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LOUISIANA Agriculture

Vol. 58, No.1, Winter 2015
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Assuring Our Future Through Scientific Research and Education

Nanotechnology

can be used in the food industry to improve health. See page 20

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Louisiana Seafood Direct helps industry compete worldwide

The Louisiana Seafood Direct Program is helping the state's seafood industry compete with the worldwide aquaculture industry.

Thomas Hymel, LSU AgCenter and Louisiana Sea Grant agent, said the state seafood industry has gone through a number of challenges, including hurricanes Rita and Ike and the BP oil spill. But it remains the largest seafood-producing state in the Lower 48.

Those who have survived the challenges are benefitting from the program, which connects fishers with consumers.

On the Louisiana Seafood Direct website, consumers can learn about fresh seafood products available from boats and processors. In Delcambre more than 70 participants are offering their products directly to consumers, Hymel said.

"It has opened a lot of doors to a lot of new commerce. It's been a huge opportunity created for commercial fishermen, packers and processors," he said.

A new boat launch at Delcambre provides easier access to the marsh and Vermilion Bay. A waterfront pavilion for a seafood and farmers market increases sales opportunities, he said. "We are ending up with more vessels coming into Delcambre to sell their catch."

That program has been expanded to the New Orleans and Houma-Thibodaux areas, and it will be developed in Cameron also, Hymel said.

A seafood processing plant under construction in Cameron is expected to be completed by June, said Kevin Savoie, LSU AgCenter and Louisiana Sea Grant fisheries agent. The facility will provide an outlet for Cameron Parish shrimpers who have had to ship their product to processors in Delcambre or Port Arthur, Texas. That shipping expense meant less money for shrimpers.

"It has opened a lot of doors to a lot of new commerce. It's been a huge opportunity created for commercial fishermen, packers and processors."

Thomas Hymel

The plant, being built where an ice house was on the Old River Loop, will be owned by the Cameron Parish Police Jury and operated by a private company, Cameron Fisheries. Funding for the $4 million project came from a Community Development Block Grant, Savoie said.

Savoie said the state-of-the art plant will be able to incorporate services such as peeling and retail packaging, similar to what is being done in the Vermilion Bay Sweet project.

"It helps get a premium price for a premium product," Hymel said.

The direct seafood marketing program for New Orleans is in the fledgling stages, said Albert "Rusty" Gaude, LSU AgCenter and Louisiana Sea Grant fisheries agent, with about 20 boats registered.

In recent years, shrimpers in the Gulf of Mexico have benefitted from higher prices as a result of a disease problem that plagued Southeast Asian shrimp farming operations, Gaude said. "There's some word right now that the farming operations are coming out of that disease cycle."

He said the overall shrimp catch in U.S. waters increased in 2014, but the amount of imported shrimp also rose. "Not only are we catching more, and not only is there more shrimp coming into the country, but we are eating a lot more shrimp."

The oyster industry is not faring as well, however. Although the BP oil spill has been blamed, Gaude said, not much direct evidence exists to prove a connection to the downturn that existed before the disaster.

The low amount of spats, or developing oysters, in the wild has been on the decline. "It's been like that for several years," he said.

An educational outreach program, Louisiana Fisheries Forward, to help fishers and processors improve efficiency and safety is an ongoing effort with the Louisiana Department of Wildlife and Fisheries. An oyster industry workshop was held in December in Houma. The third annual Seafood Summit will be held March 11 at the Houma Civic Center with more than 500 people from the seafood industry expected.

Bruce Schultz is an assistant specialist with LSU AgCenter Communications.

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Louisiana Agriculture is published quarterly by the Louisiana Agricultural Experiment Station. Subscriptions are free. You may also subscribe to a Web version of the magazine, which is available at www.LSUAgCenter.com. Please go to the "Louisiana Agriculture Magazine" site if you would like to receive an email notification when a new issue is online. If you would like to download the magazine to your e-reader, go to the magazine's website, choose the correct format, and follow the directions on your mobile device. For more information or to subscribe, please contact:
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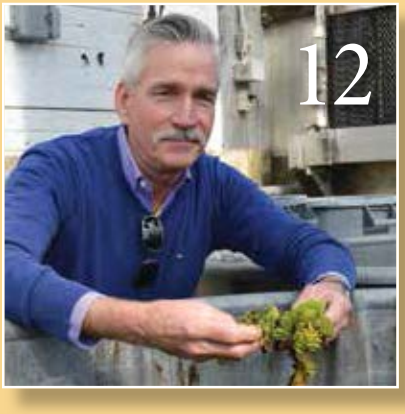


LOUISIANA Agriculture

Features

Departments

ON THE COVER: Cristina Sabliov, at right, an LSU AgCenter researcher and professor in the Department of Biological and Agricultural Engineering, likes to think in nano terms. Sabliov specializes in creating nanodelivery systems for bioactive substances that can improve people's health. Sabliov is shown here with Kurt Ristroph, an LSU undergraduate student. Read more about her research on page 20. Photo by John Wozniak

Ruben Dauzat speaks at the Louisiana Association of Conservation Districts convention, where he was named Outstanding Master Farmer of 2014 on Jan. 13, 2015. Photo by Bruce Schultz

Outstanding Master Farmer 2014, Ruben Dauzat

Ruben Dauzat, chosen as the Outstanding Master Farmer of the Year for 2014, wants to make the best crop possible each growing season, but he doesn't forget the long-term goal of conservation of the land and water.

"Our names might be on a piece of paper, but we don't own the land. We're just here for a short period of time," Dauzat said. "Everything we do on our farm is concentrated on conservation."

He grows corn, soybeans, grain sorghum, wheat, cotton and cattle on the 1,200-acre Wayside Farms near Simmesport in Avoyelles Parish.

Dauzat was given the award on Jan. 13 during the annual convention of the Louisiana Association of Conservation Districts in Baton Rouge, when nine other farmers were given certification as Master Farmers.

The Louisiana Master Farmer Program helps farmers learn the latest in conservation practices. Sponsors are the LSU AgCenter, which provides the education, the Louisiana Department of Agriculture and Forestry, the U.S. Department of Agriculture Natural Resources Conservation Service, the Louisiana Farm Bureau and the Louisiana Cattlemen's Association.

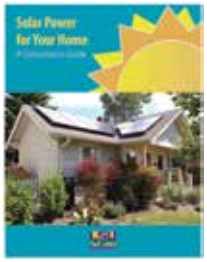
Dauzat said participating in the program affirmed he's on the right track. "Master Farmer rededicated me to conservation. I knew I was doing the right things, but it made me do it better and more of it."

Dauzat, also a graduate of the LSU Ag Leadership program, was an easy choice for the Outstanding Master Farmer Award, said Donna Morgan, Louisiana Master Farmer Program extension associate.

"He's been pretty involved with soil and water conservation, and we've had field days at his farm," she said. **Bruce Schultz**

Guide to solar power for your home now available

The LSU AgCenter has released a new guide to help homeowners learn more about solar power technology for their homes. The 24-page guide, which is available as a PDF file online only, provides information about solar power benefits, limitations, technology options, installation and financial considerations. It was written by AgCenter extension housing specialist Claudette Reichel with input from 18 experts from around the country. Go to www.LSUAgCenter.com and search for solar power. **Olivia McClure**



Sugar Cane League honors Salassi

LSU AgCenter economist Michael Salassi received the American Sugar Cane League President's Award at its annual meeting in Lafayette on Feb. 3. The award is given to individuals for their outstanding contributions and service to Louisiana's sugarcane industry. In presenting the award, league president Mike Daigle highlighted Salassi's work with the industry through research and extension activities and by providing analysis of the sugar market. **Tobie Blanchard**

Mike Daigle, right, president of the American Sugar Cane League, presents LSU AgCenter economist Michael Salassi with an award. Photo by Sam Irwin

Retired rice specialist honored at reception

More than 100 friends, farmers and fellow employees turned out on Jan. 13 for a reception at the Acadia Parish extension office for Johnny Saichuk, who retired as LSU AgCenter rice specialist.

"You don't have any idea how many people you've helped," Steve Linscombe, Rice Research Station director, told Saichuk. "I don't think you realize how many people hold you at such a high level of respect."

Jerry Whatley, retired county agent in Calcasieu Parish, spoke about Saichuk's help for extension. "You came along at the right time, and you made us all better. And we just appreciate your honesty and integrity."

Saichuk said he will continue to be active in agriculture as a consultant.

"Through the years, I've really looked up to Dr. Saichuk, and he's taught me a lot," said Dustin Harrell, the new rice specialist. "I know I have very big shoes to fill." **Bruce Schultz**

Retired LSU AgCenter Rice Specialist Johnny Saichuk, at right, talks with farmer Tim Wild at a reception in his honor on Jan. 13 at the Acadia Parish extension office. Photo by Bruce Schultz

Researchers try to increase 'energycane' production

LSU AgCenter researchers continue to evaluate energycane varieties planted at the Macon Ridge Research Station in Winnsboro as a possible new crop for producers to grow as a biofuel feedstock.

"The plants have survived the cold temperatures common during north Louisiana winters," said Collins Kimbeng, plant breeder. "They are yielding well and don't appear to be suffering from any damages caused by frigid temperatures."

Energycane is a cross between sugarcane and its wild relatives. It is grown for high fiber, or biomass, and not sugar content.

"Creating an energycane variety that is cold-tolerant will extend the range of cultivation and allow for producers outside the traditional cane-growing areas to produce energycane crops," Kimbeng said.

"Our goal is to produce an energycane crop with minimal inputs, such as reduced nitrogen rates and reduced cultivation," said Kenneth Gravois, sugarcane specialist. **A. Denise Attaway**

Energycane. Photo by A. Denise Attaway

AgCenter group works on irrigation efficiency

Greater irrigation efficiency in Louisiana is critical, according to Stacia Davis, irrigation engineer at the LSU AgCenter Red River Research Station in Bossier City. In some parts of the state, groundwater supplies are dwindling and becoming unsuitable for use on crops. Inefficient irrigation costs farmers money and encourages nutrient runoff, which negatively affects nearby waterways.

Davis said AgCenter researchers and extension agents are planning projects to examine the efficiency of various irrigation methods and technologies. For example, Davis is studying the use of soil moisture sensors to aid decisions about irrigation scheduling. Other projects include research on how different irrigation strategies affect crop and soil health.

Many farmers in northwestern Louisiana face the dilemma of not having surface water, which forces them to irrigate with water from a declining aquifer. However, the Natural Resources Conservation Service's recently-completed Red Bayou Watershed Project is helping change that.

Two intake pumps in the Red River send water to Red Bayou, which forms three pools in Caddo Parish. Farmers in the area can now pump water from those pools, which will help reduce aquifer overdraft and soil erosion, said NRCS district conservationist Brian Baiamonte. **Olivia McClure**

Fresh produce safety focus of workshops

Louisiana fresh produce growers learned about ways to reduce food safety risks at a series of workshops held across the state Feb. 10 to 13.

LSU AgCenter food safety specialist Achyut Adhikari said 48 million, or one in six, Americans get sick from foodborne illnesses every year. That statistic prompted the Food Safety Modernization Act, which will require farmers to take preventative measures against food safety risks, once the Food and Drug Administration finalizes rules to enforce the law.

Illness-causing pathogens, such as salmonella and listeria, come from a variety of sources. The most common source is fecal matter, Adhikari said, which can be spread by water, wildlife, waste and workers.

Simple steps like hand washing, using clean equipment and keeping wildlife away — things many farmers already do — can cut down on contamination.

Farmers must document their food safety practices to become certified by the U.S. Department of Agriculture for Good Agricultural Practices and Good Handling Practices, Adhikari said. Many retail stores that buy fresh produce will require sellers to be certified.

The certification process will require growers to pass an audit, an on-farm inspection, assuring they comply with the new rules, Adhikari said. Audits are performed by the Louisiana Department of Agriculture and Forestry. **Olivia McClure**

LSU AgCenter food safety specialist Achyut Adhikari discusses foodborne illnesses at a Feb. 13 food safety workshop in Hammond. Photo by Olivia McClure

The Arlene and Joseph Meraux Charitable Foundation donated $150,000 to endow Supreme Champion Animals Awards given at the LSU AgCenter Livestock Show. From left to right, Meraux Foundation board member Chris Haines, LSU Vice President for Agriculture Bill Richardson, Meraux Foundation President Rita Gue, board member Floyd Gue and AgCenter development officers Vickie Hutchinson and Randa Bordelon. Photo by Olivia McClure

Two donations made to livestock show

The Arlene and Joseph Meraux Charitable Foundation has given $150,000 to the LSU AgCenter Livestock Show — the largest single donation in the show's 80-year history. The funds establish an endowment for Supreme Champion Animal awards in beef cattle, dairy, poultry, sheep, goats and swine. Ten winners will be selected at each Livestock Show and will receive academic awards of $1,000 each. In addition, PotashCorp, of Geismar, Louisiana, donated $50,000 to support showmanship awards and serve as the corporate title sponsor for the 2015 show. **Olivia McClure**

Plant pathologist wins award

Raymond Schneider, professor in the Department of Plant Pathology and Crop Physiology, received the American Phytopathological Society's Southern Division Outstanding Plant Pathologist Award at its annual meeting in Atlanta, Georgia, on Feb. 2.

Schneider has been involved in disease management strategies for soybeans for much of his 40-year career. He was the first person in North America to find Asian soybean rust in 2004.

Raymond Schneider. Photo by Robert Carver

Schneider said he believes the relationship between plant nutrition and disease to be the next battleground in combating plant diseases, and he and his graduate students are devoting much of their research in this area. This type of research also serves as good preparation for his students.

"We have a nationwide reputation for conducting mission-oriented research. Our students are sought after because they have the thought process and a strong overview of the research process," he said.

Craig Gautreaux

Mosquito control group endows entomology scholarship

The Louisiana Mosquito Control Association (LMCA) has established an endowed scholarship in the LSU AgCenter Department of Entomology. LMCA is endowing a total of four scholarships across Louisiana, including the one at LSU.

Tim Schowalter, entomology department head, said with Louisiana's history of insect-borne diseases, the importance of medical entomology is crucial when finding ways to manage insects.

"The biggest benefit of the scholarship is the substantial increase in graduate stipends, which creates additional recruiting incentives for the top students," Schowalter said.

The LMCA scholarship endowment is open to LSU graduate students studying entomology with a focus on mosquito research. The student must be full-time and achieve a 3.0 grade point average or higher. The first scholarship will be awarded in the spring of 2016. **Brandy Orlando**


Mosquitoes. Photo by John Wozniak


Carl Motsenbocker, with the LSU AgCenter, second from right at back, and Anna Claire Ferchaud, an LSU senior, Ann Savage, with the LSU AgCenter, and Mile Berhane, with Southern University, front row, from left, pose with students from Centre de Formation Fritz Lafontant, a school with Zamni Agrikol in Haiti. The four visited Haiti to explore opportunities for exchanges and collaborations. Photo provided by Carl Motsenbocker

LSU, Southern U agriculture group hooks up with Haiti

Carl Motsenbocker and a group from Louisiana State University and Southern University returned from Haiti in January with ideas on how to engage LSU students and the community in developing sustainable agriculture projects in the Caribbean country.

Motsenbocker, a horticulture professor in the LSU College of Agriculture, traveled to Haiti with Ann Savage, an LSU AgCenter sustainable agriculture extension associate, Mile Berhane, a research associate with Southern University, and Anna Claire Ferchaud, a College of Agriculture senior studying natural resource ecology and management. The group left Baton Rouge for Haiti on Jan. 1 and was there for 10 days.

Motsenbocker describes the trip as a sustainable agriculture excursion to look at the local food systems in Haiti, assess needs at three Haitian sites and work with collaborators to support agricultural development. The group was also exploring opportunities for student and faculty exchanges.

"One of my goals is to develop a sustainable agriculture and food systems class that I will teach in spring 2016, with an optional trip to Haiti during spring break," Motsenbocker said.

LSU has several projects in Haiti with multiple goals engaging faculty and students from various LSU colleges. "The project with the College of Agriculture is to collaborate with locals and provide the education and the tools that may be needed and to support their work in their communities," he said.

Tobie Blanchard

Students trade tape measures for body scanners

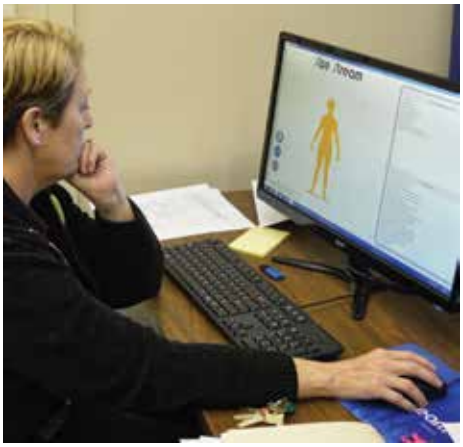
Apparel design students in the LSU College of Agriculture are trading in their tape measures for new technologies. Students in Casey Stannard's apparel product design class were using a 3- and 4-D body scanner to scan models to get quick and accurate measurements in just six seconds.

"I'm really trying to get the students used to the concept, so when they do go out to a more high-tech company, they will at least know what a body scan looks like," Stannard said.

Students can take the measurements from the scanner and plug them into computer-aided pattern-making software. From there they can create garments that will have a better fit on the model than if it had been done by hand.

"Last semester I took a pattern-making class, and we did it all by hand. And doing it in the computer is a lot faster; you are able to produce more garments," said Nicole Stephens, a junior in apparel design.

Assistant professor Laurel Romeo was operating the scanner and will use the scans of the models as part of a research project. **Tobie Blanchard**



Assistant professor Laurel Romeo in the Department of Textiles, Apparel Design and Merchandising looks at a scan of a model. Romeo is working with assistant professor Casey Stannard to help apparel design students use body scanning technology to get quick and accurate measurements of models to use when designing garments. Photo by Tobie Blanchard

Ag consultants award three $2,000 scholarships

The Louisiana Agricultural Consultants Association presented $2,000 scholarships to three LSU College of Agriculture students.

The undergraduate scholarship – funded by Young and Young Farms, RiceTec and CPS – was given to Luke Habetz, an agribusiness major. Matthew Foster, who graduated from LSU in 2012 with a B.S. in plant and soil systems, received a graduate student scholarship. He is pursuing a master's degree in agronomy with a concentration in weed science. His scholarship was funded by Dow AgriScience. The Ph.D. scholarship was presented to Maryam Shahrtash, who is studying plant health in the Department of Plant Pathology and Crop Physiology. Her scholarship is funded by the Louisiana Land Bank. **Rick Bogren**

Exchange set up with Slovak University

Thirteen students from Slovak University of Agriculture visited LSU as part of a partnership between their university and the LSU AgCenter and LSU College of Agriculture.

The collaboration started last year when Louisiana faculty visited the campus in Nitra, Slovakia. This past fall their faculty visited LSU.

"We want to establish a long-term relationship between the two universities with research, teaching, study abroad and outreach opportunities," said David Picha, director of LSU AgCenter International Programs.

College of Agriculture students will visit the Slovakian university in June. The university has about 10,000 students and is the only university offering an agriculture curriculum in Slovakia.

"We are inspired by the spirit of your campus," said Lucia Richterová, a Ph.D. student studying economics and management. "This is what I envy. I wish to have a stronger student life, and we hope to bring that back to our campus."

During their visit to LSU, students from Slovak University of Agriculture participated in events with LSU College of Agriculture students. Here, Viktor Varga (left), Ashley Turnstall (center) and Andrej Tárnik (right) play human bingo with other students. Photo by Tobie Blanchard

One striking difference between the two universities is students in Slovakia do not pay tuition. The Slovak students also said they have a grading system that goes from A to E, and their grade point averages are weighted opposite of the U.S. system. In Slovakia a 1.0 is an A average.

"The biggest value is that they can build this international network that they can have for the rest of their lives," said Ivana Tregenza, coordinator with AgCenter International Programs.

When the LSU students visit Nitra in June, they will also go to Budapest, Prague and Vienna. **Tobie Blanchard**

Paper dresses raise awareness for heart disease

Rebecca Stephens, an LSU College of Agriculture junior, won first place with her "Queen of Hearts" red dress in the Hemline for Hearts competition. Photo by Tobie Blanchard

In four hours, LSU College of Agriculture Textiles, Apparel Design and Merchandising students turned paper hearts into dresses that were works of art. Six students participated in the American Heart Association's Hemline for Hearts event at the Mall of Louisiana in Baton Rouge in January. The students are members of the student fashion and merchandising organization Hemline@LSU. The competition raises awareness of the danger of heart disease and stroke to women but also helps the students showcase their talents. **Tobie Blanchard**

Efficient Irrigation Saves Water and Money
The STAMP Program

Stacia Davis and Naveen Adusumilli

Irrigation of agricultural crops in Louisiana has contributed to the state's economic growth, and it is anticipated that the number of irrigated acres will continue to increase. Irrigated acres of major row crops increased 21 percent from 2011 to 2014 (Figure 1). This increase in irrigated acres, however, has also increased the need for water withdrawals to supplement crop water requirements. Total water withdrawals for irrigation of feed grain crops, soybeans, cotton, wheat, other vegetable crops and rice exceed 900 million gallons per day. With growing populations, declining groundwater levels, irregular precipitation patterns, and an anticipated increase in irrigated acreage fueled mostly by high crop prices, demand for water will further increase, putting additional pressure on the state's already stressed water resources. Insufficient irrigation water and inefficient irrigation in agriculture were the highest-ranked natural resource concerns for Louisiana in 2014 by the U.S. Department of Agriculture Natural Resources Conservation Service. Such anticipated effects warrant growers to make sound decisions focused on better crop water management strategies to protect the continued productivity of irrigated agriculture in the state.

The LSU AgCenter's approach to addressing agricultural water challenges in the state include education and outreach about conservation and efficiency. One such conservation effort aids in irrigation scheduling using crop soil moisture monitoring techniques, commonly referred to as smart technologies. Smart Technologies for Agricultural Management and Production (STAMP), a research and extension program, was initiated in 2014 at the Red River Research Station in Bossier City. The STAMP program aims to find answers to questions like when and how much to irrigate, plant response to irrigation at critical growth stages to maximize yield, impact of excessive irrigation on crop yield and net returns, and measuring water needs to regulate irrigation and to prevent leaching of nutrients and erosion of topsoil. The program is based on the premise that efficient irrigation water applications have the potential to address concerns over diminishing water resources, environmental regulation and rising costs of irrigated agriculture. Because it is not likely that new water sources will be found to satisfy current and future irrigation needs, water conservation through proper irrigation management strategies is critical.

Smart technologies have become popular methods to aid producers in making irrigation decisions. Prevalent among the smart technologies is soil moisture irrigation technology, typically involving sensors buried in the crop root zone that estimate the amount of soil moisture available for the crop. The soil moisture data provided by the sensors can aid the producer in deciding when to irrigate. Some sensors equipped with real-time monitoring capability can also provide information to the producer on when to stop irrigation based on soil moisture conditions achieved (Figure 2). The STAMP program is focused on field testing of the various soil moisture sensors in different crops. As a part of the research and extension program, workshops will be held for local producers to provide hands-on training. Economic analyses associated with using smart technologies will include estimation of potential reduction in pumping costs, change in crop yields, change in net returns, and payback period. Although the program is initiated in

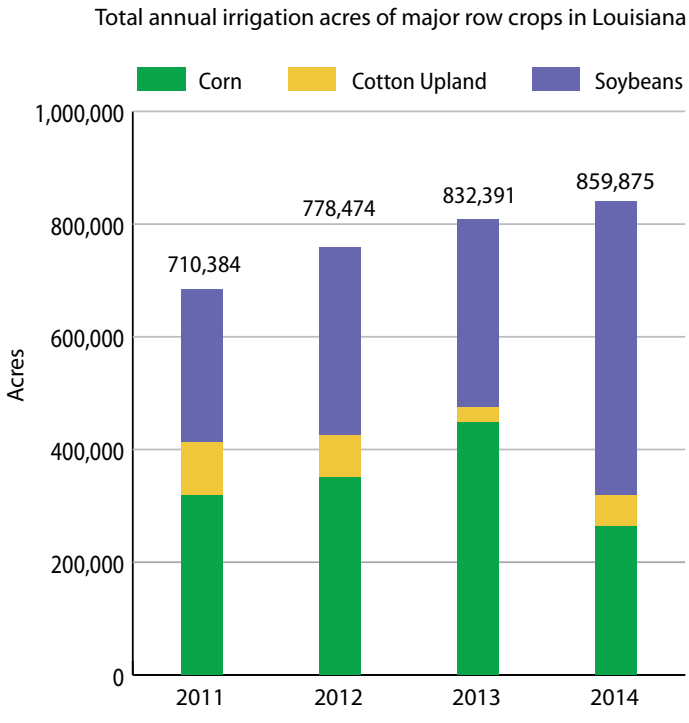


Figure 1. Annual irrigated acres of major row crops of Louisiana. Totals are shown on the top of each column.

Figure 2. Some sensors equipped with real-time monitoring capability can also provide information to the producer on when to stop irrigation based on soil moisture conditions achieved.

Louisiana's northwest region, it will extend across the state. The STAMP program will initially focus on row crops and will expand to include vegetable crops, pasture production, nursery plantations, and residential lawn management.

Specific objectives of the STAMP program include:

• **Evaluation** – Not all technologies work for every situation and for every farmer. Variable soil types, installation restrictions, technological competency and economic factors are just some of the factors that can affect the success of implementation. Research will focus on developing recommendations appropriate to Louisiana.

• **Conservation** – With strong competition for Louisiana's natural resources and changing climatic conditions, the ultimate goal is to improve irrigation efficiency, which has been shown to also improve yield, boost nutrient use efficiency, reduce sediment losses and reduce energy costs. Helping irrigators measure their water, energy and economic savings achieved by using smart technologies can direct agricultural practices toward becoming increasingly sustainable.

• **Demonstration** – With so many commercially available technologies, it can be overwhelming for irrigators to start from scratch without having educational opportunities. Knowledge will be gained by researchers and specialists during evaluation that can be translated to the irrigators through extension programs. The distribution of knowledge will occur in various ways, including workshops, field days and educational materials.

Stacia Davis is an irrigation engineer, and Naveen Adusumilli is an agricultural economist, both at the Red River Research Station, Bossier City, La.

Agriculture Irrigation on the Increase

Olivia McClure

Agriculture is one of the biggest users of Louisiana's water resources, which many people worry are in danger, both in terms of quantity and quality.

There has been a steady increase in agricultural irrigation in the past few decades in Louisiana. The number of irrigated acres has gone from 702,000 in 1974 to 1.2 million in 2013, according to the U.S. Department of Agriculture.

Major Louisiana row crops like corn and soybeans are water-intensive, and new high-yield varieties demand even more water.

"The value of irrigation can't be overestimated," said Rogers Leonard, LSU AgCenter associate vice chancellor for plant and soil sciences. "You can't afford to lose crop yields to droughty conditions. Irrigation is used as a risk management tool because it stabilizes the variation in yields over time."

To reach those higher yields, many farmers rely on decades-old irrigation methods that use excessive amounts of water to meet crop needs. Much of the water never touches crops and leaves the field as runoff, carrying soil and expensive fertilizers with it. Sometimes, that nutrient-laden water ends up in nearby streams that drain into larger bodies of water, causing low-oxygen conditions.

In some areas of Louisiana, the increase in irrigation has lowered the groundwater supply, which leaves higher concentrations of naturally occurring

LSU AgCenter water resources team at the Red River Research Station near Bossier City. From left to right, Stacia Davis, Naveen Adusumilli, Syam Dodia and Changyoon Jeong. Photo by Olivia McClure

salt — sometimes high enough to make water unsuitable for irrigation.

These problems are exacerbated by the increasing water needs of industry and urban populations that use groundwater from the same aquifers.

While new technologies and research can help achieve greater efficiency, change will not be quick or easy. Farmers face incredibly complex decisions about how and when to irrigate their crops.

Irrigation history

Farmers didn't always irrigate. Nature did it for them with rain.

"History indicated that farmers could get normal yields of soybeans from natural rainfall in some years, but in years with less rain, those yields may be off by 50 to 75 percent," Leonard said. "That loss in annual income from yield variability will not allow farmers to consistently make a profit. Long-term sustainability is only possible at higher yield levels. To get to those levels consistently, they have to provide those plants with sufficient inputs."

Today, many farmers invest in the equipment needed to irrigate, and more than 40 percent of Louisiana's row crop acreage is now irrigated, according to AgCenter irrigation engineer Stacia Davis. Good soybean prices in the past several years, for example, have made it critical to get the highest yields possible.

Beneficial as it is, irrigation can cause problems. One is with salt. In northeastern Louisiana and coastal parishes, salt in groundwater is a big concern because it hurts crop health.

Salt domes lie beneath Louisiana's surface, along with 12 major aquifers that all flow southward. Historically, rain would push saltwater to waterways and the Gulf of Mexico, but rainfall patterns have been changing since 2000, and there have been extended periods of drought in some areas of Louisiana, said retired AgCenter water specialist Bill Branch.

With more farmers putting down wells for irrigation in recent years, groundwater isn't being replaced fast enough to dilute the salt. Some recent test wells in Franklin Parish have been too salty for irrigation, Branch said.

In northern Louisiana, this problem is compounded by competition for groundwater from paper mills and growing municipalities, as well as rice farms in southern Arkansas. Branch said the Sparta Aquifer, which covers 16 northern parishes, has been "over-drafted."

Surface water, which is more renewable, can be used if a stream, bayou or lake is close to the farm. In the Shreveport area, more farmers are using surface water thanks to the Natural Resources Conservation Service's Red Bayou project, which uses water from the Red River to fill smaller bayous that farmers can pump from. But in other parts of the state, a well is often the only option.

Washing away investment

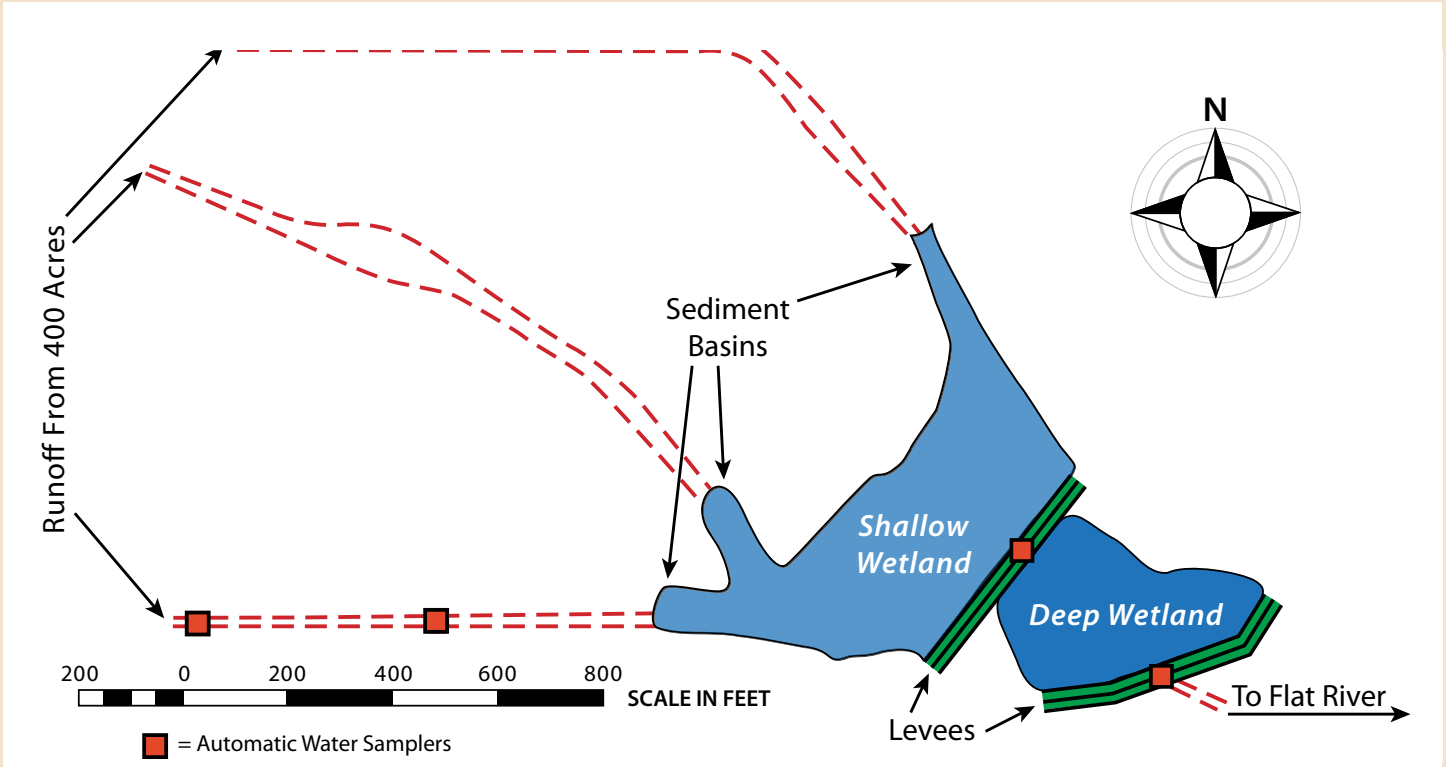
No matter where the water comes from, how it is used can pose other problems. Water does crops little good if it doesn't stay in the field.

A popular way to irrigate is pumping water into a field to flood furrows. While common in Louisiana, furrow irrigation is inefficient, Davis said. It can be difficult to know when to turn the pump off, which allows water to run off, and some of the water standing in furrows is lost to evaporation.

Drip irrigation uses small pipes placed next to rows so water drips toward crop roots. It wastes less water, but involves a higher cost.

However, farmers contending with salty groundwater can't use drip irrigation because salt precipitate will clog the system. Rust can do the same thing in areas where the soil is rich in iron.

Overhead sprinkler irrigation systems, which Davis estimates are used by 15 to 20 percent of Louisiana farmers, must operate at the correct pressure to be efficient,



In the constructed wetland at the Red River Station in Bossier City, runoff enters the system by way of three grassed drainage ditches (red dashes). Runoff then enters a shallow wetland with an average depth of 18 inches. The deep wetland is up to 9 feet deep and provides conditions for further improvement in water quality. From culverts runoff then flows to the Flat River.

which makes maintenance important. Older systems can be retrofitted with new sprinkler packages to conserve water and energy, she said.

"Your method depends on your crop and soil," Davis said. "There's not one solution."

Compounding the problem is farmers' prevailing logic that irrigation is always good, even if it isn't really necessary. Irrigation is one variable amid many that farmers can control — and the mentality tends to be that more irrigation always equals more profit.

That may not be true. Naveen Adusumilli, an economist at the AgCenter Red River Research Station in Bossier City, said one irrigation event can cost as much as $4 per acre.

Irrigating a 200-acre farm one time would cost about $800 — and if the soil is still moist from a previous irrigation, that $800 probably could have been saved. Water cannot soak into wet soil, so it will run off.

This past summer at the Red River Research Station, Davis found that cotton growing on the station did not need irrigating because there was enough rainfall. Most farmers in the region irrigated anyway, but achieved similar yields to the cotton Davis studied.

"A lot of farmers irrigate using the calendar," Davis said. "They need to make a more informed decision and know what the soil moisture and weather actually is."

That is especially true if farmers apply soil amendments like poultry litter, which hold water, Davis said.

Davis and Adusumilli are encouraging farmers to use sensors to keep an eye on soil moisture. Irrigation can be delayed if the soil is very moist. If conditions are dry, irrigation may be required sooner than usual, and sensors can help farmers ensure their crops always have enough water.

Although there are no approved regulations governing their use, unmanned aerial systems, or drones, could also help farmers monitor irrigation and know when to turn the pump off, Leonard said. Flying a drone equipped with a camera would save the time it takes a farmer to drive around a field — and potentially get stuck in a muddy turn row — to see if water has completely traveled down the field.

Environmental impact

The problems with using too much water extend beyond economics.

Flowing water causes erosion, which is bad for farmers because it removes fertile topsoil. Excessive irrigation can add additional salt to the field, which harms soil health. Another issue is that eroded soil can fill drainage ditches, Leonard said.

Runoff also takes fertilizer inputs like nitrogen and phosphorus away from crop fields and into waterways, where low-oxygen conditions known as hypoxia can result.

"You can lose more than 10 percent of applied nitrogen through surface runoff," said AgCenter agronomist Syam Dodla.

Nitrogen also leaches easily into deep layers of soil, Dodla said, which lowers the soil quality. If the soil becomes less fertile, farmers must apply even more fertilizer and perhaps irrigate more, which harms the soil even more in the long-term.

Soil erosion caused by furrow irrigation, which Dodla said is sometimes only 45 percent efficient, adds to the problem. Dodla is trying to find out if farmers can skip rows when they irrigate, which would reduce erosion, nutrient runoff and the amount of water they use, and still reach proper soil moisture levels.

Different soil types — and there are many in Louisiana — absorb water at different rates, so rows may need to be closer or farther apart to achieve sufficient moisture in skip-row irrigation.

Applying soil amendments such as compost, animal waste or charcoal made from plant matter can also help hold moisture and reduce evaporation, said AgCenter water quality expert Changyoon Jeong.

While it is best to reduce runoff, another strategy is to make good use of it. The water that runs to the ends of rows can be reused in a practice called tailwater recycling.

"These are storage systems for excess water from field runoff that can be used later," Jeong said. "It can be useful for crop growth when it's very dry."

Leftover chemicals must be removed from the recycled water before it is used on crops. One way to do that is with a constructed wetland, where nutrient particles collect and decompose.

There are many types of constructed wetlands, Jeong said, that can be used as part of tailwater recycling or simply to clean up water before it flows into waterways.

Jeong has been studying the efficiency of the constructed wetland at the Red River Research Station, which consists of two ponds — a shallow pond that contains a diverse mix of plants to trap and uptake nutrients, and a second, deeper pond that provides conditions for further improvements in water quality. Through culverts the water drains out to the Flat River.

Farmers can clean water as it runs off sloped fields by planting sections of grass called filter strips at the edges of fields and along waterways. The grass catches excess nutrients and sediments so they deposit in the strip instead of flowing out with the water, Jeong said. Depending on the angle of the slope of the land, the width of filter strips can range from 20 to 60 feet.

While these kinds of practices can save farmers money, they also cost money to implement. Still, they could be critical to the future of agriculture.

"Until recently, there's been a misconception that Louisiana has plenty of water," Adusumilli said. "We don't. Groundwater is decreasing, and competition for use of it is increasing. Once it's gone, it may be gone forever."

Future for irrigation

The water situation in Louisiana is better than in some places. Western states are dealing with one of the worst droughts in recent history. Arizona, for example, has introduced usage fees to conserve dwindling water resources.

In Louisiana, water itself is essentially free — farmers only have to pay for the energy and infrastructure used in irrigation.

Many Louisiana farmers have been working toward greater efficiency for years. Some work with the NRCS and the state Department of Agriculture and Forestry's Office of Soil and Water Conservation to develop conservation plans. The AgCenter's Master Farmer program, which includes workshops and field days, helps producers implement research-based management practices.

These programs give farmers the tools they need to address environmental concerns voluntarily, which is preferable to additional regulations that may limit crop production in the future.

"If you're pushing your yields higher and you want to maintain those levels, you have to have an irrigation strategy," Leonard said. "We have to meet the food needs of a growing world population. But at the same time, we know we have to be more efficient in our use of water resources here at home."

Olivia McClure is a graduate assistant in LSU AgCenter Communications.

Scientists Continue Quest for Cold-tolerant Salvinia Weevil

Tobie Blanchard

Researcher Seth Johnson grows giant salvinia in a greenhouse on the LSU campus to help in his study of the salvinia weevil, which feeds on and kills the plant. Giant salvinia, which is an invasive plant, was introduced in Louisiana waterways more than a decade ago. Photo by Tobie Blanchard

Salvinia weevil. Photo courtesy of The Advocate

The salvinia weevil is the tiny black speck on the salvinia leaf. Photo by Johnny Morgan

The salvinia weevil has been successful at helping to control the aquatic weed giant salvinia in waterways across the southern portion of the state for nearly seven years. The LSU AgCenter has been working with the Louisiana Department of Wildlife and Fisheries to release weevils into lakes and streams clogged with salvinia.

But researchers aren't seeing the same results in north Louisiana. Cold winters have killed off the weevils working to remove the salvinia from waterways in that area.

"We did a huge release in north Louisiana in 2009, but the weevils were wiped out in 2010 by cold weather," said Seth Johnson, a retired LSU AgCenter entomologist, who will continue working on the salvinia weevil project.

Johnson collaborates with LSU AgCenter weed scientist Dearl Sanders and entomologist Steve Micinski to rid Louisiana of salvinia. The salvinia weevils can do it, if they can survive.

Sanders said every other year temperatures have been cold enough to kill the weevils in waterways such as Lake Bisteneau in northwest Louisiana.

"Of the 22 main lakes in north Louisiana, 19 of them have a bad salvinia problem," Sanders said.

The Department of Wildlife and Fisheries has given AgCenter researchers a three-year grant for $450,000 to find or create a weevil that can survive a cold winter in the northern part of the state.

"The goal is to find one that already exists somewhere in the world, or try to develop one by taking a population and selecting out for cold tolerance," Sanders said.

The weevils used in Louisiana originate from South America. Johnson said he has put in a request for a permit to import weevils from Australia to see if they will have the cold tolerance needed to survive.

"The weevils have been in Australia for 30 years," Johnson said. "Winters in Southern Australia are comparable to the winters we experience in north Louisiana."

Johnson hopes to have Australian weevils by March. Once here, he will test their cold tolerance compared to the weevils that have survived north Louisiana temperatures.

Sanders said in 2010 most weevils died at temperatures below 14 degrees. That same year, weevils survived cold temperatures in Toledo Bend where temperatures were only a few degrees higher.

"We're not looking for a huge difference, just a degree or two," Sanders said.

Johnson will expose the weevils to different low temperatures for different lengths of time and determine the lethal temperature and lethal time for the different populations.

The researchers are also looking at bringing in another weevil population from South America. Johnson said a new LSU AgCenter assistant professor, Rodrigo Diaz, will conduct research on invasive species and will assist with the salvinia project.

"We will scour the world to find a cold-tolerant weevil," Sanders said.

Micinski, who is located at the AgCenter Red River Research Station in Bossier City, is conducting experiments on the current weevil population in north Louisiana. He wants to see if mulch placed over the salvinia will raise the temperature of the weevils and help them survive the winter.

"The leaves fall off of the existing cypress trees, and if you pile those leaves over the salvinia, it's going to insulate it," Sanders said.

Sanders said a major outbreak of giant salvinia in southwest Louisiana is now under control with help from the weevil. The researchers have been releasing weevils in the area for two years. A recent survey showed good weevil survival with increases in weevil numbers and a reduction in the amount of salvinia there.

"We're doing well with the weevil we've got in south Louisiana, and we are optimistic that we will get a cold-tolerant one for north Louisiana," Sanders said.

Tobie Blanchard is an associate specialist with LSU AgCenter Communications and communication coordinator for the College of Agriculture.

Research Moves Closer to Improving Cancer Drug

Rick Bogren

As he moved from studying plants for their medicinal components to examining those components for their individual health-related attributes to producing oral drugs for fighting cancers, Zhijun Liu has expanded the boundaries of what started as forestry research.

A researcher in the LSU AgCenter School of Renewable Natural Resources, Liu's Medicinal Plants Laboratory is now developing methods of increasing the solubility of various drugs and agrichemicals using natural solubilizers, which were discovered in medicinal plants.

One focus area is to develop a method for orally delivering the compound paclitaxel, which is formulated by the use of Cremophor and ethanol into the drug known as Taxol. This is a staple chemotherapeutic drug for treating ovarian and breast cancers in humans.

Paclitaxel is a potent and natural drug derived from Pacific yew trees. Its therapeutic potential has been held back by challenges that start at the central issue of poor solubility, Liu said.

The drug Taxol is currently administered intravenously, which requires patients to visit doctors' offices for treatment, he said. Giving it to patients orally can minimize or do away such requirements.

"An IV goes directly into the blood" to deliver the drug, he said. "If we can find a way to effectively administer paclitaxel orally, the benefits include fewer physician visits, reduced anxiety, reduced cost and improved convenience for the patient.

"Taxol is, if not the most potent anti-cancer compound, then one of the most potent anti-cancer compounds," Liu said.

A key problem with oral administration of Taxol is a protein called p-glycoprotein – also known as an efflux pump – that "pumps out" Taxol and blocks its absorption into the body.

"Our research goals are to overcome solubility issues and overcome the efflux pump enzyme," Liu said.

Liu and colleague Peiying Yang, an assistant professor and oncology researcher at the University of Texas MD Anderson Cancer Center, are working on a two-year grant from the National Institutes of Health to study a technology they developed for converting Taxol for oral administration.

Using cell culture, Liu's research has led to a four-fold improvement in moving paclitaxel into cells. At MD Anderson, researchers have shown the process has reduced tumors by 30 percent in tumor-bearing mice.

"That's an encouragement," Liu said. "But it's still not where we want to go."

In cell culture, Liu wants to increase blood levels of paclitaxel from four times to 10 times. And in the mouse study, the researchers want a greater improvement in tumor reduction. "We want at least an 80 percent tumor reduction," he said.

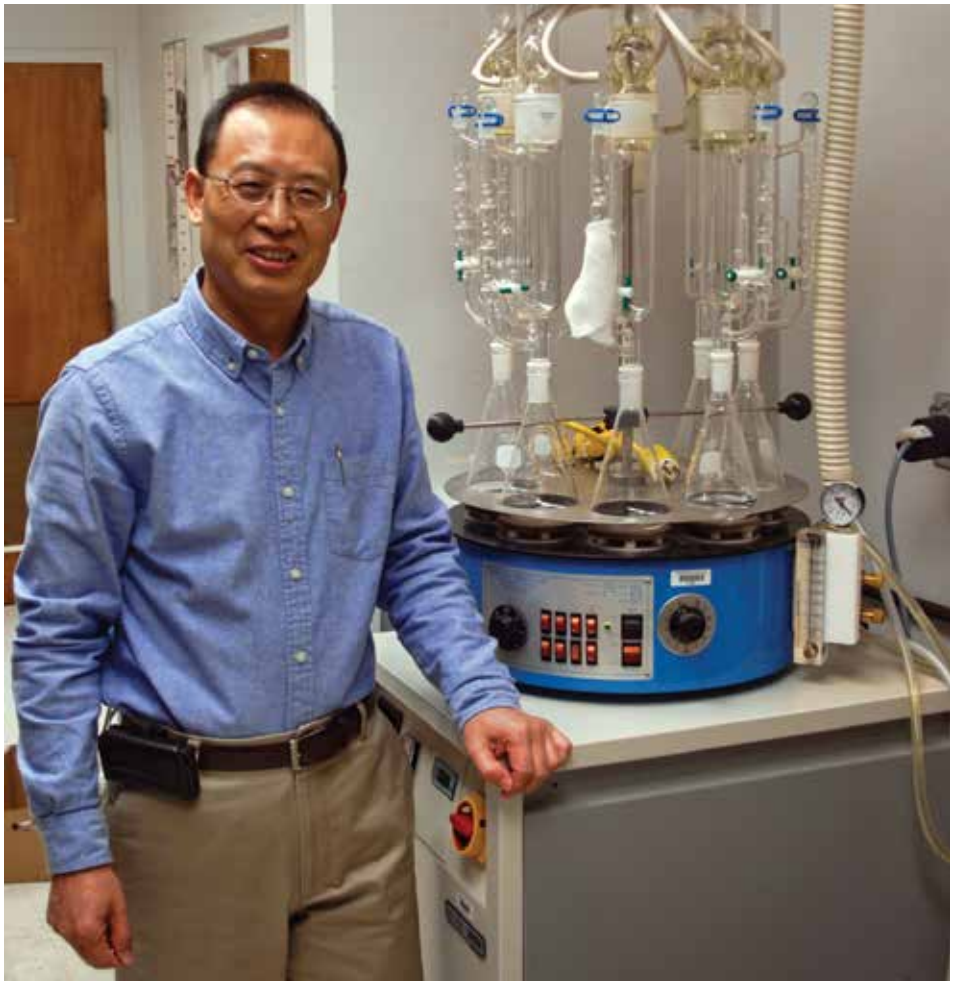
"We have seen promise, but we are not there yet," Liu said. "We know what to do next."

With the NIH grant funding ending this spring, Liu and his colleagues are looking for more funding from a new NIH proposal and from private sources.

"We hope to reach our goal of completing pre-clinical studies to pave the way to human clinical studies," he said. "We are very encouraged by promising leads."

The success of the paclitaxel project could support expansion to other promising chemotherapy regimens that perform poorly in the clinical stages or are prevented from entering the human studies because of unsolved poor solubility, he said.

Rick Bogren is a professor with LSU AgCenter Communications.



Zhijun Liu, professor in the School of Renewable Natural Resources, uses a soxhlet extractor for the preparation of plant extracts. Photo by Rick Bogren

A Growing Baton Rouge Means More Termites

Gregg Henderson and Bal Gautam

The population of East Baton Rouge Parish has jumped from 412,852 in 2000 to 445,227 in 2013, and downtown is booming with new construction and more entertainment events. But as the city grows, so do some problems; a hidden one is the growing population of the invasive subterranean termite, the Formosan subterranean termite, or *Coptotermes formosanus*. Of the six species of subterranean termites considered economically important in the U.S., Formosan termites are the most destructive, especially in Louisiana. In New Orleans alone this termite causes more than $300 million in losses every year by feeding on houses, other wooden structures, electric and telephone poles and underground cables, railroad ties, and live trees. In addition, the termites are suspected of compromising the floodwalls and levees in New Orleans with devastating results after Hurricane Katrina in 2005.

With the help of Baton Rouge residents, LSU AgCenter researchers have been monitoring the annual flight numbers of this species using light traps (Figure 1). Starting in 2009, about 15 light traps (Figure 2) were placed on government property, research stations and residential homes around Baton Rouge, and daily catches of alates (winged termites) were recorded through May and June.

The average number of alates caught per trap indicates that the Formosan subterranean termite populations are increasing at an alarming rate in the Baton Rouge area (Figure 3). In 2009, there were only 32 alates caught per trap in the whole season, whereas in 2014, the number of alates caught per trap increased to 596, an almost 20-fold increase. More Formosan subterranean termites were caught in residential areas than at research stations, possibly because of more structures and human-related activities, such as movement of infested materials like mulch, landscaping timbers, large planters and other wood-based materials. Peak flight dates were noticed as early as May 3, 2012, to as late as May 22, 2014 (Figure 4).

The AgCenter researchers wanted to develop a diagnostic tool to better determine when the first peak flight of the year would occur. Investigating what triggers *C. formosanus* swarming in Louisiana may help to predict the potential flight date with reasonable accuracy, which in turn can caution homeowners and the termite control industry to take necessary steps before major swarming.

There is a general belief that subterranean termite swarming is triggered when a certain accumulative temperature has been reached at the initiation of the flight season. This temperature is measured in terms of heat units. For example, one heat unit is 1 degree Celsius above a specified "base" temperature, a temperature at which foraging of subterranean termites slows to a crawl. For *C. formosanus*, this base temperature is considered to be 13 degrees C (55 degrees Fahrenheit). At this temperature most termites will stay in the ground, unless they already have invaded your cozy warm home. The heat unit accumulation was calculated with a start date of July 1, the date when the current season's two-month flight ends, to the date when the first peak flight was recorded for each of the six years of data collection. When Formosan termites decide to exit en masse, almost every light post in the city will have some termites flying around it. The swarming pattern shows multiple major flights during its swarming season and many more smaller localized (single colony) flights. Since termites fly in the early evening and are attracted to lights, it is recommended that homeowners turn off unnecessary outside lighting during this time.

Formosan subterranean termite *Coptotermes formosanus* alates, also known as swarmers, captured on a sticky trap used to monitor populations. Photo by Scott Bauer Photo, USDA Agricultural Research Service, Bugwood.org

Figure 1. Black light trap. Photo by John Wozniak

Based on six years' survey data, a minimum of 2,203 heat units are required before the first peak flight of the season in Baton Rouge (Table 1). The first peak flight always occurred in May, but the dates varied. The second peak flights occurred nine days, on average, after the first peak flights (range six to 12 days). All of them happened in May, except in 2013, when one occurred on June 2. On average, there were 110 extra heat units that accumulated after the first peak flights and before the second peak flight. By comparison, the first swarm of the native subterranean termites in Texas occurs after only 602 heat units accumulate. Native subterranean termites are a more temperate region insect, whereas Formosan termites are more subtropical in nature.

Statistical analysis of six years' survey data showed a significant correlation between the average number of alates and the year. Possibly even more important is the fact that the number of alates is increasing every year in Baton Rouge, an indication that the *C. formosanus* population is growing and expanding its destructive nature. It is important to note that a light to moderate rainfall event occurred one to seven days before the peak swarm dates in all years studied. In conclusion, we suggest minimum heat units of 2,203 in association with precipitation at the beginning of the swarm season will provide the estimates of *C. formosanus* peak swarming events.

Gregg Henderson is a researcher and professor, and Bal Gautam is a research associate, both in the Department of Entomology.

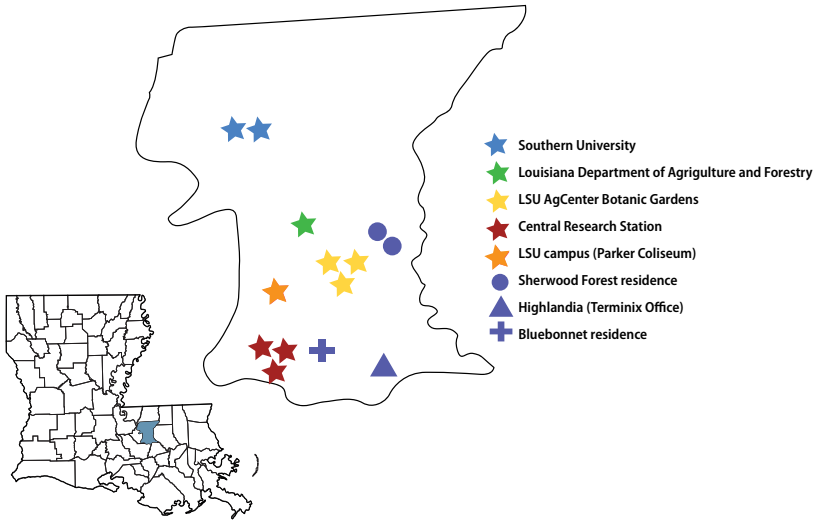


Figure 2. East Baton Rouge parish map showing trap locations.

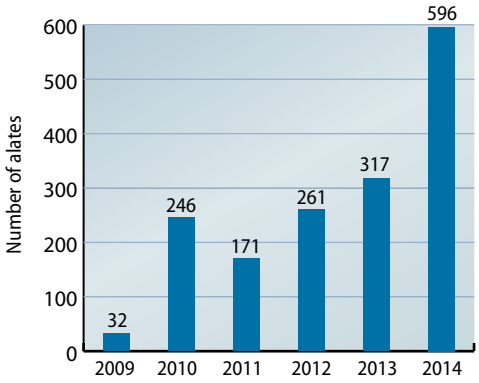


Figure 3. Average number of *C. formosanus* alates caught per trap in a season in Baton Rouge.

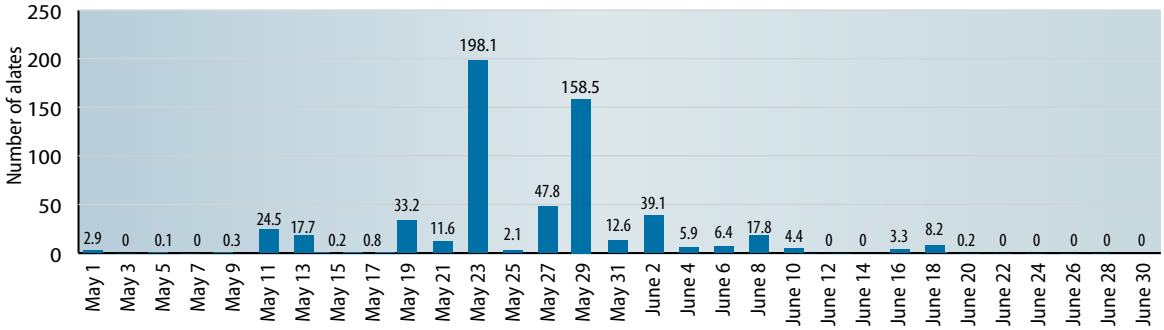


Figure 4. Average daily *C. formosanus* alates caught per trap in 2014 in Baton Rouge.

Table 1. Heat unit accumulation, precipitation and the peak *C. formosanus* swarming from 2009-2014 in Baton Rouge.

Year	Minimum threshold for first peak swarm (2203 heat units) date	First peak swarm date	Total accumulated heat units	Days from precipitation to first peak swarm date	Average number of alates/trap	Total number of alates in all traps
2009	April 24	May 16	2,475	1	32	292
2010	May 17	May 17	2,203	2	246	3,440
2011	April 23	May 10	2,368	7	171	2,400
2012	April 10	May 3	2,402	1	261	3,648
2013	May 22	May 22	2,208	1	317	4,440
2014	May 12	May 22	2,313	7	596	8,345

Managing Sugarcane Beetles in Louisiana Sweet Potatoes

Tara P. Smith, Julien M. Beuzelin, Theresa F. Arnold and Dana M. May

Sweet potatoes are an important agricultural commodity in Louisiana, with a total production value exceeding $85 million in 2013. Soil insect pests, which reduce root yield and quality, are often cited as one of the most limiting factors affecting production. The sugarcane beetle (Figure 1) has emerged as the primary target of soil insect management programs for sweet potato producers in Louisiana during the past 10 years. Unlike most soil insects feeding on sweet potatoes, only adult sugarcane beetles cause crop damage. These adult beetles feed on sweet potatoes late during the growing season by creating gouges on the surface of the roots (Figure 2). Because sweet potatoes are an aesthetic crop, minimal damage negatively affects marketability of the roots.

Limited options are available to manage sugarcane beetles in sweet potatoes. The insecticides Belay 2.13SC (clothianidin) and Brigade 2EC (bifenthrin) are presently labeled for soil applications preplant or approximately three weeks after planting. Belay can control the sugarcane beetle and is currently recommended. Root injury has been reduced in field plots treated with these and other labeled insecticides; however, results have varied among locations and production years. Thus, there is a need to better document activity of clothianidin and other insecticides of interest to refine sugarcane beetle management recommendations.

A study conducted in 2013 at the LSU AgCenter Sweet Potato Research Station in Chase examined the efficacy of selected insecticide treatments against controlled sugarcane beetle infestations in sweet potatoes. All insecticides evaluated in the study are labeled for use on sweet potatoes in Louisiana and were applied to experimental plots prior to planting or 20 days after planting. Sweet potato transplants were planted at a rate of one plant per foot of row, consistent with commercial practices. Insecticide treatments were applied to experimental plots with a carbon-dioxide-charged spraying system calibrated to deliver 20 gallons per acre.

Polyvinylchloride pipes 12 inches in diameter and 15 inches tall were placed 3 inches into the soil around individual sweet potato plants in each plot (Figures 3 and 4). Adult sugarcane beetles were collected using black lights during September and were maintained on sweet potato roots until needed for infestations. Four sugarcane beetle adults were individually placed on each plant surrounded by a pipe in each plot. Following this mechanical infestation, pipes were covered with a mesh screen cap secured by a rubber band.

Feeding injury to the sweet potato roots, number of beetles recovered and beetle mortality were evaluated 10 days after insect release began by harvesting whole plant samples. Each sweet potato plant and surrounding soil contained within the pipe were placed into a plastic tub (Figure 5). All of the soil was sifted (Figure 6) to recover beetles. Each sweet potato root (Figure 7) was also examined for the presence of feeding injury.

The majority of sugarcane beetles – 79-90 percent – were recovered (Figure 8). Injury ranged from 6 percent to 17 percent of sweet potato roots with sugarcane beetle feeding (Figure 9). However, differences in

Figure 1. Adult sugarcane beetle. Photo by Jerry Lenhard

injury were not detected for any insecticide treatment evaluated in this study. Beetle mortality ranged from 2 percent to 34 percent, with the Lorsban 4E treatment resulting in significantly higher beetle mortality (Figure 10). Belay applications were not associated with increased mortality.

Occurrence of and damage incurred from sugarcane beetles in sweet potatoes are highly erratic. The insecticides evaluated in the study have been shown to significantly reduce sugarcane beetle damage in naturally infested small-plot field studies. In field trials conducted from 2011 to 2014, sugarcane beetle damage ranged from zero to 40 percent in 2011, 12-57 percent in 2012, zero to 5 percent in 2013 and zero to 12 percent in 2014.

The current study design allowed researchers to evaluate sugarcane beetle damage in sweet potatoes in a contained system. Insufficient numbers of sugarcane beetles were collected during 2014, which prevented successful replication of the study. LSU AgCenter scientists plan to use the current design to evaluate insecticide management options for the sugarcane beetle in sweet potatoes at the Sweet Potato Research Station and the Dean Lee Research and Extension Center in subsequent years. Studies evaluating cropping systems adjacent to sweet potatoes and alternative monitoring techniques for the sugarcane beetle are also in progress. Results from these studies will be integrated into a multidisciplinary pest management program for the sugarcane beetle in sweet potatoes.

Figure 2. Sweet potatoes with sugarcane beetle injury. Photo by Tara P. Smith

Acknowledgements: This project was supported by the Specialty Crop Block Grant Program at the U.S. Department of Agriculture through grant agreement 12-25-B-1464, NIFA Hatch Funds and the Louisiana Sweet Potato Commission.

Tara P. Smith is associate professor and research coordinator at the Sweet Potato Research Station, Chase, La.; she is also the director for the Northeast Region. Julien M. Beuzelin is an assistant professor at the Dean Lee Research and Extension Center, Alexandria, La. Theresa F. Arnold is research associate and graduate student at the Sweet Potato Station, and Dana M. May is research associate at Dean Lee.

Figure 3. PVC pipe used to contain beetles. Photo by Tara P. Smith

Figure 4. Photo of the test area with PVC pipes. Photo by Tara P. Smith

Figure 5. Plastic tub with sweet potato plant and surrounding soil. Photo by Tara P. Smith

Figure 6. Device used to sift soil to recover beetles. Photo by Tara P. Smith

Figure 7. Sweet potato root harvested from PVC enclosure with sugarcane beetle feeding injury. Photo by Tara P. Smith

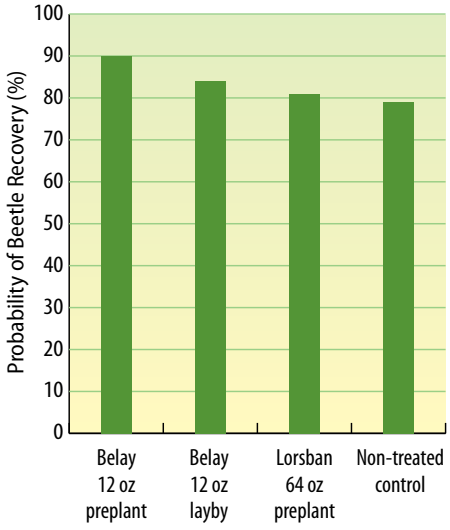


Figure 8.

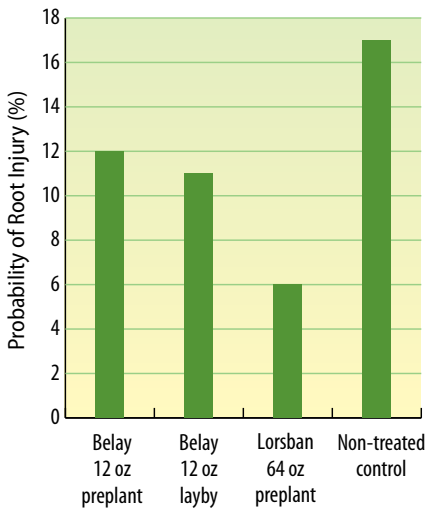


Figure 9.

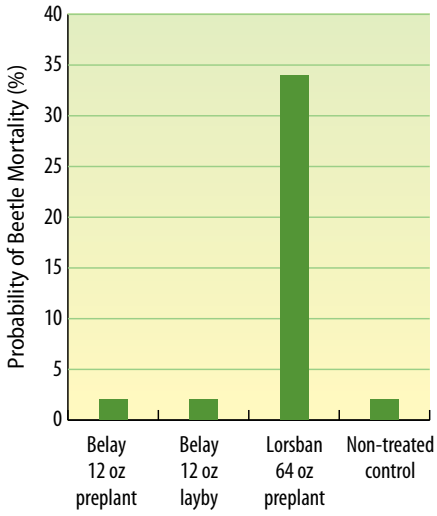


Figure 10.

Racial and Ethnic Diversity in the Gulf of Mexico Region: 2000-2017

Mark J. Schafer, Tasia Mehzabin and Huizhen Niu

The Gulf of Mexico has long been one of the more diverse regions within the United States, and it is projected to become even more diverse in the coming decades. Before 1960, primarily two racial groups, whites and blacks, characterized the region's diversity. Since 1960, the region has experienced dramatic increases in ethnic diversity with Latino migration into Texas and Florida. The region's smaller Native American populations are decreasing while Asian populations are increasing. But Latino migration is projected to continue to drive diversification in the region in the coming decades.

Mapping Racial and Ethnic Diversity Index

LSU AgCenter researchers examined county-level trends and projections in racial and ethnic diversity in the Gulf of Mexico region from 2000 to 2017, using data from the U.S. Census Bureau. Both the 2000 and 2010 censuses asked about Hispanic ethnic identity in a separate question from racial identities in which the categories were white, black, American Indian, Asian, Native Hawaiian and other Pacific Islander, some other race, and two or more races. In this study the researchers combined all who identified as Hispanic into one separate group.

There are two components of diversity in a given location: (1) the number of different groups represented and (2) the distribution of people across groups. Conceptually, more diverse places have both more groups and a more even distribution of people across groups. Several diversity measures have been developed that consider both number of groups and evenness of distribution. The LSU AgCenter study uses the ESRI Diversity Index, which has a range from zero (no diversity) to 100 (complete diversity). Zero means everyone belongs to the same race or ethnic group; the index approaches 100 when individuals are evenly split among two or more groups.

The diversity index translates into the probability that two randomly selected people belong to different racial or ethnic groups. A diversity index of 33, therefore, equals a 33 percent chance (or 1 in 3) that any two people are different races or ethnicities; an index of 50 means a 50 percent chance (1 in 2) that any two people are different; 67 means a 67 percent chance (2 in 3), and so forth. Counties with a diversity index of 33 or lower were labeled as low diversity; counties with an index between 33 and 50 were labeled average diversity; those between 50 and 66 were labeled high diversity; and those over 66 were very high diversity. Importantly, the diversity index does not privilege any one group. A county with 6,000 white residents and 4,000 black residents would have the same diversity index, 48, as a county with 6,000 black residents and 4,000 white residents, which would also be 48.

The maps in Figures 1, 2 and 4 show county-level diversity for the 134 counties in the Gulf of Mexico region for three separate years – 2000, 2012 and 2017. In 2000, the mean county level diversity index for all 134 counties was 36.5, and there were 50 low diversity counties; 61 average-diversity counties; 23 high-diversity counties; and no very high-diversity counties. The least diverse counties in 2000 were Citrus County, Florida, just north of Tampa, and Livingston Parish, Louisiana, east of Baton Rouge, with indexes of 10 and 11, respectively. In these counties there was only a one in 10 chance that two randomly chosen people would be different races or ethnicities. The most diverse counties were two Houston, Texas, area counties, Fort Bend County and Harris County, both with diversity scores of 62 (Figure 1).

By 2012, the number of low-diversity counties had been reduced to 18, and the number of average-diversity counties declined to 47. By contrast, the number of high-diversity counties increased to 53, and an additional 15 counties had diversity scores over 66, placing them in the very high-diversity category (Figure 2).

In 2012, the least diverse county was Cameron Parish, Louisiana, with a diversity index of 14.2, while the two most diverse counties were Hendry in Florida and Harris in Texas, with scores of 81.4 and 81.6, respectively. In these counties there was an 8 in 10 chance that two randomly selected people were different races or ethnicities. In 2012, Hendry County, Florida, had a total population of 39,505, with 19,517 Latinos, 13,583 whites, 5,170 blacks, and 1,235 others (Figure 3).

The Gulf Coast region is expected to become even more diverse over the next several years. Long-term projections are less precise, but reliable estimates can be made for 2017. By 2017, only 11 counties are predicted to still be low-diversity, and the number of average-diversity counties will decline to 45, while 59 counties will fall in the high-diversity category, and 20 will be very high-diversity. All of the very high-diversity counties will have relatively equitable distributions of non-Hispanic white and black, as well as Latino residents, perhaps also with smaller proportions of Asians and Native Americans (Figure 4).

Racial and Ethnic Diversification in the Gulf of Mexico Region

The mean county-level diversity index in 2000 was 36.5, or in the average diversity range (Table 1). By 2012, the mean county diversity index increased to 48.8, and it is expected to continue to increase to 51.3 by 2017. The last column indicates that the region's county-level diversity index will have increased by more than 50 percent by 2017.

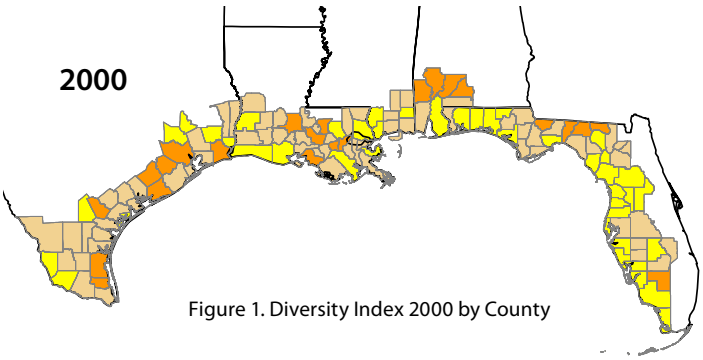


Figure 1. Diversity Index 2000 by County

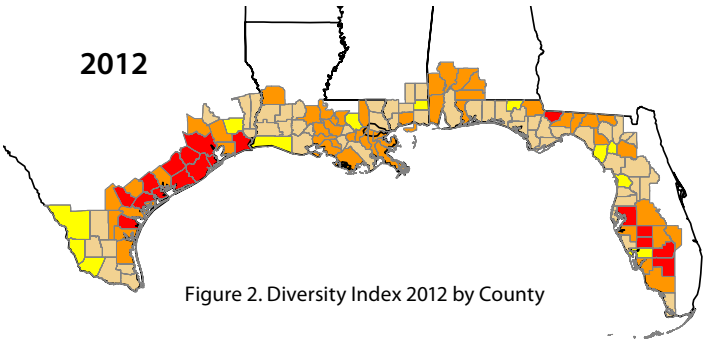


Figure 2. Diversity Index 2012 by County

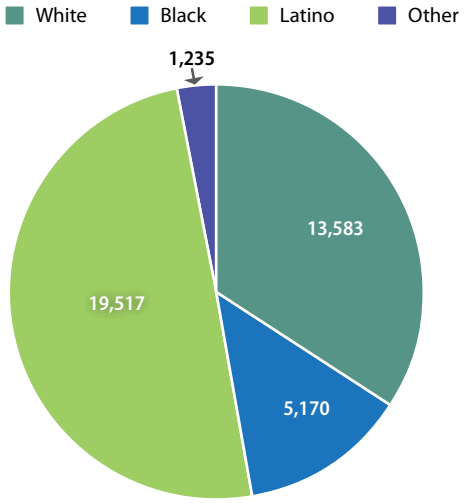


Figure 3. Hendry County, Florida, 2012 racial and ethnic diversity.

More than two-thirds of the 134 Gulf counties will experience 30 percent or more increases in diversity from 2000 to 2017. In Live Oak County, Texas, for example, the chances that two randomly selected people were different races will have increased from about 24 in 2000 to 60 in 2012. If you lived there in 2000, there would be only a one out of four chance that another random person was a different race or ethnicity from you. But if you move there by 2017, the chances will increase to three out of five that another person will be different from you. By contrast, eight Texas counties will experience diversity declines from 2000 to 2017. This is due to increasing white Latino populations. Six of these counties will be more than 90 percent Latino, and 90 percent white, by 2017.

The breakdown by states indicated that Alabama's seven coastal counties exhibited a comparatively higher level of diversity than other states in 2000, but they have not seen as much change in diversity as the other states. Florida's coastal counties are diversifying the fastest, with a projected 73 percent increase in diversity from 2000 to 2017, followed by Texas coastal counties, which are expected to see a 50 percent increase in county-level diversity. The coastal counties of Mississippi and Louisiana should each see about a 35 percent increase in diversity, suggesting that the coastal portions of these two states are also diversifying, just not quite as rapidly as those of Florida and Texas.

The breakdown by urban and rural counties shows that urban counties are diversifying much more quickly than rural counties. Rural counties were more diverse than urban counties in 2000. Urban counties are now more diverse and are expected to continue to outpace rural counties over the next decade, but rural areas are still experiencing significant racial and ethnic diversification in the region.

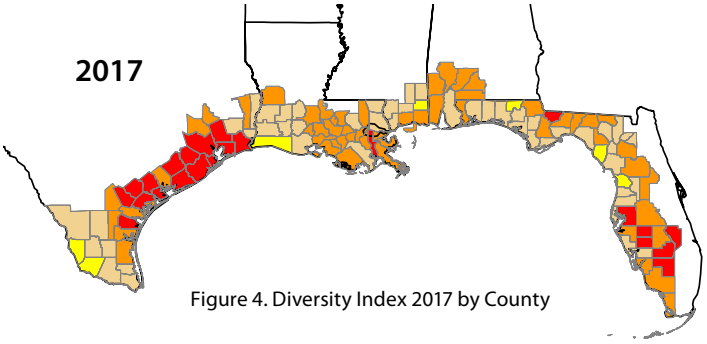


Figure 4. Diversity Index 2017 by County

Conclusion

The Gulf of Mexico region, along with other Southern states, has long been one of the most racially diverse regions within the United States. Moreover, the region's current diversification trends are directly related to migration of Latinos into Florida, Texas and, increasingly, the central Gulf states. Although workers are more likely to work with someone of a different race or ethnicity and students are more likely to go to school with someone of a different race or ethnicity, the county-level analysis presented here cannot confirm or discount this assertion. People live, work and go to school in neighborhoods that are still more segregated than these county-level figures suggest.

Another drawback to this analysis lies in the fact that an increasing percentage of Americans assert multiple racial and ethnic identities. Multiracial identities, captured in census data since 2000, complicate studies of diversity. Here the researchers' decisions to group all Latinos into one group irrespective of race and combine those with multiracial identities along with all other races (Asian, Native American, Pacific Islander) resulted in lower diversity index scores than could have been obtained through a different treatment of those with combined ethnicity/racial and multiracial identities. These limitations are relatively minor, however, as the overall trends showing increasing county-level diversification enhance our understanding sociodemographic change in the Gulf of Mexico Region.

Diversification presents both challenges and opportunities for individuals, communities, industries and governments. Individuals with diverse identities affect broader social, economic and environmental processes. Diversification expands the linkages between the Gulf of Mexico region and an increasingly globalized and interdependent world.

Mark J. Schafer is an associate professor in the Department of Agricultural Economics and Agribusiness; Tasia Mehzabin and Huizhen Niu are graduate students in that department.

Table 1. Diversity Index Change by Region, State and Urban/Rural Counties

	2000	2012	2017	2000-2017 Percent change
Gulf Region	36.5	48.8	51.3	52.0%
Texas (37)	39.1	53.9	55.9	50.0%
Louisiana (33)	39.8	47.9	50.1	34.6%
Mississippi (8)	31.7	38.3	41.1	35.2%
Alabama (7)	46.0	50.2	51.5	16.0%
Florida (49)	31.6	47.0	50.2	73.0%
Urban (71)	34.7	49.3	52.3	66.5%
Rural (63)	38.3	48.2	50.2	35.6%

Key to Diversity index

- Diversity index < 30 low diversity
- Diversity index between 31 - 50 average diversity
- Diversity index between 51 - 65 high diversity
- Diversity index > 65 very high diversity

Sabliov Looks at Nanotechnology to Create Healthier Foods

Liz Lebrón

While many of her colleagues work to discover the next big thing, Cristina Sabliov, an LSU AgCenter researcher and professor in the Department of Biological and Agricultural Engineering, likes to think in nano terms. Sabliov specializes in creating nanodelivery systems for bioactive substances that can improve people's health.

Sabliov and her colleagues get their inspiration from industries not immediately associated with food, such as medicine – industries that pioneered the use of nanotechnology through high-cost research and development projects. Now that nanotechnology is more commonplace, the food industry is taking advantage of its lower cost and wider availability to create pathways for improved consumer health.

The medical field has successfully used nanodelivery systems in the treatment of cancer, and Sabliov and her team hope similar conveyance mechanisms will enable them to improve vitamin uptake and bio-viability.

"We can actually target food to a specific segment of the population," Sabliov said. "Maybe if you are predisposed to cancer or cardiovascular disease, you will someday consume food that is designed for you specifically."

Supported by a grant from the U.S. Department of Agriculture's National Institute of Food and Agriculture, Sabliov and her team design nanoparticles that can be loaded with vitamins, antioxidants and other healthy bioactives. The particles, which measure just one hundred nanometers in size, provide improved stability of the bioactive material they carry. Improved stability leads to greater efficiency in delivering the compound and, in turn, greater benefit for the recipient. Moreover, scientists can engineer the particles with time-release technology to match their specific delivery needs.

Sabliov has been working on nanodelivery systems for natural food colorants that can replace artificial dyes in processed foods. They have had success with beta carotene, the orange color in carrots, which companies could potentially use to give macaroni and cheese its distinct color.

"Particle design is a function of its intended application," Sabliov said. "This will dictate what kinds of materials you will choose to make your particles and how you design them."

Consumers already encounter natural nanodelivery systems in products like vitamin D-enhanced milk, but use of engineered nanostructures in food science was not always a welcomed advance.

"When I joined LSU 10 years ago, the field of nanotechnology was quite new, especially in food," Sabliov said. "There wasn't a lot of interest in applying nanotech to food because of all the unknowns."

Unknowns continue to exist today. Concerns over nanotechnology use in food include questioning what happens to the particles once they have delivered the bioactive agent to the body.

To ensure the nanostructures she develops are safe for consumption, Sabliov works with a team of scientists, including toxicologists, to better understand how the particles' absorption, distribution, metabolizing and excretion affect the body.

"There's a big push to engage consumers and find out what they know about nanotechnology and what they perceive as

Cristina Sabliov is a researcher and professor in the Department of Biological and Agricultural Engineering. Photo by John Wozniak

Supported by a grant from the U.S. Department of Agriculture's National Institute of Food and Agriculture, Sabliov and her team design nanoparticles that can be loaded with vitamins, antioxidants and other healthy bioactives.

dangerous," she said. "Companies are pursuing this type of research behind closed doors, and industry is listening to academia as well. I'm convinced we will see more of this technology in the market within 10 years."

One promising avenue for the widespread use of nanotechnology in consumer goods is colorant nanoparticles for food. Many natural colors are unstable and not water soluble, which led food manufacturers to use artificial food colorants in their products. Under pressure from consumers to use more natural ingredients, companies like Kraft Foods, which recently announced it will discontinue use of two types of yellow food dye in its cartoon character-shaped macaroni and cheese, are seeking natural substitutes.

In collaboration with Carlos Astete, assistant research professor, Sabliov has been working on nanodelivery systems for natural food colorants that can replace artificial dyes in processed foods. They have had success with beta carotene, the orange color in carrots, which companies could potentially use to give macaroni and cheese its distinct color.

"If you put beta carotene in a particle covered by a surfactant," Sabliov said, "then those particles are very nicely suspended in water and it will provide the uniform orange color you're looking for, even though the compound inside is hydrophobic. We made that."

Seeing her work on dinner tables across the country would be one of Sabliov's greatest professional achievements. In her lab, she works to ensure the successful adoption of nanotechnology by the food industry through rigorous and comprehensive research that addresses both consumer and industry concerns. She is currently designing food using patented particles she created.

Sabliov and her research team design nanoparticles that can be loaded with vitamins, antioxidants and other healthy bioactives, with potential use in the food industry to improve people's health. Photo by John Wozniak


Kurt Ristroph is an LSU undergraduate student studying with Prof. Sabliov. Photo by John Wozniak

"It would be very rewarding if at some point during my career I could see some of the products that we design available on the market," Sabliov said. "If we see the technology is well-regulated and embraced by both consumers and industry, that would make me feel like I made a significant contribution to the field."

Sabliov understands that the classroom is the gateway to the grocery store shelf, and she takes pride in training the future nanotechnology workforce. In addition to teaching a graduate class in nanotechnology, Sabliov also mentors young faculty both in the United States and abroad.

"This field will take off at some point," she said. "My contribution is training and mentoring scientists who can then train students at other universities around the world. If we want to see the field develop and safely applied to foods, then we have to collaborate."

Liz Lebrón is a communications graduate assistant with the LSU College of Engineering.

Nanocellulose

A Green Building Block for Next-Generation Sustainable Material and Energy

Qinglin Wu

During the past decade, nanocellulose has attracted considerable attention because of its unique physical and chemical properties and the growing interest in the bioconversion of renewable lignocellulosic biomass. Nanocellulose refers to cellulose broken down to the level of molecules and atoms. Substantial academic and industrial interests have been directed toward the potential applications of nanocellulose for various fields, including high performance composites, electronics, biomedical materials and energy.

What is nanocellulose?

Cellulose, one of the world's most abundant, natural and renewable biopolymer resources, is widely present in various forms of biomass, such as trees, plants, tunicates (marine invertebrate animals) and bacteria. In plant cell walls, approximately 36 individual cellulose molecule chains connect with each other through hydrogen bonding to form larger units known as elementary fibrils, which are packed into larger microfibrils. These microfibrils have disordered (amorphous) regions and highly ordered (crystalline) regions (Figure 1). In the crystalline regions, cellulose chains are closely packed together by a strong and highly intricate network, while the amorphous domains are regularly distributed along the microfibrils. When the amorphous regions of cellulose microfibrils are selectively hydrolyzed, these microfibrils break down into shorter crystalline parts, which are generally referred to as nanocellulose (Figure 1). Nanocellulose is further divided into short rod-shaped cellulose nanocrystals (CNCs) and long-fiber-shaped cellulose nanofibers (CNFs).

Nanocellulose has nanoscale dimensions and excellent mechanical properties. Its tensile strength is stronger than steel and many other materials (Figure 2). Because of an abundance of hydroxyl groups on its surface, nanocellulose can be modified to accomplish many functions, including polymer grafting, which could successfully facilitate the incorporation and dispersion of nanocellulose into different polymer matrices.

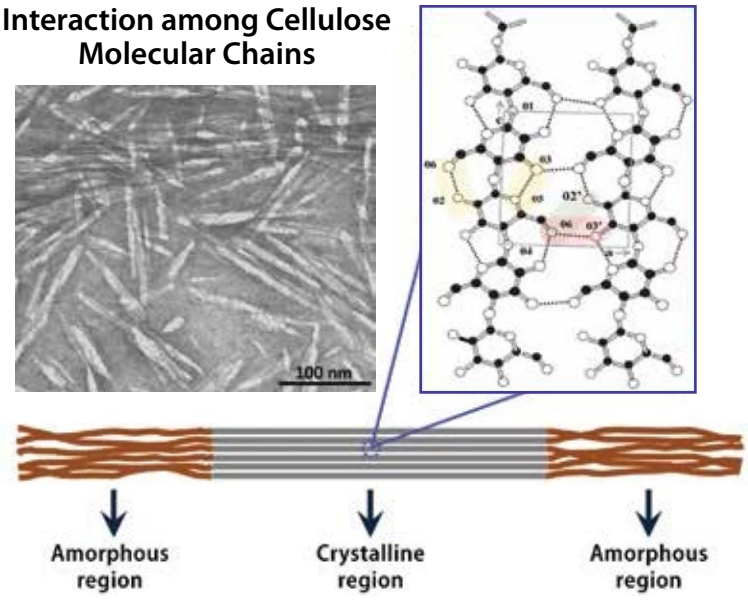


Figure 1. Semi-crystalline structure of cellulose and cellulose nanocrystals from wood.

Nanocellulose production

The production of nanocellulose is generally carried out in two steps. The first step consists of pretreatment of the raw material like wood chips to obtain purified cellulosic fibers, an essential pulping process for paper making. The pretreatments can be chemical, thermal, mechanical, biological or a combination of the processes. The second step consists of transformation of the purified cellu-

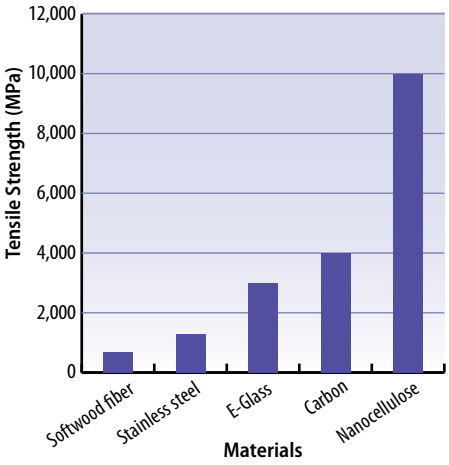


Figure 2. A comparison of tensile strength of various materials.

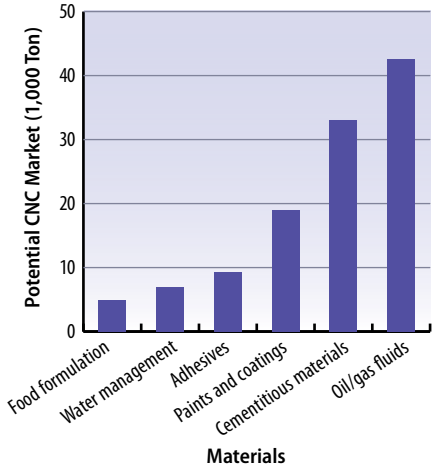


Figure 3. Some potential markets for nanocellulose - CNC material.

Figure 4. Flexible rechargeable Li-Ion battery based on nanocellulose technology. (dx.doi.org/10.1021/nl5024029 | Nano Lett. 2014, 14, 5677–5686)

losic fibers into microfibrils (CNFs) or short crystals (CNCs).

The main processes typically used are mechanical treatment, acid hydrolysis, and enzymatic hydrolysis. The treatments can be applied separately or combined. For example, enzymatic or acid hydrolysis pretreatments followed by mechanical treatments are normally carried out to enable quick disintegration of cellulosic fibers. The pretreatments allow opening the fiber structure to facilitate access to the cellulose microstructure for effective processing. Thus, a sufficiently selective pretreatment helps increase the access to the microsites and still maintain a desired degree of polymerization in the cellulose chain.

Nanocellulose products

As a green building block, numerous products can be derived from nanocellulose. Some of the emerging products include additives for paints, varnishes, coatings, adhesives, drilling and other fluids, polymers (thermosets and thermoplastics), hydrogels, cosmetics and pharmaceuticals. Products that can be derived from nanocomposites include optical devices, nanofilters, high-strength yet lightweight body armor, fuel-efficient yet super-durable vehicles, medical devices, bendable battery systems, flexible electronic displays and biofuels. Figure 3 shows some potential markets for CNCs. Among the products that CNCs will play an important role in developing are fluid loss control agents in the next generation of smart drilling fluids.

Nanocellulose film and membranes are being considered as good candidates to replace traditional polymer and glass substrate in energy devices. A new scientific term, green electronics, has been created with the goal of helping to produce eco-friendly electronics. Figure 4 shows a new generation of a flexible Li-Ion battery based on nanocellulose technology. The new architectural design provides unprecedented advances in the electrochemical performance. It also provides shape flexibility and safety tolerance far beyond those achievable with conventional battery technologies for development of next-generation energy storage systems.

Eco toxicological aspects

Nanomaterials such as nanocellulose have unusual physical and mechanical properties, which are not found in the bulk materials. However, because of their small size, there could be a range of potential health hazards, known as nanotoxicity. For nanocellulose materials, an effort has been made to investigate their safety in terms of both the environment and living beings, as well as possible modifications of production techniques that can reduce any toxicity present. For example, using a 3-D in vitro model of the human epithelial airway barrier, it was observed that cellulose nanofibers isolated from cotton elicited a significantly lower cytotoxicity and pro-inflammatory response than multiwalled carbon nanotubes and asbestos fibers. Thus, nanocellulose is generally considered as nontoxic as table salt.

Standardization

As government, academic and industrial research and development organizations endeavor to understand and develop nanocellulose-based products for multiple industrial sectors, there is a great need for international standards for cellulose nanomaterials. A committee within the International Nanotechnology Division (INSCC) of TAPPI, an international paper and pulp technical organization, has been formed to help guide and coordinate standards development worldwide.

Future perspectives

Nanocellulose with its lightweight, high-strength and transparent properties is of great interest for many applications in a wide variety of areas. Nanocellulose is quickly becoming available commercially worldwide. The manufacturing emphasis is placed on rapid scaleability. Research efforts focus on new applications and ensuring safety of the new materials in the environment, the workplace and the products.

Nanocellulose will compete with petrochemical products, and their industry has nearly a century of development experience. Partnerships among the forest products industry, the petrochemical industry and the manufacturing industry are the key to introduce "green" nanocellulose — environmentally sustainable — to a large consumer market with competitive cost and performance.

Qinglin Wu is the Roy O. Martin Sr. Professor in Composites and Engineered Wood Products in the School of Renewable Natural Resources.

Impact of Cow Size on Efficiency

Ryon S. Walker

Eight years ago a beef extension specialist asked a Montana rancher who owned 400 head of Angus cows how much his cows weighed. "They will average 1,250 pounds across the board," he replied. After weighing his cows at weaning in the fall, he found to his surprise the herd of 400 Angus cows averaged 1,400 pounds – with one cow, who had a 395-pound calf, weighing 1,900 pounds.

Over the past 30 years, U.S. cattle producers have seen a tremendous change in cow body weights. Data from the National Agriculture Statistics Service indicate that between 1975 and 2005, carcass weights of bulls have increased 223 pounds; cows, 146 pounds; steers, 144 pounds; and heifers, 194 pounds. Based on this, it is estimated that cow size has increased 300 pounds during this period, with an estimated average U.S. cow weight of 1,350 pounds.

Beef cow size is determined by evaluating the mature body weight of a cow (5 years of age or older) at a body condition score of 5. Body condition score is a measure of the condition of an animal using a scale of 1 (emaciated) to 9 (obese). Over this same span of 30 years, the cow/calf segment of the beef industry has improved weaning weights significantly. This is in response to pressure from the feedlots to select for more growth and performance in calves. Because there are strong positive genetic correlations between weaning weight and mature cow size and carcass weights and mature cow size, the mature size of cows has increased as a direct response to selecting for growth and performance, particularly in Bos Taurus breeds (Angus, Hereford, etc.). It is unknown, however, how the increase in mature cow size has affected how much that animal eats, how efficient she is at eating and meeting the nutritional needs of her body, and how efficient she is at weaning a calf.

Another concern is the impact of cow size on production efficiency, which refers to how efficient a bigger cow is at weaning a heavier calf compared to her lighter herd mates. Researchers at the Dickenson Research & Extension Center in North Dakota evaluated production efficiency in their herd and reported body weight ranged from 856 to 1,935 pounds, with their bigger cows 300 pounds heavier than their lighter cows. In addition, those cows weighing 300 pounds heavier produced only 1 pound more of calf at weaning than their lighter herd mates.

Estimates of feed required for maintenance of body weight date back 30 years, and this change in cow size may have in turn affected intake and feed efficiency. The "Nutrient Requirements of Beef Cattle" handbook, a national publication, states that daily dry matter intake (daily amount of forage or feed an animal consumes on a dry matter basis) increases 1.5 pounds for every 100-pound increase in mature cow body weight, assuming milk and stage of production are constant (Figure 1). This equates to 548 pounds of additional dry matter intake per year for a cow that weighs 100 pounds more than her herd mate. To understand cow efficiency and how cow size have affected the ability of that cow to raise a calf and maintain her body weight every year, researchers can evaluate how much she eats and her production efficiency.

Dry Matter Intake and Production Efficiency

Researchers at the LSU AgCenter Hill Farm Research Station in Homer conducted a study to determine differences in dry matter intake and efficiency during a 70-day feeding period in beef cows based on their mature body weight. The study was conducted in a group of 38 Angus crossbred beef cows during their lactating (with heifer calves at side) and non-lactating (following weaning) stages of production.

Based on body weight at the beginning of the feeding period, cows were sorted into a light or heavy body weight group for evaluation of ryegrass baleage and hay intake. During both feeding periods, cows in the heavy body weight group averaged 1,377 pounds compared to 1,210 pounds for cows in the light body weight group, a difference of 167 pounds.

During lactation, cows in the heavy body weight group consumed 2 pounds more of dry matter per day than cows in the light body weight group; however, the light body weight cows gained 5 pounds more over 70 days (Figure 2). During non-lactation, cows in the heavy body weight group consumed 2.43 pounds more of dry matter per day than cows in the light body weight group with similar body weight gains. This data would suggest that for every 100-pound increase in body weight, dry matter intake would increase 1.18 pounds during lactation and 1.45 during the non-lactation

Estimates of feed required for maintenance of body weight date back 30 years, and this change in cow size may have in turn affected intake and feed efficiency.

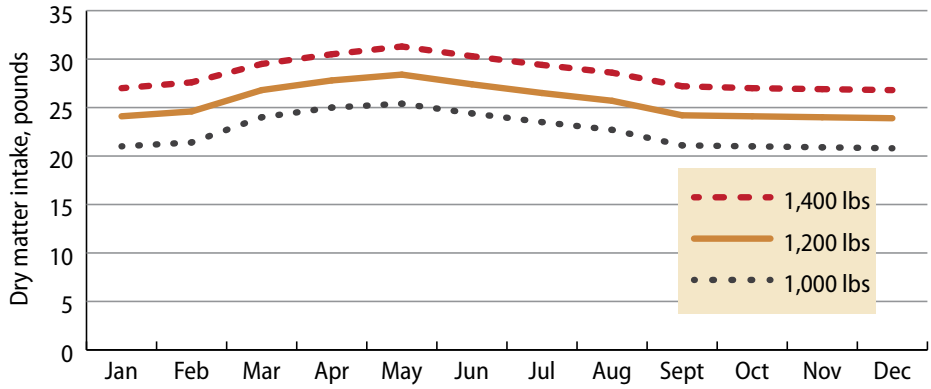


Figure 1. Daily dry matter intake requirements over the calendar year for a 1,000-, 1,200-, and 1,400-pound beef cow calving in February based on similar milk and stage of production.

Ryon S. Walker is an assistant professor and researcher at the Hill Farm Research Station in Homer. He is also the beef coordinator in the Northwest Region and responsible for the Master Cattleman program.

In today's economic environment, arguably the most valuable piece of equipment on a cow/calf operation is a good set of scales.

period. This indicates the difference in intake based on body weight may be less than the nutrient requirements of beef cattle as stated in the handbook. In addition, the increase in cow size may not have affected intake of forages for the larger cows as a group.

AgCenter researchers evaluated production efficiency in the beef herds at the Hill Farm (commercial Angus crossbred) and at the Dean Lee Research and Extension Center (3/4 Angus and 1/4 Brahman) in Alexandria in 2012 by sorting the cows into heavy and light body weight groups, based on body weight at weaning. At the Hill Farm, cows in the heavy body weight group averaged 163 pounds heavier and weaned a 32-pound-heavier calf at weaning than cows in the light body weight group (Figure 3). At Dean Lee, cows in the heavy body weight group averaged 165 pounds heavier and only weaned a 4-pound-heavier calf at weaning than cows in the light body weight group (Figure 4).

In a previous evaluation of 12 herds in northern Minnesota in 2010, four of the 12 herds had an average difference of 173 pounds in body weight between the heavy and light cows within each herd, with their heavy body weight cows weaning only 0.25 pounds more at weaning. The other eight herds had an average difference of 181 pounds in body weight between the heavy and light cows within each herd, with their heavy body weight cows weaning 25 pounds more at weaning.

Increasing cow size has a point of diminishing returns, but to what extent is still questionable. There appear to be differences among commercial herds in weaning production efficiency based on cow size. However, most producers do not know the production efficiency of their herd. If bigger cows wean a heavier calf, does that difference in pounds weaned pay for the difference in forage that the larger dam will consume? In today's economic environment, arguably the most valuable piece of equipment on a cow/calf operation is a good set of scales. Before deciding whether to keep or sell your bigger cows, producers should measure what they weigh and what they produce.

One-month old and three-week old crossbred calves. Photo by Kathy Kramer

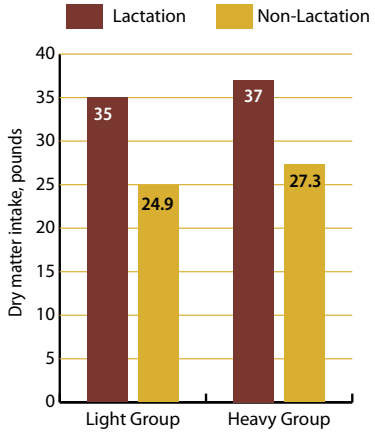
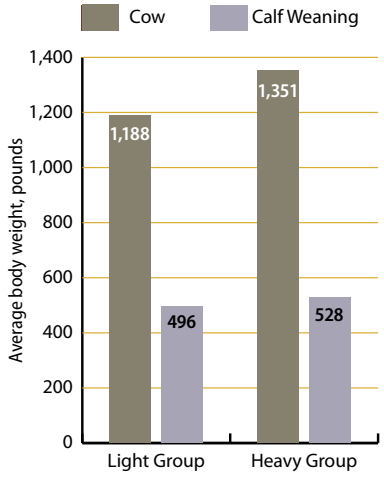
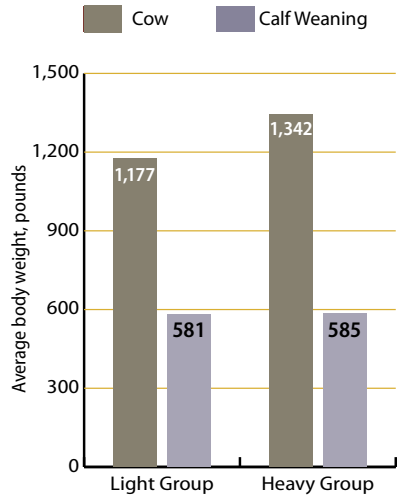


Figure 2. Dry matter intake (in pounds) of cows sorted into a light or heavy body weight group and fed for 70 days during lactation and during non-lactation (post-weaning).



Angus crossbred

Figure 3. Average body weight of mature Angus crossbred cows and their respective calf weaning weights from the Hill Farm Research Station cow herd sorted into a light and heavy body weight group.



Brangus

Figure 4. Average body weight of mature Brangus cows and their respective calf weaning weights from the Dean Lee Research and Extension Center cow herd sorted into a light and heavy body weight group.

Economic Value of Prescribed Sugarcane Burning

Michael E. Salassi, Michael A. Deliberto, Kenneth A. Gravois and Benjamin L. Legendre

Sugarcane is one of the major agricultural commodities produced in Louisiana. With more than 400,000 acres of sugarcane in production and 11 factories processing approximately 14 million tons of sugarcane into 1.5 million tons of raw sugar and more than 95 million gallons of molasses annually, sugarcane is one of the major economic drivers of the state's agricultural sector. With raw sugar and molasses as the primary products produced, the annual value of the state's sugarcane crop has averaged $948 million per year over the 2011-2013 crop years. This annual revenue from sugarcane production has an estimated impact of approximately $2 billion per year on the state's economy. Louisiana is also one of the major sugarcane-producing states in the United States, accounting for approximately 48 percent of total sugarcane acres and 43 percent of total cane sugar produced in the country.

Sugarcane's production process is much different from that of other Louisiana agricultural crops. Sugarcane is planted vegetatively using whole stalks of sugarcane rather than seed as is typical for other crops. It is a perennial crop, whereby several years of harvest can be obtained from one initial planting. In addition, the practice of prescribed burning is an integral part of the sugarcane production process. Prescribed burning is a crop management practice widely used in the production and harvest of many agricultural and timber products across the United States. In Louisiana, prescribed burning is widely used in sugarcane production to reduce the amount of excess plant material associated with the harvest, transportation and processing of sugarcane into raw sugar and molasses. The annual economic value of prescribed burning to the Louisiana sugarcane industry is estimated to be approximately $120 million per year.

Benefits of prescribed sugarcane burning

The primary purpose of burning sugarcane, either before or just after harvest, is to remove unwanted plant material from the field, primarily plant leaves and tops. If left on the field, this plant material can reduce succeeding crop yields. If transported to the mill with harvested sugarcane, this plant material can increase processing costs and reduce raw sugar recovery. The burning of sugarcane as a crop harvest management practice has many direct and indirect benefits. Some of the major direct benefits of sugarcane burning in Louisiana include: (1) reducing the number of truckloads needed to transport harvested sugarcane to the mills, thereby reducing traffic and wear and tear on public roads; (2) decreasing the volume of plant material processed at raw sugar mills, thereby shortening the harvest and processing season; (3) increasing raw sugar recovery

Programs like the Certified Burn Manager Program, which provide training to sugarcane farmers to understand and follow safe fire and smoke management guidelines, will help ensure that this important practice can continue.

Photo by John Wozniak

In Louisiana, prescribed burning is widely used in sugarcane production to reduce the amount of excess plant material associated with the harvest, transportation and processing of sugarcane into raw sugar and molasses.

from processed sugarcane, thereby improving the overall quality of the sugar; and (4) decreasing crop yield losses in subsequent sugarcane stubble crops, thereby extending the crop cycle and reducing planting costs.

Prescribed burning of sugarcane also has several indirect benefits. Under certain crop conditions, burning the sugarcane crop before harvest can improve the efficiency of harvesting the crop in the field, thereby reducing the cost of harvesting sugarcane. In addition, burning the sugarcane field can reduce plant diseases that might overwinter on remaining crop material, reduce insect pest populations within fields on subsequent stubble crops, and reduce the establishment and spread of weeds.

Economic value of prescribed sugarcane burning

Four direct components of the annual economic benefit of sugarcane burning were estimated using 2011-2013 crop year average sugarcane production data. These average base data values, used in the determination of the economic value of sugarcane burning, included measures of acres of sugarcane in production, acres of sugarcane harvested for sugar, tons of sugarcane harvested, average raw sugar recovery rate, and average raw sugar and molasses market prices.

Reduction in additional transportation costs

Without burning, the addition of lighter plant trash material in trucks hauling harvested sugarcane to the mills would reduce the hauling weight from the typical 27 tons of sugarcane per truckload to about 25 tons per load. This would require an estimated 94,546 additional truckloads to haul the state's annual sugarcane crop to mills. Using a representative hauling cost rate of $6 per ton, the estimated value of this additional transportation cost would be $14.2 million per year.

Reduction in additional processing costs

Additional plant trash material shipped to the mill along with harvested sugarcane as a result of not burning would result in the processing of an additional 1.35 million tons of plant material at the state's raw sugar mills. Using a typical in-season variable grinding cost per ton for an average-sized mill in the state, the estimated value of this additional processing cost would be $6.1 million per year.

Reduction in sugar recovery losses

Additional plant trash material processed would reduce sugar recovery by about 3 pounds per ton of cane for every additional 1 percent trash. Without burning, the additional plant material processed at mills would be approximately 9.1 percent, thereby reducing sugar recovery by 27 pounds per ton of cane processed. Using the previous three-year average prices for raw sugar and molasses and factoring in typical price discounts for impacted sugar quality, the estimated value of revenue loss from reduction in sugar recovery would be $29.8 million per year.

Reduction in stubble crop cane yield losses

Additional plant trash material left on the fields without burning would reduce sugarcane yields on the succeeding stubble crops.

Photo by John Wozniak

Using an approximate yield reduction factor of 11 percent based on previous research, the estimated value of this sugarcane yield reduction on stubble crop acreage would be $70.2 million per year.

Combining these four values together provides a direct estimate of the annual value of the economic benefit of burning to the Louisiana sugarcane industry of approximately $120.3 million per year. Prescribed burning is vital to the continued economic viability of the Louisiana sugarcane industry. Programs like the Certified Burn Manager Program, which provide training to sugarcane farmers to understand and follow safe fire and smoke management guidelines, will help ensure that this important practice can continue.

Michael E. Salassi is the Nelson Fairbanks Endowed Professor in the Department of Agricultural Economics and Agribusiness, and Michael A. Deliberto is a research associate in the department. Kenneth A. Gravois is the extension sugar specialist at the Sugar Research Station in St. Gabriel. Benjamin L. Legendre is a professor and head at the Audubon Sugar Institute.

Louisiana Super Plants Great New Selections for 2015

Allen Owings, Dan Gill and Regina Bracy

It may be hard to believe, but the LSU AgCenter's Louisiana Super Plants program is now five years old. With the announcement of four new varieties for 2015, the program has now named 32 great landscape plants as top selections for home gardeners in Louisiana.

The goal of this program is to identify and promote exceptional plants that perform well in Louisiana. Some of these are new varieties, and some are older varieties with a proven track record.

The LSU AgCenter and Louisiana's nursery and landscape industry, through the Louisiana Nursery and Landscape Association, saw the need for a state-based program that uses university research to identify and promote exceptional plants. Similar programs, such as Texas Superstars and Mississippi Medallions, are ongoing in other states. Funding for this project was initially provided through the Louisiana Department of Agriculture and Forestry with U.S. Department of Agriculture Specialty Crop Block Grant Program funds. The LSU AgCenter Hammond Research Station, partnering with the School of Plant, Environmental and Soil Sciences, leads the program.

Each Super Plant must have at least two years of rigorous evaluations and have a proven track record under north and south Louisiana growing conditions. Louisiana Super Plants must be proven hardy across the state. They must be easily produced and available for all nursery and landscape industry wholesalers and retailers to market and sell.

Louisiana Super Plants are selected a year or two in advance of a public announcement. The selection process includes LSU AgCenter horticulture faculty and members of the Louisiana nursery and landscape industry. The program results in home gardeners having an increased awareness of better-performing landscape plants.

2015 selections named

Four new Louisiana Super Plants are being announced for 2015. Spring selections are Henna coleus and Fireworks pennisetum. Fall choices are Homestead Purple perennial verbena and Leslie Ann camellia.

Henna coleus

Coleuses are generating a lot of interest these days. Just look at the amazing variety of these plants available at area nurseries. One issue with coleus varieties is finding those that are less inclined to bloom. Coleus is grown for its colorful foliage, and the flower spikes are not generally desirable. The newest coleus for the most exceptional performance in Louisiana is Henna. The foliage is highly fringed and sports shades of gold, chartreuse and reddish-purple on top and reddish-purple underneath. Plants reach 24-30 inches in height and do best planted in a full-sun to partial-sun landscape. They should be planted in spring after the danger of frost has passed. Plants last until first killing frost.

Fireworks fountain grass

Pennisetum is an ornamental grass commonly known as purple fountain grass. A new red-foliaged variety addition to this group of grasses is Fireworks.

These are annuals in north and central Louisiana but can be perennials in the warmer locations of south Louisiana. Plants need full sun and will be 4 feet tall in the landscape by fall. Planted in clumps of three to five, they can be used as a vertical focal plant in flower beds. Flower plumes start midsummer and continue until first frost.

Irrigation requirements are minimal. This unique new fountain grass has no insect and pest issues.

Henna coleus. Photo by Allen Owings

Fireworks fountain grass. Photo by Allen Owings

Homestead Purple verbena. Photo by Allen Owings

Homestead Purple verbena

The best perennial verbena for the Louisiana landscape is Homestead Purple. Even with an avalanche of new varieties on the market, this plant is still the best of the best for Louisiana. Rich purple blooms cover a three-foot-wide canopy of foliage twice annually – peak bloom being midwinter until late spring (mid-February through May) and then another flowering during fall.

Although perennial verbenas are generally planted in spring, we need to consider fall and winter planting of perennial verbenas for best performance the first year. This is the reason we are promoting Homestead Purple as a fall Louisiana Super Plant.

In the landscape, spacing between plants should be 18 inches at planting, and the plants should be sheared occasionally to bring back nice, new foliage growth. They should be fertilized at planting and in each spring. Verbenas need full sun and well-drained soil for best success.

Leslie Ann camellia

Finally, Leslie Ann is a camellia sasanqua that is popular in Louisiana and has been a longtime proven performer in Louisiana landscapes. Plants need a mostly sunny to partly sunny area and prefer acid, well-drained soil. The flower petals are bi-colored and sometimes tri-colored with blends of pink, blush and white. Leslie Ann is a mostly upright grower that will mature at 8 feet tall in the landscape. Plants are early-season bloomers – starting in late October and continuing until mid- or late December.

All Louisiana Super Plants are "university tested and industry approved." The four 2015 selections, as well as all the past selections, can be relied on to make great, colorful warm-season and cool-season Louisiana landscapes.

Leslie Ann camellia. Photo by Allen Owings

Past Selections

Cool-season flowers

Amazon dianthus
Swan columbine
Diamonds Blue delphinium
Redbor kale
Sorbet violas
Camelot foxglove

Warm-season flowers

BabyWing begonias
Bandana lantanas
Butterfly pentas
Little Ruby alternanthera (Joseph's coat)
Senorita Rosalita cleome
Serena angelonia
Luna hibiscus (rose mallow)
Kauai torenia (wishbone flower)
Mesa gaillardia

Shrubs

Aphrodite althea (rose of Sharon)
Belinda's Dream rose
Conversation Piece azalea
Drift roses
Frostproof gardenia
Penny Mac hydrangea
ShiShi Gashira camellia
Flutterby Petite Tutti Fruitti Pink buddleia (butterfly bush)
Rabbiteye blueberries

Trees

Shoal Creek vitex
Southern sugar maple
Willow oak
Evergreen sweetbay magnolia.

Each Super Plant must have at least two years of rigorous evaluations and have a proven track record under north and south Louisiana growing conditions.

Allen Owings is a professor at the Hammond Research Station; Dan Gill is an associate professor in the School of Plant, Environmental and Soil Sciences; Regina Bracy is a professor and Southeast Regional Director.

Family Fest Highlights Solutions to Rural Health Problems

Olivia McClure

West Carroll Parish is made up of quiet little Southern towns — the kinds that cannot be located on maps, that exist unknown to the outside world in a region where change occurs almost as slowly as the pace of life. These are places that seem charming to some and backwards to others.

These are places where diabetes and hypertension are nearly as common as the traditional foods that locals "fix" for social gatherings. Cuisine is not derived from cookbooks, but from recipes passed down family trees and memorized like words to a song.

"Some people say 'whenever there's an event, I make peanut butter cake' or 'I make chicken and dumplings,'" said LSU AgCenter agent Monica Stewart. "It's just what people do here. It's tradition. When people get together, they serve fish — usually caught in the surrounding area, then fried."

This is the Mississippi Delta region, where food-centric old-fashionedness barricades improvement of the region's staggering health statistics. About half of West Carroll Parish's 11,600 residents are obese and have high blood pressure, according to a survey conducted by the Pennington Biomedical Research Center.

On Oct. 25, 2014, parish residents came to the Thomas Jason Lingo Community Center for an event that did not involve a covered dish meal, but instead started with a one-mile fun run. Inside the community center, volunteers staffed rows of exhibits on leading a healthier, safer lifestyle.

Master Gardener Kim Ruffin helps children make a "Garden in a Glove" at the Family Fall Fest. Photo by Olivia McClure

The crowd of attendees at the Family Fall Fest was a fulfilling sight for Stewart, who coordinates the Healthy Communities program, which launched at the fest last year. The joint endeavor of the LSU AgCenter, Southern University Agricultural Center and Pennington Biomedical Research Center strives to expand access to and awareness of healthy foods and physical activity opportunities.

Pennington recently conducted health screenings at the parish AgCenter extension office. Stewart said some participants were surprised to learn they had ailments like high blood pressure or diabetes. As a result, many have realized they must change their ways.

The Family Fall Fest in Oak Grove featured several booths demonstrating how to live a healthier life, including this one, where participants could measure their body fat level. Photo by Olivia McClure

"They need to learn healthy," Christina Dyess, of Darnell, said of her three children whom she brought to the fair. "I want them to be healthy — not to be overweight, not to sit around with a bag of chips."

Just as parents can set an example for children, Stewart hopes West Carroll Parish can set an example for the rest of Louisiana. But being an example — being different — in the Delta is not easy. It is one of the poorest, unhealthiest areas of the entire country.

Terri Crawford, AgCenter northeast regional nutrition agent, said "having a healthy West Carroll Parish will take years" because it will mean breaking the mold of how things have always been.

One of the biggest hurdles is the Delta region's history of poverty. Crawford said there is a gym in Oak Grove, the parish seat, but many people cannot afford the membership or gas money to drive into town.

The joint endeavor of the LSU AgCenter, Southern University Agricultural Center and Pennington Biomedical Research Center strives to expand access to and awareness of healthy foods and physical activity opportunities.

Stewart said about 85 percent of people nationwide have access to recreational facilities. In West Carroll Parish, that percentage is about 30. Combined with the slow pace of life typical of north Louisiana, the lack of things to do is harming people's health, she said.

Access to fresh, whole fruits and vegetables is also low, which is ironic given northeastern Louisiana's vibrant agriculture industry. Crawford said the AgCenter has been helping establish school and community gardens to supplement what little produce is available at convenience stores in the tiny outlying communities that surround Oak Grove.

Ten-year-old Josh Blakely, of Goodwill, who won a bicycle in a drawing for participating in the early-morning run, said the event reinforced something his grandmother tells him all the time.

"Eating vegetables is important because it gives you nutrients," Blakely said.

But here, a healthier lifestyle is not as simple as eating more vegetables.

"Even when locals do have healthier food, they often choose cooking methods that make it unhealthy," Stewart said. "It's simply a mindset, as well as tradition, with limited forethought given about the effect on the body."

Stewart believes motivation will be the key to breaking old habits. Anything from a desire for longevity to being able to play with one's children can encourage people, she said.

"Losing people can motivate behavior change — like seeing something happen to someone and realizing that you don't want the same thing to happen to yourself," Stewart said.

Josh Blakely, 10, of Goodwill, tries out the new bicycle he won at the Family Fall Fest as LSU AgCenter associate vice chancellor Gina Eubanks looks on. Photo by Olivia McClure

Gina Eubanks, LSU AgCenter associate vice chancellor for nutrition and food science and Southern Ag Center vice chancellor for extension, said tackling the parish's problems is a daunting, but important, task.

"The focus of the Healthy Communities initiative is to get the community involved and excited," Eubanks said. "People have to gain the knowledge and then learn how to use it. That's the hard part because it takes time."

But someday, organizers hope, things will change. Stewart said exposure to new behaviors is the first step toward change, and the Healthy Communities initiative is helping spark it.

Olivia McClure is a graduate assistant with LSU AgCenter Communications.

Healthy cooking demonstrations were one of the many exhibits at the Family Fall Fest. Fannie Coleman, an AgCenter nutrition educator in Richland Parish, was one of the featured cooks. The fest is part of an LSU AgCenter effort to improve health in West Carroll Parish. Photo by Olivia McClure

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