity is a causal factor for soil salinity. Soil salinity beyond a certain threshold level can be detrimental to crop production. Soil salinization occurs when salt accumulates in the upper layers of soil, and it is generally prevalent in areas where evaporation exceeds precipitation, mostly in water-deficit conditions. In the U.S., about 12.8 million acres of agricultural land under irrigation have been affected by salinity. In this study, LSU AgCenter researchers focus on agricultural production areas overlying two aquifers — the Mississippi River alluvial aquifer, which is in the northeast part of the state, and the Chicot aquifer, which is in the southwest part of the state — to understand the potential effect of salinity in Louisiana.

Both the Mississippi River alluvial aquifer and the Chicot aquifer play a significant role in Louisiana agriculture. Understanding the economic effects of soil salinity in agricultural lands is vital because a detailed knowledge of possible effects of increased soil salinity conditions is essential for planning farming practices in salinity-affected regions of Louisiana. Because farm soil salinity in Louisiana is mainly irrigation induced, this study investigated the effect of saline soils on the yield of three major irrigated crops: rice, corn and soybeans. The study also explored the economic effect of some alternative cropping systems that can be adapted to prevent the adverse effects of increased salinity.

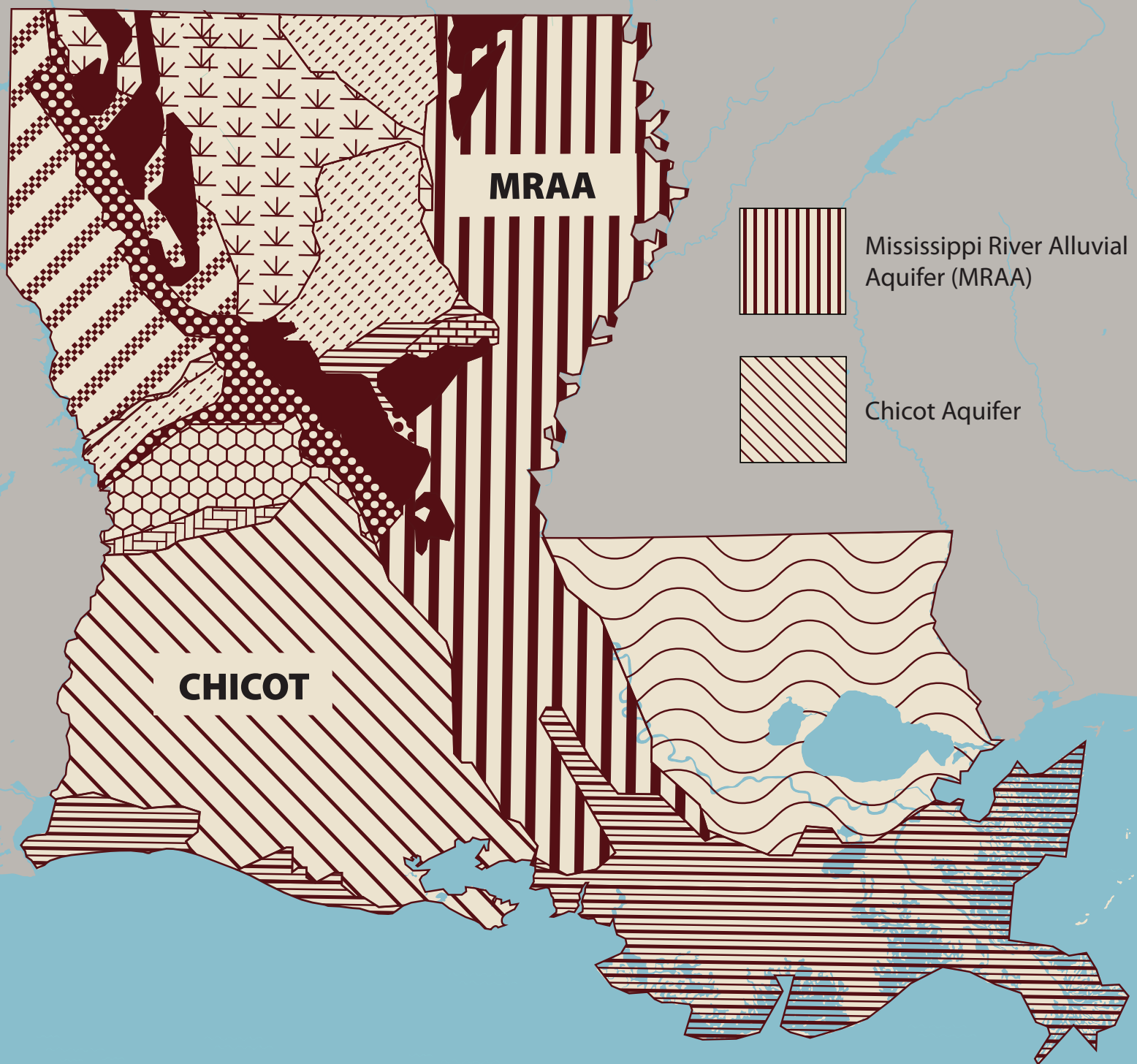
The Mississippi River alluvial aquifer and Chicot aquifer together are a major source of groundwater for 41 Louisiana parishes. For this study, however, the researchers considered only 17 of the 41 parishes because those are the areas where farmers irrigate rice, corn and soybeans. A two-stage approach assessed the economic damage of salinity to crop production. The first stage looked at the trend of increased salt content within these aquifers in order to predict the future level of salinity. Future salinity conditions were estimated based on previous data and studies by the U.S. Geological Survey and other researchers in Louisiana. Three scenarios representing three potential rates of increase in salinity were assumed: low, medium and high, in which the salinity level in these aquifers rise at a rate of 5 ppm, 20 ppm and 50 ppm per year. These assumptions were then used to estimate the salinity level of two aquifers in 10, 20 and 30 years. This provided nine scenarios to explore.

The threshold salinity model was used to determine the relative yield of selected crops in these nine scenarios. Results show that even a medium increase of 20 ppm in salinity in these aquifers can be devastating to the agricultural production of the region. Researchers estimate that in the 30th year, the high rate of salinity rise could reduce rice yield in the Chicot aquifer region by more than 39 percent and corn yield in the Mississippi River alluvial aquifer region by more than 60 percent if no preventive measures are adopted and if salinity increased as projected. Soybeans also showed a similar trend in yield loss under high-salinity levels.

In the second stage, the researchers used a software program to estimate the potential economic effect from the increasing levels of salinity. The total economic effects of salinity-induced crop yield losses were estimated for the economy of the regions and the state for each scenario. To estimate the potential economic effect to the 17-parish regional economy, the researchers set a baseline economic scenario and compared it with the economic contribution of future crop production under increased salinity conditions. The baseline scenario in this study is the current total economic contribution of irrigated crop production (rice, corn and soybeans) in the 17-parish region, which is approximately 6,700 people employed and \$1.13 billion in total output generated. By comparing the baseline scenario with a 30-year projection, the results show increased salinity can result in a loss of more than \$500 million in total output and more than 3,000 jobs. However, adoption of alternative cropping systems, such as the use of salt-tolerant crop varieties, switching to a nonirrigated system and switching to other salt-tolerant crops (cotton, sorghum and wheat), can significantly reduce the loss due to salinity. By employing alternative measures, the economic loss due to salinity with respect to the baseline scenario can reduce job losses by more than 35 percent and output losses by more than 20 percent.

Clearly, water and soil salinity need to be addressed in Louisiana's breadbasket regions.

Rajan Dhakal is a graduate assistant; Krishna P. Paudel is the Gilbert Durbin Endowed Professor; Matt Fannin is the J. Nelson Fairbanks Endowed Professor; and Naveen Adusumilli is an assistant professor, all in the Department of Agricultural Economics and Agribusiness.



The study area includes row crop production overlying MRAA and the Chicot aquifer. Note: According to the U.S. Geological Service, Louisiana has 13 major aquifers or aquifer systems (Red River alluvial aquifer, Mississippi River alluvial aquifer, upland terrace aquifer, Chicot aquifer system, Chicot equivalent aquifer system, Evangeline aquifer, Evangeline equivalent aquifer system, Jasper aquifer system, Jasper equivalent aquifer system, Catahoula aquifer, Cockfield aquifer, Sparta aquifer and the Carrizo-Wilcox aquifer). Only two aquifers studied in this article are labeled in the figure, and the remaining aquifers are separated using different symbols.

Use of Broiler Litter in Electricity Production and Resulting Economic Impacts

Krishna P. Paudel, Huizhen Niu, Chandra Theegala, Quizhou Ma, Doleswar Bhandari and Naveen Adusumilli

Poultry production, which is the largest animal industry in Louisiana, generated approximately \$1.8 billion combined in farm revenue (\$904.9 million) and value-added activities (\$882.3 million) and employed 4,361 individuals in 2017. The poultry industry in Louisiana has had steady growth since 1990. Economic opportunities created by the poultry industry also translate into large amounts of poultry litter as a byproduct. Disposal of this valuable resource and unavoidable byproduct in an environmentally safe manner is one of the priorities of poultry farmers. Consisting of all 13 essential plant macro and micro nutrients (nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, manganese, copper, zinc, chlorine, boron, iron and molybdenum) and valued three-times as cost-effective as a commercial fertilizer, the litter is an economic replacement of fertilizer input in crop production. However, over the years, a quest for answers for proper management of litter has been an agenda item for several parishes. This is mostly due to relatively decreased demand from crop producers, citing both concerns over phosphorus management in fields treated with litter over a number of years as well as supply issues.

LSU AgCenter researchers have conducted a study evaluating an alternative economic opportunity for poultry farmers, and that is electricity generation using poultry litter. Several states dealing with poultry litter as a byproduct have evaluated such alternatives to enable discussions on creating sustained economic opportunities as well as environmentally safe solutions. The broiler industry contributes most to the Louisiana economy among poultry production but also is responsible for the lion's share of litter production. Broiler birds are produced in 11 central and northern parishes of Louisiana. In the past, land applications of broiler litter as a plant nutrient source had been the norm. To some extent, this has been a successful way to reduce the pressure to dis-

pose of a large volume of litter. While correctly applying litter on land has been shown to reduce the rates of erosion and nutrient runoff over time by strengthening the soil, overapplication can lead to phosphorus buildup in soil and potential leaching and runoff of nutrients to nearby waterbodies. These latter concerns have necessitated looking for alternative ways to dispose of manure safely and economically. Several alternatives, including composting and use in animal feed, are being used. However, none of these disposal methods can alleviate the problem completely.

Recently, there has been increased interest in producing electricity as a means of providing alternative ways to dispose of poultry litter. Fibrowatt, a company located in the United Kingdom, has been converting poultry litter to electricity since the 1990s. In the U.S., a similar operation, Fibrominn, is in existence in Minnesota, and other states are actively pursuing the construction of such a plant to address litter disposal issues. Poultry litter can be used as an energy source using a thermochemical process (anaerobic digestion) and combustion process (pyrolysis, gasification and cogeneration).

LSU AgCenter researchers identified the location of all commercial broiler houses in 11 central and northern parishes using Google Earth and verified the number of broiler birds using data from the 2017 LSU AgCenter Louisiana Summary of Agriculture and Natural Resources. The challenge is to find an optimal location to build an electric plant to use broiler litter at the minimum cost. The optimal location of electricity plants depends on the spatial distribution of broiler houses, volume of litter produced in each broiler production facility, location of the urban area, location of water bodies or other environmentally sensitive areas, and the road, rail and electricity network. Several methods can be formulated to optimally locate electricity plants and allocate broiler litter to those plants. In this study, researchers used the second order conic program-



ming for location identification and the linear programming approach for allocation amount. The optimized model maximizes the profit from allocating litter to electricity plants and minimizes total pollution related to transporting litter from a broiler house to a proposed electric plant. To identify the road network from each broiler house to power plant locations, researchers use an actual road network, road slope and speed limits on the roadways.

It is possible to build one or more power plants to use all the broiler litter produced in the state. If only one power plant is built, the transportation costs from a broiler production facility to an electric plant could be prohibitively high. If many power plants are built, it may not be profitable given the high variable and fixed costs of building and operating an electricity plant.

When only one electricity plant is built to use all broiler litter produced in the 11-parish area, results from the optimization model indicate that the plant should be built in Lincoln Parish. This parish is one of the major broiler-producing parishes and is close to other major broiler-producing parishes, which include Union and Jackson. However, this may be too restrictive for the large number of broiler production facilities in Sabine, Natchitoches and Vernon parishes. An alternative is to build three electricity plants — one each in Union, Lincoln and Vernon parishes. The total volume of manure transported from broiler production to electricity plant is 170,412 metric tons, and the total cost to transport litter to these plants is \$5.3 million. Assuming all litter produced is used for electricity, this amount of litter can generate 18 MW of electricity with a direct electricity value of \$10.5 million per year. The ash value left after electricity production equals \$443,071. Therefore, the direct value of electricity production from broiler litter in the study area is approximately \$11 million.

If the cost of poultry litter were to be only \$2 per ton, which is much lower than the prevailing rate, and all of it was used for electricity production, then the rate of return per year from an electricity plant would be 26.6 percent. The low purchase price for poultry litter may be acceptable to producers because it would provide a steady stream of revenue and an alternative and an economically desirable solution to disposal of poultry litter. This payment amount per ton of litter is also consistent with what Fibrominn pays to poultry producers in Minnesota. The total economic impact to Louisiana from building electric plants would be approximately 48 jobs created, resulting in \$2.6 million in labor income, \$7 million in total value added, and \$14.5 million in industry output.

It is time for poultry-dominant parishes and industry to consider alternatives to address national concerns regarding the role of poultry litter in water pollution using voluntary methods that prevent enforcement of restrictive regulations. Litter to electricity provides that alternative. Some other states, including North Carolina and Minnesota, have used cogeneration plants (combining poultry litter with wood chips), which may be a possibility for Louisiana, considering that forestry is the state's No. 1 agriculture industry and that there are wood chip pellet plants built recently by Drax Biomass in Morehouse and LaSalle parishes. As per the Clean Air Act of 1963 and its subsequent amendments, a poultry litter-based electricity generation plant needs to follow all regulations related to the emission of air pollutants.

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Syrup Production for Fuels and Chemicals from Bagasse

Giovanna M. Aita, Fang Deng, Patrisha Bugayong, Saeed Oladi and Dae-Yeol Cheong

Bagasse is the solid residue that remains after the extraction of juice from crops such as sugarcane, energy cane and sorghum. It is a promising renewable resource that can be used in the production of a syrup feedstock with great potential in the processing of fuels (for example, ethanol, butanol), polymers, microbial lipids and other chemicals. Pretreatment and enzymatic or acid hydrolysis are needed processes to convert the polymeric sugars, cellulose and hemicellulose, already present in the bagasse into monomeric or fermentable sugars, mostly glucose and xylose. These sugars can then be concentrated into a syrup.

In pretreatment, bagasse is treated with chemicals to “soften” the biomass and expose its polymeric sugars. Pretreatment also reduces the lignin content, which is the component that acts as the glue that holds both cellulose and hemicellulose together and gives plants their rigidity. Alkali-based pretreatments, especially ammonia-based, have demonstrated success in removing the lignin and improving

enzymatic digestibility. After pretreatment, bagasse that has been softened becomes easier for enzymes to digest. Enzymes aid in breaking down long sugar chains of cellulose and hemicellulose into monomeric sugars, glucose and xylose. This process is known as enzymatic hydrolysis and yields a liquor known as hydrolysate.

A downside to any pretreatment process is the generation of toxic or nonsugar compounds that result from the degradation of cellulose, hemicellulose and lignin. These nonsugar compounds include organic acids, phenolic compounds and furaldehydes, which, if present in the hydrolysate, can alter the final quality and purity of the syrup and interfere with downstream processes such as enzymatic hydrolysis and fermentation. For example, organic acids can inhibit microbial growth and reduce fermentation yields; furaldehydes can interfere with cell replication; and lignin-derived phenolic compounds can damage cell membranes, inhibiting cell growth and enzyme activity. However, if recovered from the hydrolysate, these nonsugar compounds can have great potential as platform chemicals in the production of value-added products. For example, acetic acid is widely used in the food industry and in the production of vinyl acetate monomers, acetic anhydride and esters for use in paints, adhesives, paper coatings and textile treatments. Furaldehydes can be converted into building block chemicals used in the manufacture of alternative fuels, polymers, foams and polyesters. Lignin-derived phenolic compounds have antimicrobial, anticarcinogenic and antioxidant properties



Alma Plantation in Lakeland, Louisiana, is one of 11 sugar factories in Louisiana. The sugarcane is brought to the mill where it is processed into sugar. Bagasse is the solid residue that remains after the extraction of juice from sugarcane. Photo by Olivia McClure

with applications in the food, pharmaceutical and cosmetic industries. Therefore, the strategy for producing syrup from bagasse or any agricultural residue should be designed not only to remove these nonsugar compounds from the hydrolysate but also recover them as potential value-added products. Some detoxification methods include evaporation, flocculation, overliming and adsorption with activated carbon, ion exchange resins and laccases. Among these methods, activated carbon is one of the most widely applied methods for removing impurities from various sources because of its low cost, high capacity of adsorption and ease of use.

Once the nonsugar compounds and any other impurities have been removed from the hydrolysate, the remaining sugars can then be concentrated into a syrup. Hydrolysates are extremely susceptible to microbial deterioration because of their high water content, and evaporation facilitates the

removal of excess water. The final syrup has reduced water activity, which helps control microbial growth and preserve the fermentable sugars, thus improving the logistics associated with long-distance transportation, long-time storage and year-round supply of feedstock materials to processing industries. Once at a processing facility, the syrup can be converted through chemical or biological processes into renewable transportation fuels (ethanol, butanol, gasoline, diesel, jet fuel) and specialty chemicals (polymers, fumaric acid, dyes) for use in the chemical, food, pharmaceutical, leather and textile industries.

Giovanna M. Aita is an associate professor, Patrisha Bugayong and Dae-Yeol Cheong were postdoctoral fellows, and Fang Deng and Saeed Oladi were graduate assistants at the LSU AgCenter Audubon Sugar Institute, St. Gabriel, Louisiana.

RESEARCH BRIEF

Fumaric Acid Production from Bagasse

Giovanna M. Aita and Fang Deng

Fumaric acid has been identified by the U.S. Department of Energy as one of the top 12 building block chemicals that can be potentially manufactured using renewable biomass. It can serve as an acidifying agent in food and animal feeds and as the raw material in the production of polymer resins, plasticizers, esters and inks. Currently, fumaric acid is produced from petroleum-derived maleic acid. However, economic and environmental sustainability concerns as well as consumer preference for biobased products have advocated the use of biobased manufacturing methods for renewable feedstocks in the production of fumaric acid.

Pure glucose is the preferred carbon source for fumaric acid fermentation by fungi belonging to the genus *Rhizopus*. However, using pure sugars as a carbon source significantly increases production costs and sacrifices their use in food supplies. Thus, efforts are underway to achieve ideal fermentation yields using biomass or agricultural residues as a carbon source, including energy cane bagasse and sugarcane bagasse, the solid residue that remains after extracting the juice from the crop stalks. The polymeric sugars (cellulose and hemicellulose) present in the biomass are not easily accessible by enzymes because of the presence of lignin, which acts as a barrier. Therefore, alkali-based pretreatment methods, such as using ammonium hydroxide, are needed to disrupt the complex lignin-carbohydrate structure by decreasing the crystallinity of the cellulose and by partially removing the lignin.

Although biomass pretreatment is key in aiding with the access of these sugars (mostly glucose from cellulose

and xylose from hemicellulose), the harsh conditions often associated with pretreatment result not only in the release of these sugars but also in the generation of nonsugar compounds such as organic acids, phenolic compounds and furan derivatives, which can inhibit cell growth and fermentation yields. These nonsugar compounds can be removed from the collected mixture of sugars and nonsugar compounds, or hydrolysate, leaving behind the sugars that can then be concentrated into a syrup. This syrup mostly contains glucose and xylose sugars. Furthermore, another challenge in using bagasse as a carbon source is xylose utilization, a sugar that is not readily fermented by most microorganisms as is glucose, which can result in reduced fumaric acid yields.

Fumaric acid can be produced through fungal fermentation in a two-stage process: seed culture and acid production. Optimization of this two-stage process is crucial for maximizing yields. During the seed culture stage, carbon and nutrients (for example, minerals, nitrogen and amino acids) are provided to promote optimal fungal growth; whereas, in the acid production stage, fungal growth must be limited by reducing the nitrogen content in the medium to allow the overproduction of fumaric acid. The addition of a neutralizing agent is key for maintaining an optimum pH, removing any inhibitory end products and providing the required supply of carbon dioxide for producing fumaric acid.

LSU AgCenter research has demonstrated that syrup from dilute ammonia-pretreated energy cane bagasse can be used as a novel carbon substrate in the fermentation of fumaric acid. Thus, syrup, a renewable feedstock produced from dilute ammonia-pretreated energy cane bagasse, could be used as a substitute for pure sugars and as the carbon source for fumaric acid production.

Giovanna M. Aita is an associate professor and Fang Deng was a graduate assistant at the LSU AgCenter Audubon Sugar Institute, St. Gabriel, Louisiana.

Louisiana Program Promotes Sustainable Agriculture for Growers Big and Small

Carl Motsenbocker, Milagro Berhane and Sydney Melhado

Farmers, ranchers, educators and researchers worldwide are implementing a variety of sustainable agriculture practices to maintain resources for the future. These agriculture professionals are making a profit, protecting the land, water and air, while also caring for farmers, ranchers, their communities and their quality of life.

For some producers, sustainable practices include using cover crops to suppress weeds and benefit the soil. For others, it may include limiting water or using buffers of grass or other noncrops along streams to protect aquifers. In the U.S., the federally funded Sustainable Agriculture Research and Education (SARE) program works to advance sustainable agriculture through research and educational outreach and by funding grants for farmers, researchers, students and communities.

Across the state, the Louisiana SARE Professional Development Program works to support farmers, researchers and educators as they explore practices that improve stewardship, profitability, and the social and economic health of farm communities. Louisiana SARE provides sustainable agriculture training for extension agents, Louisiana Natural Resources Conservation Service agents and other agricultural professionals. Mentor farmers are also a target audience. They help fellow producers transition to a more sustainable form of agriculture. Farmers are not necessarily the direct focus of the training, but they are the ultimate beneficiaries. For most of these trainings, however, experienced, beginning and aspiring farmers are also encouraged to attend along with their extension agents.

Louisiana SARE is administered jointly by the two land-grant universities in Louisiana, the LSU AgCenter and the Southern University Agricultural Research and Extension Center. The pro-

gram is funded by the U.S. Department of Agriculture through Southern SARE. SARE supports at least two coordinators in every southern state, or one for each land-grant university, as well as a part-time program assistant.

The sustainable agriculture movement became focused in the 1980s in reaction to a series of developments, including the publication of “Silent Spring” by Rachel Carson in 1962, a book that documented the effects of pesticide use, and the farm crisis of the 1980s — a critical economic situation. Other circumstances included the negative aspects of the Green Revolution, which was a focus on research and technology that brought about a large increase in agricultural production in the mid-20th century but also contributed to water and soil pollution, human and animal health concerns, and increased farm debt. National funding for sustainable agriculture began in 1988 with an act of the U.S. Congress and ultimately led to the current SARE program.

The goal of SARE is that farmers and ranchers develop new, innovative strategies to produce and distribute food, fuel and fiber sustainably. While these strategies may vary greatly, they need to fall under three broad goals, known as the Pillars of Sustainability:

- Profit over the long term.
- Stewardship of our nation's land, air and water.
- Quality of life for farmers, ranchers and their communities.

These pillars are often referred to as the three-legged stool of sustainable agriculture. There is not a set prescription of practices, but farmers and ranchers can be considered sustainable when following these three tenets.

The national, regional and state SARE programs provide access to sustainable agriculture extension and research educational materials, grant opportunities, workshops and trainings, and networking. The Louisiana SARE program is the main contact for sustainable activities and programming in the state. The Louisiana SARE coordinators, the program assistant and an advisory board are the core team working with collaborators around the state to meet specific challenges and provide educational programs and resources that are designed to meet local needs of agricultural educators, farmers, agency personnel and others. The overall goal of the Louisiana SARE program is to increase education, funding, networking, communication and resources toward sustainable agriculture in Louisiana.

Louisiana SARE provides training sessions each year in-state as well as travel awards for extension agents, other agriculture professionals and mentor farmers to attend sustainable agriculture conferences and workshops in other states. A major effort is to support attendance at the annual meeting of the Southern Sustainable Agriculture Working Group (SSAWG), which is considered the premier sustainable agriculture conference in the South. The first SSAWG was held in southwest Louisiana in 1991, and there are now more than 1,200 enthusiasts attending the two-day annual meeting. The Louisiana SARE program also hosts technical trainings, such as the annual Southern University Fall Garden Workshop, the Cut Flowers Hands-on Workshop, the Beginning and Advanced Organic Farmer Training, and the Farm Profitability Workshop in 2018. In recent years, trainings around the state included the following: high tunnels workshops in various locations, the New Orleans Urban Farm Tour, and high

tunnel pest exclusion and alternative insecticides workshops.

A key component for SARE is also grants. Southern SARE provides competitive grants annually for research and education, graduate students,

professional development programs, producers and on-farm research. Since 1988, SARE has funded 34 grant projects totaling \$1 million to support sustainable agriculture practices and educational materials across Louisiana.

Carl Motsenbocker is a professor in the School of Plant, Environmental and Soil Sciences; Milagro Berhane is a research associate at the Southern University Agricultural Center; and Sydney Melhado is an extension associate at the LSU AgCenter.

Farmers Encouraged to Mine Big Data for a Marketing Edge

Olivia McClure

Farmers were encouraged to take advantage of new data-driven technologies at the LSU AgCenter digital agriculture conference Jan. 29 at the State Evacuation Shelter near Alexandria, Louisiana.

About 90 people came to event, which was part of a new push at the AgCenter and the LSU College of Agriculture for more education and research on using technologies that record and interpret data to make farming more efficient and profitable.

"We're moving toward designing a program that fits our students of tomorrow," said Rogers Leonard, AgCenter associate vice president. "But we can't forget about the farmers that are out there today."

More events are being planned to help farmers understand the massive data sets gathered by tools such as harvest yield monitors, remote sensors and drone cameras, he said.

At the conference, AgCenter engineer Randy Price said yield monitors, which come standard on most new combines, are a good place to start for those interested in using data to make better choices on the farm. A farmer could use the monitor's data to map yields across a field and identify areas that are less productive, for example.

Modern combines record data not just on yield but also fuel usage, elevation and location.

"That's a lot of information at your fingertips," but it has no value on its own, said AgCenter agent R.L. Frazier. "The value comes in what you do with the data."

Farmers will need to cooperate with academics and industry professionals to make sense of data collected on their farms, said Thanos Gentimis, an assistant professor in the AgCenter Department of Experimental Statistics. He teaches a class aimed at training students to use ag data.

Sharing data can help farmers and researchers alike, said Luciano Shiratsuchi, an associate professor in the AgCenter School of Plant, Environmental and Soil Sciences.

A bigger pool of data improves research projects and the

resulting recommendations, he said. And farmers can benefit from the expertise of someone who can translate data into an action item, like applying varied rates of fertilizer according to the needs of different parts of a field.

Making data available to others — like firms that specialize in ag data interpretation — is an opportunity for success, said Terry Griffin, an economist with Kansas State University.

"It's not just what you would do," Griffin said. To be competitive, today's farmers also need to know about what their neighbors, other farmers, retailers and ag companies are doing — and patterns that emerge in large data sets can offer insight.

Several speakers at the conference emphasized that moving into the digital agriculture era requires investing both time and money. During a panel discussion, farmers B.J. Duckworth and Mead Hardwick described the learning curve they had to overcome when they first began studying data from their farms to evaluate and adjust their practices.

Farmers who don't yet own the latest data-tracking tools need to consider their goals and budget carefully before rushing to the equipment dealership, said AgCenter economist Michael Deliberto.

"It certainly gives producers the ability to be more efficient in input use," he said. Those potential savings, however, won't necessarily be enough to justify the cost of the latest gadgets and machines.

They also won't do much to help a farmer who has neglected more important things, like planting crops on time, Griffin said.

"If you're not doing well in the basics, adding some of these technologies will not help," he said.

The conference also featured a poster session that highlighted LSU student research and a vendor fair.

Olivia McClure is an assistant specialist with LSU AgCenter Communications.

Inside:

Using a "nitrogen-rich strip" of sugarcane rows in a field can prevent overuse of fertilizer on the crop. Overuse not only wastes money and is bad for the environment, but it can reduce yields.

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The availability of multiple insecticidal seed treatment options gives Louisiana rice farmers the flexibility to manage insect pests unique to their situations.

See page 17

Nearly 45 percent of all water used for global crop irrigation goes to rice production. LSU AgCenter scientists are developing rice varieties that use less water in case of prolonged water depletion.

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LSU AgCenter economists have looked at the possible benefits of turning excess poultry litter into electricity.

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Production of fuels and chemicals from sugarcane bagasse could be an economic boost for Louisiana agriculture.

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