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LOUISIANA Agriculture

Assuring Our Future Through Scientific Research and Education

Bob R. Jones - Idlewild Research Station
adds value to state's economy

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Global Warming Costly for Louisiana's Coast

Johnny Morgan

Exploring ways to combat global warming and detailing the formation of coastal Louisiana were main topics discussed by speakers at the Center for Natural Resource Economics and Policy (CNREP) 2016 forum held March 21-22 in New Orleans, which was sponsored by the LSU AgCenter.

Two of the keynote speakers were Gernot Wagner, lead senior economist at the Environmental Defense Fund, and Richard Campanella, geographer with the Tulane School of Architecture.

Wagner discussed the economics of climate change and how it will affect everyone.

"At the end of the day, when it comes to doing enough about climate change, the thing to do is price CO2 and get out of the way," Wagner said.

Campanella presented a 300-year historical geography of New Orleans, explaining how over 7,000 years, the Mississippi River deposited sediment that built up the delta, which is now New Orleans.

"The formation of the delta was fundamentally fluid and dynamic. It depended on pure gravity," he said. "What man has done is impose rigidity on that fluidity."

To use a banking analogy, Campanella said, there is more withdrawal of sediment than is being deposited to create new land area.

"What's being done now structurally is the building of the new $15 billion levee system, which is higher and stronger than ever before," he said.

Bringing social scientists together to tackle the issues of socioeconomic challenges of coastal resource management and policy is the goal of the CNREP triennial meeting, said Rex Caffey, LSU AgCenter and Sea Grant economist, who was conference chairman.

A major focus of the meeting is the role that ecosystem services play in federal policy and the latest advancements in natural resource valuation.

"We started this conference to fill a gap – a response to the lack of socioeconomic information to understand how people will be affected for both economic and political reasons," Caffey said.

Over the three days of the conference, a number of presentations and panel discussions related to climate change, valuation of ecosystem services and coastal restoration financing.

Even though the Gulf Coast was the main topic discussed at the forum, presenters came from as far away as Sweden.

Lina Isacs, a Ph.D. student at the Royal Institute of Technology in Stockholm, presented her research on state preferences as they relate to changes in environmental quality.

"What I'll discuss is the importance of letting people have a discussion before they state their willingness to pay for changes in environmental quality," she said. "It's a new approach to valuing environmental benefits that are more realistic in terms of how people function when they make decisions."

Mark Shirley, AgCenter and Sea Grant fisheries agent, gave a presentation on "How Far Away Is the Gulf of Mexico," which is a 4-H program he developed with Thu Bui, AgCenter and Sea Grant fisheries agent, in St. Mary Parish.

"The idea for the program is to get students to understand the changes that will occur in their areas along the coast in the next 50 years when they become grandmas and grandpas," Shirley said.

As part of the project, the students built elevation benchmarks in front of every school in the parish to show how fast land loss is occurring, Shirley said.

"The goal is to get them to realize the risk of living in their changing communities," Shirley said.

Yunuke Noyanamba, a junior at Bemidji State University in Minnesota, was part of a volunteer cleanup group during the week before the conference in the Lower Ninth Ward of New Orleans. She said she was surprised to see so many properties still abandoned almost 11 years after Hurricane Katrina.

The forum had more than 225 attendees, including 160 presenters and panelists representing 63 public and private institutions located in 29 U.S. states and five countries.

Abstracts from the conference and a complete conference program may be obtained at www.cnrep.lsu.edu. For more information contact Caffey at rcaffey@agenter.lsu.edu.

Johnny Morgan is a specialist with LSU AgCenter Communications.

LOUISIANA Agriculture

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LOUISIANA Agriculture

ON THE COVER: The Bob R. Jones-Idlewild Research Station in Clinton is home to two captive deer herds, white-tailed and red deer, in addition to a native population of white-tailed deer, turkeys and other upland game birds and animals. Among the research projects at the station are trials conducted to determine the preference of native white-tailed deer for different commercially available forage mixes. This photo of red deer is by Olivia McClure.

Soybean board gives $1.75 million for research, outreach

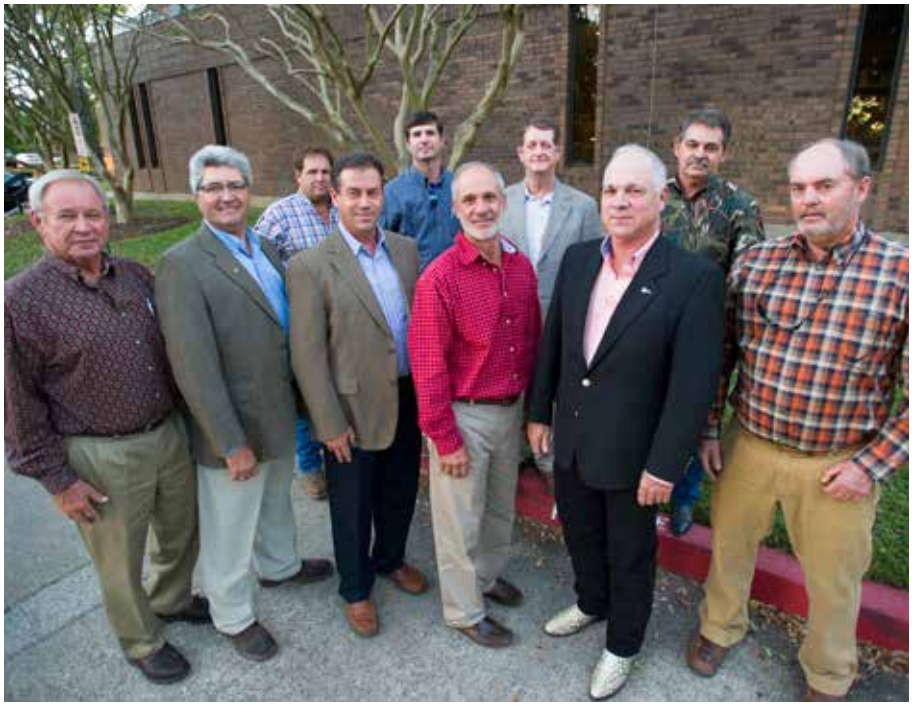
The Louisiana Soybean and Grain Research and Promotion Board has given the LSU AgCenter $1.75 million to fund a total of 62 research and outreach projects in 2016.

"We are grateful that Louisiana farmers, through their checkoff programs, see enough value in our scientists' work to support their research," said Rogers Leonard, associate vice president. "They recognize that the economic return per dollar they invest is worth it."

The funds come from a commodity checkoff program that collects a percentage of farmers' proceeds from sales of soybeans, corn, wheat and grain sorghum.

"The checkoff program that funds the Louisiana Soybean and Grain Research and Promotion Board is important to Louisiana farmers," said Raymond Schexnayder Jr., chairman of the board. "This funding supports LSU AgCenter research that addresses issues specific to Louisiana's unique climate and geography, such as insect and disease pressures that are not prevalent in the rest of the United States."

The funded projects cover all aspects of agricultural production and focus on helping farmers make better management decisions. Among them, Leonard said, are two new projects requested by board members – using winter cover crops in conservation programs and the effects of irrigation on phosphorus and potassium in grain crop production. **Olivia McClure**



Members of the Louisiana Soybean and Grain Research and Promotion Board are, from left to right, Robert Thevis, of Simmesport; Joey Olivier, of Arnaudville; J.K. Bordelon, of Moreauville; Carlos Polotzola, of Melville; Ryan Kirby, of Belcher; Charles Cannatella, of Melville; Donald Berken, of Welsh; board chairman Raymond Schexnayder Jr., of Ventress; Leo Franchebois, of Opelousas; and Dan Turner, of Mer Rouge. Photo by Olivia McClure

Rice planting gets off to good start

Good weather set the stage for good planting conditions for the 2016 rice crop in Louisiana.

"In general, we're off to a good start," said Steve Linscombe, director of the LSU AgCenter H. Rouse Caffey Rice Research Station. "I think this has probably been the most favorable growing conditions in the month of March in my career."

Some farmers were finished planting as early as March 7, he said.

Linscombe said most farmers appear to have good stands, with only a few scattered fields needing to be replanted.

The bird repellent AV-1011 is working well at preventing birds from eating rice seed, he said. "This has been an outstanding product for us."

Louisiana's rice crop could increase over last year's 412,000 acres, Linscombe said. It may be too late to replant flooded corn fields, and a portion of that land could be used to grow rice. **Bruce Schultz**

Research associate James Leonards, right, walks behind a planter being loaded by LSU AgCenter rice extension specialist Dustin Harrell at the H. Rouse Caffey Rice Research Station in Crowley. Photo by Bruce Schultz

Rains wreak havoc for corn farmers

Chris Johnson looks over a "lake" that was once a corn field in eastern Ouachita Parish on March 16 right after heavy rains caused massive flooding in parts of Louisiana. LSU AgCenter corn specialist Dan Fromme estimated that about 40,000 acres of corn would have to be replanted. Corn acreage for the state was forecast to be down significantly from last year's 500,000 acres. Photo by Tammi Arender

4-H'ers learn outdoor skills

Dakota Puckett, 16, of Webster Parish, takes aim during the bow competition of the outdoor skills challenge held during the Louisiana 4-H North Regional shooting sports contest at the Long Range Gun Club near Shreveport. The components of the outdoor skills challenge were a wildlife ID test, shooting a bow, shotgun and rifle, and an orienteering test. Photo by Craig Gautreaux

Arrows flew, clay targets were busted, and written tests were taken—all part of the 4-H outdoor skills competition March 23-26 near Shreveport.

The event, held at the Long Range Gun Club, had more than 900 4-H'ers participate. The number of participants shows how popular the program has become for Louisiana youth, according to David Boldt, LSU AgCenter 4-H shooting sports coordinator.

"We're probably at about 5,000 to 6,000 kids that are involved with it. As far as competition, which is coming to the two regionals, we are close to 2,000," Boldt said.

One of the big draws of the 4-H outdoor skills program is its family involvement. "As you can see if you walked around, they have tents set up. They're cooking. It's really family oriented. You'll see all family members come out, and they will do it all day," Boldt said.

Benny Bell, an agricultural education teacher at Ebarb High School in Sabine Parish, sees the program as an opportunity for students who are not involved in traditional extracurricular activities such as football, softball or track.

"I pick kids that don't compete in other sports. It's an outlet for them that they might not have otherwise," Bell said.

Bell has had six students advance to the national finals held annually in Grand Island, Nebraska.

"Safety is our No. 1 priority. We want the kids to have fun, but be safe," Boldt said.

The competition could not be accomplished without a large contingent of volunteers, many of them parents.

"We give such an investment into the other children in our school and our parish, and we want to see them do well and support them," said Carla Jinks, a parent volunteer from Bienville Parish, who was taking vacation time to help coach. **Craig Gautreaux**

4-H camp puts students, parents on road to better health

4-H'ers from across Louisiana learned that fitness can be fun and healthy eating doesn't have to bust your budget at the LSU AgCenter 4-H Food and Fitness Family Camp March 18-20 at the Grant Walker 4-H Educational Center in Pollock.

Ebony Martin, of St. Martin Parish, left, and her daughter, Janell Howard, show off their chocolate-dipped bananas with dried fruit at the 4-H Food and Fitness Camp at the Grant Walker 4-H Educational Center in Pollock. Photo by Tammi Arender

This year's theme was "Passport: Roundtrip to Good Health." The camp was open to 4-H students and their parents.

"If the parents aren't on board, it's really hard for kids to make changes," said Jessica Stroope, LSU AgCenter extension associate.

Twenty-two fourth- through sixth-graders, most accompanied by either one or both parents, participated in numerous activities conducted by 4-H'ers, who are members of the 2015-2016 4-H State Food and Fitness Board, and the board's advisers.

Sessions included lessons in nutrition, food preparation, food safety and fitness.

"Fitness can be fun. It doesn't have to be about working out and eating boring food," said Alexis Cole, board president.

The 4-H Food and Fitness Family Camp was made possible, in part, by a grant from ConAgra Foods.

"The ConAgra grant supports the food and fitness programs along with the 4-H parish efforts throughout the state," Stroope said. "It focuses on nutrition and food budgeting skills for families."

For Jennifer Anderson, of Natchitoches Parish, and her 10-year-old son, Sawyer, the camp was a bonding time. "I think it's great that we get to do this as a family activity," she said. **Tammi Arender**

U.S. official urges African involvement

Agricultural research and education efforts are critical to helping solve food security issues in Africa, a senior U.S. Department of State diplomat said during a meeting with students and faculty. Linda Thomas-Greenfield, assistant secretary of the Department of State's Bureau of African Affairs and an LSU graduate, met with faculty members and students to discuss the LSU AgCenter's international outreach efforts and current agriculture issues in Africa.

Several African students studying agriculture at LSU had a chance to tell Thomas-Greenfield about their research projects in nutrition, dairy science and soil science. Some of them have plans to return to their home countries after graduating to teach people about new agricultural practices that can improve productivity and strengthen the food supply.

Thomas-Greenfield said she is glad the students realize the importance of extending their research results to farmers.

Linda Thomas-Greenfield, assistant secretary of the U.S. Department of State's Bureau of African Affairs, right, talks to students about involvement in African agriculture. Photo by Olivia McClure

"We are in the throes of a food crisis in Africa, and we're on the edge of a famine in Ethiopia," she said.

Improving agriculture will help promote peace and prosperity in Africa, Thomas-Greenfield said, adding that it was encouraging to hear the students want to be part of that process. **Olivia McClure**

Alumni, students, faculty receive annual awards

Three alumni were recognized for their contribution to agriculture and the College of Agriculture during a ceremony on April 8. Jeff Hughes and Jim Simon both received the outstanding alumni award. Colorado Robertson received the early career outstanding alumni award.

Hughes, of Bogalusa, is a 1949 graduate of the college with a degree in forestry. He worked as a forest professional for Gaylord Container and its successors for 51 years before retiring in 1986. His involvement in forestry continued as he began his second career as a consultant to Weyerhaeuser.

Simon, of New Iberia, is a 1983 graduate of the college with a degree in agricultural mechanizations. Simon worked in the banking industry for 20 years. He became the general manager of the American Sugar Cane League in 2004. He is one of four U.S. sugar industry representatives on a team that negotiates sugar trade with Mexico.

"His family has been involved in the sugar and rice production business for several generations, and he possesses a genuine interest in agriculture and its people," Laborde said.

Robertson received a degree in agribusiness in 2009 and his master's in public administration in 2011. During his time as a student, Robertson served as president of the LSU Agricultural Students Association and LSU Student Government.

Since graduation, he has been employed as the enterprise risk officer at LSU, where he helped to spearhead the successful drive to obtain autonomy for LSU from the State Office of Risk Management, resulting in a savings of more than $6.5 million for the university. He is also co-owner and manager of Robertson Farms in Amite.

Morgan Richard, a senior from Elton majoring in animal, dairy and poultry sciences, received the Gerald and Norma Dill College of Agriculture Alumni Association Outstanding Senior award. Richard has held leadership positions in many student organizations, including Dairy Science Club, Block & Bridle, Collegiate 4-H and LSU Student Government. She is a member of Les Voyageurs.

Ariel Bergeron, a senior from Houma majoring in animal, dairy and poultry sciences, received the K.C. Toups Memorial Les Voyageur Award. Bergeron is an LSU Discover Scholar.

Bradley Sartain, a graduate student in the School of Plant, Environmental and Soil Sciences, received the Ray and Dorothy Young Endowed Assistantship in Louisiana Row Crop Integrated Pest Management. Sartain has a bachelor's degree in wildlife and fisheries and a master's degree in aquatic weed control. His thesis research and external projects have provided operational guidelines and management protocols for difficult-to-control aquatic plants.

Georgianna Tuuri, an associate professor in School of Nutrition and Food Sciences, was awarded the Ann Armstrong Peltier Professorship in Dietetics.

Phil Elzer, associate vice president and interim director of the School of Animal Sciences, was awarded the Meraux Foundation Supreme Champion Livestock Professorship.

Tobie Blanchard

The LSU College of Agriculture Alumni Association honored alumni, students and faculty at a ceremony April 8. Left to right are Luke Laborde, alumni association president; Barbara Hughes Favre, daughter of Jeff Hughes; Bradley Sartain; Colorado Robertson; Georgianna Tuuri; Jim Simon; Ariel Bergeron; Phil Elzer; Morgan Richard; and Bill Richardson, dean of the LSU College of Agriculture and LSU vice president for agriculture.

Student receives national dairy scholarship

Morgan Richard was awarded a national scholarship for her outstanding academic career and interest in dairy science. Photo by Tobie Blanchard

Morgan Richard, a senior in the School of Animal Sciences from Elton, Louisiana, is the recipient of the National Dairy Promotion and Research Board's highest scholarship, the $2,500 James H. Loper Jr. Memorial Scholarship.

The national board awards up to 19 scholarships nationwide to eligible undergraduates enrolled in programs that emphasize dairy. Of those recipients, one is chosen for the Loper scholarship.

LSU dairy science professor Cathy Williams said Richard is an outstanding student who has been involved in many activities that promote the dairy industry and animal agriculture as a whole.

"She gained valuable dairy experience as a student worker at the LSU dairy farm and for the past two years as a student worker in my dairy nutrition program," Williams said. "She has assisted with many research projects and conducted her own research through a grant from the College of Agriculture."

Richard plans to either attend veterinary school to specialize in food animal medicine, with an emphasis on dairy, or pursue a doctorate in ruminant physiology.

Tobie Blanchard

Student creates gluten-free muffin

A graduate student in the School of Food Sciences and Nutrition, Amber Jack, has created a gluten-free, low-sugar banana muffin that taste-testers say they would buy.

"It is easy to incorporate different fruits in muffins to hide the unpleasant flavor or aroma that gluten-free flour would give the muffin," Jack said.

Gluten is a protein found in wheat, barley and rye. Gluten-free is a trend in the food industry. In 2015, consumers spent more than $5 billion on gluten-free products.

Witoon Prinyawiwatkul, Jack's adviser and an LSU AgCenter food scientist, said it is gluten that gives breads, cakes and cookies their rise and texture, so muffins without it can fall flat.

"Gluten-free products are not so simple to make because without the wheat protein, you don't get the texture that you want," Prinyawiwatkul said.

Jack said she went through about 20 different formulations before she found one that produced a gluten-free muffin that is surprisingly similar to its gluten counterpart.

"I got 128 panelists to come try my product," Jack said.

She said she was overwhelmed by the results, which showed that people liked the muffins, with most preferring the one with half sugar and half sugar substitute.

"There may be a company that wants the recipe for this product, so we can actually work with Amber to sell that" said Gaye Sandoz, coordinator of the LSU AgCenter Food Incubator.

Jack was able to work on her product in the AgCenter's new Sensory Analysis Center, which offers state-of-the-art commercial kitchen. **Tobie Blanchard**

Graduate student Amber Jack has developed a gluten-free, low-sugar banana muffin that closely mimics the taste and texture of a regular muffin. Photo by Tobie Blanchard

Students study agriculture in Nicaragua

Six students traveled to Nicaragua during spring break as part of the International Experiences in Agriculture program. The group participated in farm visits, educational excursions and a zip-line canopy tour of a volcano. The students were Cole Sawyer, junior in agricultural business from St. Francisville, Louisiana; Alexis Latona, a junior in education from Lakeland, Florida; Tim Sandles, a graduate student in agricultural education from Madisonville, Texas; Jade Halliburton, a graduate student in agricultural education from Magnolia, Arkansas; Christen Wall, a sophomore in agricultural business from Springfield, Louisiana; and Alexis Agard, a junior in agricultural business from Houston, Texas.

Monroe area alumni gather for reception

The LSU College of Agriculture held an alumni reception at Restaurant Cotton in Monroe on March 30. Among the participants was 92-year-old C.B. Griggs, of West Monroe, center. Leslie Blanchard, left, is the assistant dean, and Bill Richardson, right, is the dean as well as LSU vice president for agriculture. Griggs, a 1948 graduate in vocational agriculture, taught vocational agriculture at Ouachita High School for several years before leaving teaching to pursue a master's degree and doctorate from Mississippi State University. He talked about his time at LSU, telling a story about one of his student jobs, which was collecting camellia cuttings from camellia plants. He said he got the job because he was married. The plants were near women's student housing, and the university only allowed married men, and not single men, to have that job in that area. Photo by Tammi Arender

Learning about Louisiana's Wildlife

Scientists study animals, plants, habitat at the Bob R. Jones-Idlewild Research Station

Glen T. Gentry Jr.

In 1956, the Idlewild Research Station, with its 1,800 acres of rolling hills and hardwood creek bottoms, became part of the Louisiana Agricultural Experiment Station. The station originally supported research on cattle, forages, horticulture, agronomy and wildlife. Through the years its mission has changed, resulting in a research station now focused on wildlife. The name was changed in 2007 to the Bob R. Jones-Idlewild Research Station, memorializing a local landowner and outdoorsman, who was instrumental in the original establishment of the station. Of the total acreage, nearly 1,300 acres are in some forest system. Loblolly pine predominates, but hardwood bottoms grow along Sandy Creek, which weaves through the station. There is also a 40-acre lake connected to a 4-acre overflow pond.

Research at the station includes cooperative forestry projects involving insect monitoring, stand improvement, weed control and forest products utilization. The station is home to two captive deer herds, white-tailed and red deer, in addition to a native population of white-tailed deer, turkeys and other upland game birds and animals. This station is also home to a herd of 70 beef cows and the base of operations for the feral swine research program. The station is the original site of research on controlling the invasive weed giant salvinia in Louisiana waterways, and that research continues.

Research with the captive deer herds includes improving artificial insemination techniques, vaccine development for epizootic viral diseases and improved animal husbandry. Annually, experiments are conducted to foster genetic improvement through improved pregnancy rates following artificial insemination. These trials use both the more conventional transcervical and the more invasive laparoscopic approaches. Briefly, the transcervical procedure is the placement of semen within the uterus by means of an insemination gun and vaginal speculum while the animal is restrained in a drop-bottom chute. Whereas, the laparoscopic procedure is conducted on an animal under general anesthesia and held on her back in a cradle. Three small incisions are made in the abdomen, and semen is injected into the uterine horns via a specialized needle system using a laparoscope to determine site of injection. Results have indicated that although both approaches result in acceptable pregnancy rates (greater than 50 percent), the laparoscopic approach is more efficient with pregnancy

White-tailed deer and red deer are part of a herd used for research purposes at the Bob R. Jones-Idlewild Research Station. Research with these captive deer herds includes improving artificial insemination techniques, vaccine development for epizootic viral diseases and improved animal husbandry. Photo by Olivia McClure

Of the total acreage of 1,800 at the Bob R. Jones-Idlewild Research Station, nearly 1,300 acres are in some forest system. Loblolly pine predominates, but hardwood bottoms grow along Sandy Creek, which weaves through the station. There are cooperative forestry projects involving insect monitoring, stand improvement, weed control and forest products utilization. Photo by Olivia McClure

rates reaching 80 percent. Efforts in this area of reproduction in white-tailed deer remain one of the main focuses of the white-tailed deer husbandry efforts.

Studies are also underway to determine the transmission of insect-borne viruses that result in hemorrhagic disease in both deer and cattle. Hemorrhagic disease is the most important infectious disease of white-tailed deer in the Southeast United States. This disease is caused by two related viruses, epizootic hemorrhagic disease or bluetongue virus. It is thought that these viruses are spread through biting midges. When white-tailed deer become infected, it is in most cases fatal. These types of diseases have detrimental effects in both captive and native white-tailed deer populations across the United States. In 2012, the South Dakota Game, Fish and Parks Department issued refunds for hunting licenses because of the negative effect of this disease on their native population. One recent result of the LSU AgCenter research effort was the development of a protocol that allows the Louisiana Department of Wildlife and Fisheries to collect bone marrow from deer carcasses found on the landscape. Once analyzed, scientists can determine if hemorrhagic disease was the culprit. Findings from these studies will also allow recommendations to be developed on how producers might combat transmission in a penned scenario. A more in-depth article on this research effort can be found in the fall 2015 issue of Louisiana Agriculture magazine.

The Bob R. Jones-Idlewild Research Station maintains a herd of 70 beef cattle for research purposes. Photo by Olivia McClure

Feral hogs have become the No. 1 animal nuisance in Louisiana, resulting in a negative economic impact of more than $70 million annually in the state, which is a conservative estimate. Currently, a research effort is focused on developing a toxic baiting system for feral swine. Lethal-dose trials were carried out to determine the dosage of the preservative sodium nitrite required to cause a

humane death in feral pigs. Also, preference trials are underway to determine the flavor as well as the bait formulation needed to deliver this toxicant to feral swine.

To date, 13 different bait components have been tested, and a matrix believed to assure consumption by feral swine has been determined. The current objective has been to determine an encapsulation protocol that will protect the sodium nitrite from the environment but allow release into the pig's digestive tract once consumed. Results from these experiments look promising, but refinement of this protocol is still needed. Because sodium nitrite is toxic to all mammals, albeit at different dosages, a delivery system will be a requirement before a toxicant is approved. AgCenter scientists are currently assessing one in-house system and two systems from the private sector so that when a bait becomes available, the effect on nontargeted animals will be either eliminated or significantly reduced. The goal before the product can enter the marketplace is for it to be effective only on feral pigs.

Giant salvinia has become the No. 1 invasive aquatic weed in the state, causing millions of dollars of lost revenue to the recreational industry and reduced property values for lakefront property owners across the state. Research conducted on this station over the past decade has shown that production of the salvinia weevil once released onto salvinia can be utilized as a primary biocontrol agent. The station operates one of three salvinia weevil nurseries to supply weevils to the Department of Wildlife and Fisheries for use on public waterbodies. The success of the salvinia weevil has been confined to areas of the state south of Interstate 10. However, in collaboration with the Department of Entomology, research trials are underway to identify a cold-tolerant weevil for use in waterbodies in north Louisiana.

Other research trials utilizing the native wildlife include varietal development of soft mast food, such as crabapples, mayhaws and apples, for wildlife in conjunction with plant breeders focusing on wildlife habitat improvement. Also, trials are conducted to determine the preference of native white-tailed deer for different commercially available forage mixes. Each year several forage mixes are planted on food plots and consumption differences are recorded.

The station is the original site of research on controlling the giant salvinia invasive weed in Louisiana waterways, and that research continues. Photo by Olivia McClure

Members of the Bob R. Jones Wildlife Research Institute board of directors are, left to right, Dearl Sanders, Ben McDonald, Ann Reilly Jones, William Shockey, Mike Salmon, David M. Ellison, David Bramletter, John Baron Jr. and Tom McVea. Not pictured are Klein Kirby, Rawlston D. Phillips Jr. and Thomas Terrel. Photo by Kathy Kramer

In 2015, the Bob R. Jones Wildlife Research Institute was established. The focus of the institute is to provide science-based information to wildlife enthusiasts, private landowners, corporate landowners and general stakeholders across Louisiana in the area of wildlife and habitat management. The institute is governed by a board of directors from the private sector and currently has 15 adjunct and two appointed faculty members. In 2016, a scientific board was formed to advise the board of directors on ongoing research and future proposals. This private-public partnership is now poised to bring science-based solutions to wildlife issues for the stakeholders of Louisiana.

Glen T. Gentry Jr. is an associate professor and research coordinator at the Bob R. Jones-Idlewild Research Station in Clinton.

Battling Feral Swine

Research aims at effective, safe control

Glen T. Gentry Jr.

Feral swine (*Sus scrofa*) are considered an invasive species and continue to cause damage to agronomic cropping systems and human infrastructure, such as levees, and pose a significant human health risk across the United States.

These pigs are not native to North America. Domestic pigs were introduced by Spanish explorer Hernando DeSoto's expedition in the mid-1500s as a food source. This type of introduction continued through the 17th and 18th centuries by Spanish explorers. It wasn't until the early 1900s that the first introduction of the Eurasian Wild Boar occurred in Hooper Bald, North Carolina, for sport hunting. This was followed by secondary introductions into South Carolina, Georgia, Florida, Mississippi, Tennessee, West Virginia and California. Escaped or released Eurasian stock eventually crossed with decedents of those introduced by explorers or escaped domestic pigs resulting in a Eurasian-feral hog hybrid, which is present today across much of the U.S.

Because of the wild pig's adaptability, opportunistic eating habits and reproductive rate, the control of this invasive species has proven difficult. The gestation of the pig is 115 days, and feral sows typically give birth to 1.5 litters of six piglets per year, beginning at around 13 months of age. Because of this reproductive rate, it has been estimated that 70 percent of the existing feral pig population would have to be removed to keep pig numbers at steady levels. However, the only methods legally available for population control are hunting, trapping and snaring. Trapping uses a box or corral trap. Snaring involves use of a steel cable looped and attached to a tree in which the loop tightens as the hog passes through a confined space. All of these solutions have been shown to be short-term with little long-term effectiveness.

The use of poisons shows more promise than other methods for being more efficient, effective and economical on a large scale. Over a 30-year period, 18,000 pigs were removed from Santiago Island in the Pacific Ocean using hunting, poisoning, trapping and snaring. In one study these four control methods were compared. The researchers found that trapping and snaring were ineffective, shooting was moderately effective, and poisoning was the most effective. Poisoning was 11 times cheaper than shooting and 80 times cheaper than trapping. One concern with the use of poison is fear that nontarget animals will be negatively affected. To that end, not only is there a need for a toxic bait, but also an efficient and accurate delivery system.

Researchers have long known that pigs are more susceptible to methemoglobin formers than most other domestic livestock and humans, but the vast majority of wildlife species have not been tested. A methemoglobin former causes changes in the structure of red blood cells, resulting in cells that can no longer carry oxygen, thus causing suffocation. Pigs are more sensitive than other animals to these substances because they have low levels of a specific enzyme that reverses the process of methemoglobin formation. This makes methemoglobin formers, such as sodium nitrite, an attractive choice for use in feral pig control.

Sodium nitrite is used as a preservative in human foods and as an antidote for cyanide poisoning. Research from Australia has determined that it does not pose a significant hazard to the environment. This is because it is highly water-soluble, which results in hydrolysis of the sodium nitrite into sodium, nitrous acid and hydroxide ions, which do not accumulate in the environment. The risk of secondary poisoning is, therefore, reduced or eliminated. Studies have shown that the half-life (amount

Corral gate used to capture feral swine. Photo by Glen T. Gentry Jr.

Feral swine in commercial-type corral trap caught in the Feliciana parishes. Photo by Glen T. Gentry Jr.

of time for a compound to decrease to half of its original value) of sodium nitrite in pigs to be between 29 and 62 minutes, meaning degradation of the sodium nitrite occurs rapidly. Data from research trials have indicated that nitrite levels in thigh muscle, liver and small intestine samples collected between one and seven days post-death from pigs poisoned with sodium nitrite were less than 100 parts per million. This concentration is less than 200 parts per million, which is considered safe for human consumption, according to the U.S. Food and Drug Administration.

Studies conducted at the LSU AgCenter have centered on the determination of the lethal dose of sodium nitrite for feral pigs, development of an effective delivery medium, and development of an effective and selective delivery system. All three of these goals are necessary for the successful labeling of a feral swine toxic bait.

For determination of the lethal dose, wild-caught feral pigs were captured using commercial-type corral trapping systems in East and West Feliciana parishes. Feral pigs were then weighed and dosed with a known amount of sodium nitrite. The number of pigs that expired and the time from administration of sodium nitrite to death were recorded.

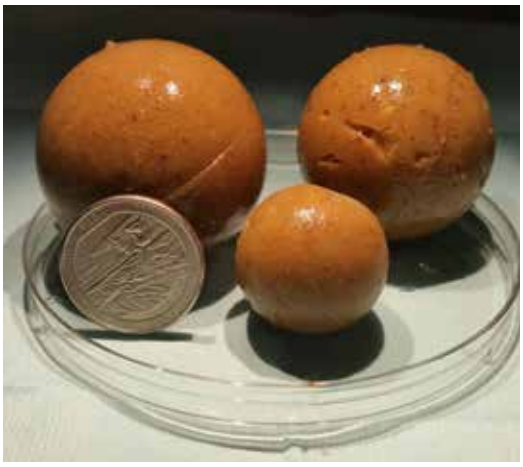
Over the course of the study, concentrations from 0.00192 to 0.00336 ounces per pound were tested, and the LD90 (lethal dose required to kill 90 percent of the test population) was determined to be 0.00291 ounces per pound, or 182 parts per million, equating to a dose of 0.15 ounces to kill a 50-pound pig. Pigs died at all dose concentrations tested, with 25 percent of pigs dying at 0.00192 ounces per pound and 100 percent at 0.00336 ounces per pound. This indicates that there is some variation in the susceptibility of the wild pig population to the effects of sodium nitrite. However, there was no difference in time to death across all tested dosages with pigs succumbing at an average of 2.5 hours. Also, data showed that the sex and the weight of the pig had no influence on the success of the sodium nitrite to induce its toxic effects.

The second aim of the study was to determine an effective delivery medium, or a bait, that pigs prefer. LSU AgCenter researchers conducted preference trials introducing bait flavors to individual pigs. Using remote video cameras the researchers determined the preference of pigs to a pair of baits offered. As a pig approached the feed pan from any direction, both baits were equally available. Researchers analyzed the video to determine the amount of time each pig spent consuming each bait until one of the bait pairs was completely gone. The percentage of time the pig spent eating a particular bait was then analyzed to determine preference. In most cases the pig would consume all of one bait before starting on the other. Each pig was considered one trial and multiple trials on multiple pigs were conducted.

Because pigs readily consume whole-shelled corn, this food was used as a control to which all other baits were compared. Foods tested include white oak acorns, strawberries, marshmallows, peanut butter, fish meal, grape jelly and corn soaked in diesel fuel. In all cases, the pigs preferred corn. Comparison with fresh bass resulted in no preference. However, when bass was dehydrated,

Tube feeding of a feral pig to determine lethal dosage of sodium nitrite. Photo by Glen T. Gentry Jr.

Amount of sodium nitrite needed to kill a 50-pound pig. Photo by Glen T. Gentry Jr.



Bait prototype. Photo by Glen T. Gentry Jr.

the pigs preferred it over corn in almost all cases. The pigs showed a similar preference for dehydrated pogie fish. Therefore, the LSU AgCenter prototype bait now utilizes dehydrated pogie fish.

Currently underway are trials comparing different encapsulation formulations to protect the sodium nitrite from the environment and the bait manufacturing process to prevent hydrolysis and to hide its taste. Sodium nitrite readily reacts with humidity and air to form other compounds not as potent as methemoglobin formers, resulting in a compound that is five times less effective. Because of the pig's great sense of smell and taste, sodium nitrite is not readily consumed in its base form and must be "hidden" from the olfactory (smell) and gustatory (taste) systems. Early laboratory studies have shown that the LSU AgCenter's encapsulation formulation shows promise. The next step will be to determine its effects on feral pigs, and this work is underway.

Concurrently, AgCenter researchers have developed a delivery system that will eliminate nontarget collateral damage with near real-time operator control, allowing delivery of baits to feral pigs only. Recently, researchers began testing a system that utilizes audio recognition to determine if pigs were present and opened feeding doors for the pigs to access. The system now works with visual recognition software that will ultimately recognize pigs and allow feeding while also recognizing bears, resulting in feeding doors closing and the system going into lockdown mode.

AgCenter researchers have also been testing a wild pig feeder developed in Florida that uses a different design to only feed pigs. This feeder utilizes a swing door that is unlocked by the weight of the pig and excludes bear via a grate fastened over the floor. The grate allows a pig's hooves to reach the floor and unlock the door, whereas, the bear's paw cannot reach the floor and is held up by the grate, thus not allowing access to the feeder.

There is no doubt that feral pigs pose significant threats to agriculture, native wildlife, civil infrastructure and human health. The LSU AgCenter will continue research efforts until a bait is approved for use on the landscape. With the sheer number of feral pigs across our nation, eradication may not be possible. However, the development of a toxic bait will add to the toolbox of measures to control and manage this invasive species.

Glen T. Gentry Jr. is an associate professor and research coordinator at the Bob R. Jones-Idlewild Research Station in Clinton. Zhijun Liu is a professor and researcher in the Medicinal Plant Laboratory in the School of Renewable Natural Resources. Matt Capelle is a research associate at the station. Mei Liu and Yixuan Dong are postdoctoral researchers, Xiaomei Fu is a visiting scholar, and Jian Zhang is a research associate in the Medicinal Plant Lab.

Acknowledgement
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Examining Regional Differences in

Feral Hog Damage in Louisiana

Shaun M. Tanger, Kurt M. Guidry, Trey Laviolette and Luke Habetz

Feral hog damage in the United States is estimated at $1.5 billion annually, based on a hog population estimate of 4 million individuals, but these estimates are conservative. While the awareness and concern regarding feral hogs in Louisiana has increased significantly over the past few years, quantifying the monetary losses created by this invasive species has been mostly anecdotal. To get a more accurate picture of how much economic damage results from feral hog activity, LSU AgCenter researchers conducted a survey.

During 2014 and early 2015, a questionnaire was mailed to more than 4,000 Louisiana agricultural producers. The response rate was 30 percent, with 1,192 responding. The purpose of this survey was to determine trends and patterns in feral hog damage to farming operations in the state, examining both commodity losses and other damages.

For each commodity listed in the survey, respondents were asked to provide the total number of acres produced in 2013, the number of acres damaged by feral hogs and an estimate of the percentage of yield loss or reduction experienced as a result of feral hogs. Price and yield data were obtained from the LSU AgCenter Louisiana Summary for Agriculture and Natural Resources.

The survey responses on the number of acres affected and estimated percentage yield losses were then combined with published data on state average yields and average prices for each commodity. The average yield per harvested acre in 2013, as reported by the Louisiana Summary, was used as the "normal" or "expected" yield producers would have experienced without feral hog damage. The average price received by producers in 2013, as reported by the Louisiana Summary, was used as the sales price producers were expected to make on their 2013 production.

With the published price and yield data, along with the survey estimates of acres affected and percent yield loss, the estimated economic impact of production losses to a particular commodity can be calculated as:

Economic Impact (by commodity type) =
Acres Affected x (Yield x Yield Loss Percent) x Price

It should be noted that this economic impact reflects only losses associated with yield reductions and does not reflect any potential effects from quality losses.

The second area of the cost section of the survey was designed to elicit information about other damage caused by feral hogs. These are identified as nonproduction costs and include increases to production costs (replanting and additional field cultivation), losses of stored commodities, losses to hunting lease income, losses of livestock and repairs and replacement of damaged equipment and farm infrastructure. Respondents were asked to provide their estimates of the costs associated with each issue as a result of the presence of feral hogs. Those costs were then tabulated for the entirety of responses and transformed into state-level estimates based on the survey sample response.

Feral hogs were reported to be most prevalent in the northeast, along the Red River, and along the Mississippi River, followed by southwest Louisiana. These locations may be an artifact of the survey sample. Because farmers were the respondents, those areas where farming is most common are showing up most in the maps designed from the responses. Another interpretation is that the hogs are merely sticking close to waterways, which provide areas rich in the organisms hogs browse upon.

Tables 1 and 2 show dollar values attached to production losses and nonproduction losses. Total production losses were tabulated to be approximately $55 million from the study respondents. Commodity loss categories indicate

Table 1. Estimated 2013 Crop Production Losses to Louisiana Agriculture from Feral Hogs[A]

Region	Soybeans	Corn	Rice	Hay	Grain Sorghum	Other[C]	Total
Northwest	$2,666,888	$1,002,855	$71,722	$620,456	0	$207,537	$4,569,457
North Central	$163,339	$334,284	$163,944	$244,012	0	$167,878	$1,073,456
Northeast	$2,611,517	$7,840,710	$861,173	$158,063	$20,678	$1,306,349	$12,798,491
West Central	$422,257	$802,520	0	$228,678	0	$129,170	$1,582,624
Central	$8,508,281	$2,309,679	$2,693,856	$914,561	$2,065,959	$1,775,691	$18,268,026
East Central	$3,445	0	$333,516	$13,992	0	$79,743	$430,696
Southwest	$666,359	$130,807	$1,903,473	$2,035,444	$124,629	$156,605	$5,017,316
South Central	$193	$1,192	$760,609	$626,821	$168,246	$400,911	$1,957,972
Southeast	0	$213	$1,015	0	0	$27,559	$28,787
Unidentified[B]	$3,017,833	$723,031	$2,093,618	$1,116,099	$316,399	$2,447,052	$9,714,032
Total	**$18,060,112**	**$13,145,290**	**$8,882,926**	**$5,958,126**	**$2,695,911**	**$6,698,493**	**$55,440,858**

[A] Losses associated with a reduction in yields directly attributable to feral hogs.

[B] Unidentified includes those survey respondents that did not indicate the location of their farming operation.

[C] Other includes losses associated with cotton, wheat, pecans, sugarcane, oats, unidentified grains, pasture d timber.

Table 2. Estimated 2013 Nonproduction Losses to Louisiana Agriculture from Feral Hogs[A]

Region	Increased Production Costs	Animal Injury and Deaths	Stored Feed and Commodity Loss	Equipment and Farm Damage	Wildlife and Natural Resources Damage	Other	Total
Northwest	$397,884	$1,796	$46,704	$194,092	$19,364	$44,908	$704,751
North Central	$198,494	0	$20,658	$134,724	$110,653	$361,061	$825,590
Northeast	$2,332,792	$13,886	$554,345	$302,231	$358,007	$205,859	$3,767,120
West Central	$187,716	$17,963	$68,260	$143,706	$64,668	$53,890	$536,202
Central	$2,748,374	0	$399,682	$1,082,282	$582,457	$1,517,892	$6,330,688
East Central	$331,152	0	$8,982	$214,660	$315,255	0	$870,049
Southwest	$2,440,142	0	$405,070	$611,648	$236,216	$176,938	$3,870,014
South Central	$141,909	0	$7,185	$113,168	$14,371	$35,926	$312,560
Southeast	$142,808	$18	0	0	$7,185	0	$150,011
Unidentified[B]	$2,171,123	$197,595	$245,198	$978,997	$350,283	$5,389	$3,948,585
Total	**$11,092,395**	**$231,258**	**$1,756,084**	**$3,775,510**	**$2,058,459**	**$2,401,863**	**$21,315,570**

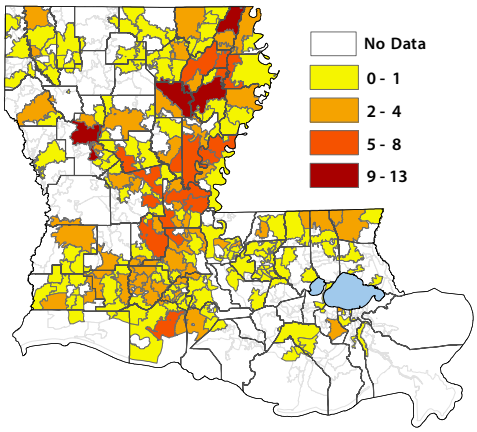
[A] Estimated value of impact associated with all impacts not associated with yield or production losses.
[B] Unidentified includes those survey respondents that did not indicate the location of their farming operation.

soybeans were hit hardest by feral hogs in overall dollar losses at more than $18 million, followed by corn at about $13 million, rice at nearly $9 million and hay at nearly $6 million.

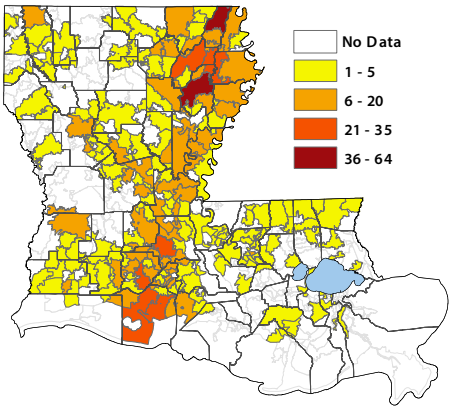
The total nonproduction-related losses were at more than $21 million statewide. Costs incurred (or dollar losses not related to lost production) indicate replanting costs were by far the largest. The second largest were additional cultivation costs, followed by damage to pastures and levees. The other category is a catchall for those not listed in the survey with specific headings.

Those numbers do not include losses associated with state and federal lands or other public areas within the state, nor do they include private lands (non-farms). The loss estimates here are strictly related to farming operations. Therefore, this total loss estimate is thought to be conservative. Nonetheless, this loss still represents a large enough economic loss that it should be considered a priority for state and federal policymakers to formulate prescriptions to mitigate these feral hog populations. Multiple public and private policy options should be cultivated to help stakeholders anticipate, recognize, evaluate and control the effects of this invasive species in the future.

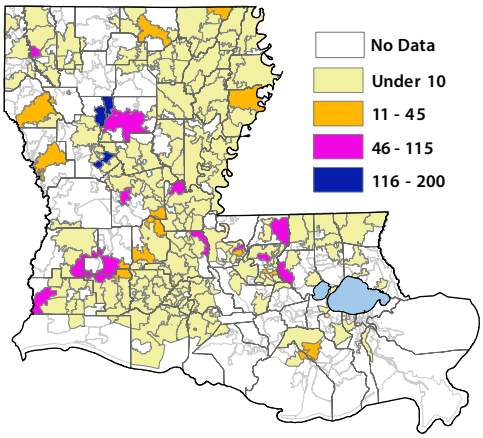
The northeast (District III), central (District V) and southwest (District VII) regions had the largest amounts of total damage for both production and nonproduction losses, with the northwest (District I) region also registering close to $5 million in production damage (Map 5 and Tables 1 and 2). Mitigation efforts are



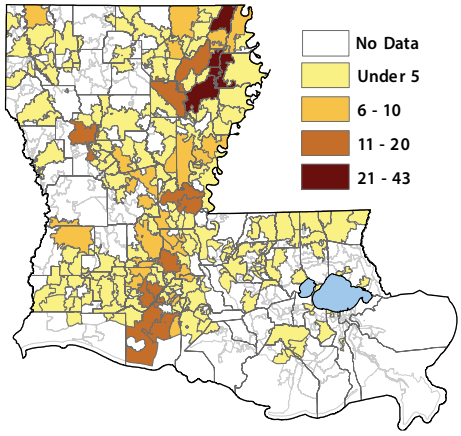
Map 1: Survey Response by Zip Code
This map indicates where the survey responses came from.



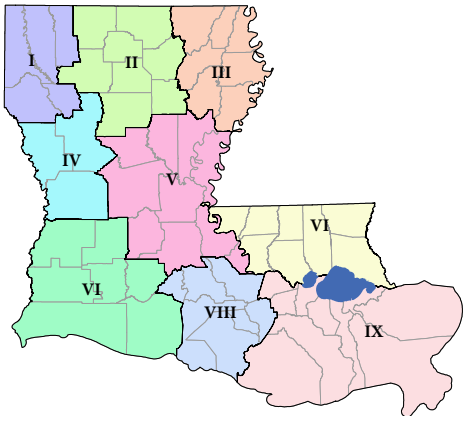
Map 2: Presence of Feral Hogs
These are the respondents reporting feral hogs on their property.



Map 3: Acres Damaged by Feral Hogs
Respondents indicated how many acres were damaged by feral hogs.



Map 4: Losses from Feral Hogs
Respondents indicated they lost value on their farms from hog damage.



Map 5: National Agricultural Statistics Service (NASS) Districts in Louisiana

likely to have the biggest per-acre impact if focused in these regions. For now, it appears that the problem is largely a rural one. Slowing the feral hog populations before they reach more densely populated areas is key to avoiding incidence of human-hog interaction and indirect effects on large populations.

Feral hogs are known to carry waterborne pathogens that can affect drinking water, including *E. coli, Campylobacter, Salmonella, Cryptosporidium* and *Giardia*, so they present a real threat to contaminating freshwater sources.

The results of this study are alarming because the effect on crops where damage in dollars is high is only a small percentage of acres of production. For example, the damage to soybeans at $18 million comes from only 5 percent of the acres reported. In 2013, soybeans generated $775 million in farm-gate value, so roughly 2.3 percent of overall value was destroyed by feral hog activity. Referring back to the population growth estimates for feral hogs, which predicts a doubling of the population in five years, indications are that the economic effects on soybean farmers could be quite devastating.

These survey results do not account for lawns and yards in rural and suburban locations – areas most likely to experience hog activity if populations continue to grow. It is not hyperbole to project a problem of hundreds of millions of dollars for Louisiana if feral hog activity proceeds unabated. Further, public land areas, which contain fragile and threatened plants and animals, along with a multitude of hunting opportunities, are not captured in the survey results but make up more than 2 million acres in the state. The effects on wildlife, as captured in lost hunting lease revenue, are significant, and it is a reasonable assumption that this would hold true on public lands.

Shaun M. Tanger is an assistant professor and Kurt M. Guidry is Gilbert J. Durbin Endowed Professor in the Department of Agricultural Economics and Agribusiness. Trey Laviolette and Luke Habetz are both undergraduate students in the department.

Environmental Best Management Practices for

Poultry Production in Louisiana

William E. Owens, Theresia A. Lavergne, Jason Holmes, Ernest Girouard, Donna S. Morgan, Corrine Ray and Neal Hickman

Louisiana's poultry industry, which is the largest animal industry in the state, generated $1.7 billion for the state's economy in 2015. The LSU AgCenter Hill Farm Research Station in Homer, which is in the heart of poultry-producing area, includes two broiler houses used to compare and evaluate the latest innovations in equipment and management techniques for raising broilers under commercial conditions. The station also has a laboratory facility capable of supporting a variety of demonstrations and evaluations that can help educate poultry producers so they can remain in compliance with regulations for nutrient management and water quality.

In recent years there has been increased interest in the potential impact of agriculture on water quality. Lawsuits by environmental groups are seeking to force the U.S. Environmental Protection Agency (EPA) to establish federal numeric nutrient water quality standards for all states in the Mississippi River Basin. Louisiana agriculture is at the center of this action and must increase its efforts to educate producers in proper nutrient management procedures and conservation practices. There also has been an increase in EPA investigative activity involving Louisiana's poultry producers, with several site inspections of poultry operations and some rulings involving poultry producers.

To address the need for more education, demonstrations and training sessions on poultry environmental best management practices (BMPs) were conducted in 2014 and 2015. These sessions

were part of a Conservation Innovation Grant from the U.S. Natural Resources Conservation Service (NRCS). In August 2014, approximately 30 LSU AgCenter and NRCS agents met for training at the Hill Farm. In September and October 2014, workshops were held in Many and Ruston for poultry producers with approximately 120 producers in attendance. A poultry field day was held at the Hill Farm in June 2015 to summarize the grant results and train producers in BMPs. Approximately 120 producers, poultry field agents and extension agents participated. These sessions also allowed producers to enroll in the Louisiana Master Farmer Program and acquire credits for Phase I and II of the program, as well as continuing education credits for producers already certified as Master Farmers.

Topics covered at these sessions included the effect of the accumulation of exhaust fan dust on vegetation and on the ground next to exhaust fans at poultry houses. Over time, dust from the houses is expelled, and this dust is thought to contribute to the degradation of water quality after rain washes it from vegetation into runoff water. Other topics included the benefits and comparison of in-house pasteurization of poultry litter, NRCS guidelines for nutrient management plans and the Water Quality Index for Agriculture (WQIag). Automatic water collection units were used to demonstrate BMP methods and their impact.

Fan Dust Evaluation

To evaluate the impact of fan dust on runoff water quality, water samples were collected from plots at areas of high and low fan dust accumulation. Plots with and without grass buffer strips were used. Samples were collected after each sufficient rain event and evaluated for total phosphorus, total nitrogen, nitrate and dissolved phosphorus. A total of 36 rainfall events were evaluated over a two-year period from October 2013 to June 2015. Results indicate that fan dust caused an increase in nitrate in runoff water but did not exceed EPA-established limits of 10 milligrams per liter. There was also a slight increase in phosphorus and no increase in total nitrogen. The presence of a vegetation buffer reduced the amount of nitrate and total phosphorus present in runoff water.

One of the concerns about poultry houses and water quality is the accumulation of dust on the vegetation outside of the exhaust fans. Scientists at the LSU AgCenter Hill Farm Research Station conducted research on this and other topics of concern to the poultry industry and presented their findings at a series of workshops. Photo by Bruce Schultz

In-House Pasteurization of Broiler Litter

Poultry litter is the bedding and waste that accumulate in the house as each flock grows. After each flock, some of the litter is removed, and new bedding is added before the next flock. Periodically, all of the litter in a house is removed, and new bedding is added. Many broiler producers re-use litter from previous flocks to help reduce the amount of litter for disposal and to help defray production costs. In-house pasteurization of broiler litter can be a good litter management tool to allow re-use of litter. In this process the litter is pulled into long rows, called windrows, within the house. Each windrow is approximately 1.5 feet high and 4 feet wide. The poultry litter will then self-heat or compost, resulting in a reduction of moisture, ammonia and bacterial pathogens. This process, when properly done, allows the litter to be re-used safely.

Two local poultry producers participated in a project to demonstrate and evaluate in-house pasteurization of litter. Windrows were evaluated at the houses of these two producers and the Hill Farm for five flocks. The Hill Farm poultry houses were windrowed seven times during the demonstration. In addition, stacked litter – which is the litter removed and stored outside – at the Hill Farm was sampled for comparison to windrows for four flocks. Litter was sampled and analyzed for total bacteria count and moisture content. Litter temperature was measured during pasteurization. Results indicate that in-house pasteurization allowed litter to reach temperatures above 130 degrees F, resulting in substantial reduction of bacterial pathogens in litter and reduction of moisture. These beneficial effects were seen in both the producer houses and the Hill Farm houses. The most notable issue to in-house pasteurization is having enough time to windrow the litter with the short turnaround schedule often required by the industry. Proper windrow techniques were demonstrated to producers at the field days.

These training sessions on BMPs and nutrient management practices were conducted within the framework of the Louisiana Master Farmer Program, which was initiated more than 14 years ago in response to growing concern of impending regulations for agricultural producers across the state, regardless of commodity. Through voluntary certification, producers are learning about environmental stewardship through education, demonstrations and implementation of conservation practices. This, along with NRCS recommendations and expertise, will help maintain water quality standards and provide evidence to regulatory agencies that agriculture can be self-regulating in this critical area.

William E. Owens is a professor and resident coordinator at the Hill Farm Research Station in Homer. Theresia A. Lavergne is a professor and poultry extension specialist. Jason Holmes is an LSU AgCenter county agent and works with Louisiana's poultry producers. Ernest Girouard is the state coordinator and Donna S. Morgan is the regional coordinator of the Louisiana Master Farmer Program. Corrine Ray and Neal Hickman are research associates at Hill Farm.

Three Years of Giant Salvinia Biological Control Research on Cross Lake in Northwest Louisiana

Bobby Johnson, City of Shreveport, releases weevils on Cross Lake in March 2013. These weevils had been collected from the LSU AgCenter weevil nursery in Houma. Photo by Stephen Micinski

Stephen Micinski, Bentley Fitzpatrick, Bobby Johnson and Steve Williams

Giant salvinia is a free-floating fern native to Brazil. It is one of the world's most invasive aquatic weeds. The first natural population in the United States was found in South Carolina in 1995. Since then it has spread across the southern U.S., with its first report in Louisiana from Toledo Bend Reservoir in 1999. Although the plant is sterile, it grows by vegetative propagation and fragmentation. It can double in size in as little as three days at optimum temperatures.

The salvinia weevil is native to Argentina, Brazil and Paraguay. Its use as a biological control agent for giant salvinia has been spectacular in tropical regions around the world. Adult weevils feed on buds and leaves while the larvae tunnel inside the rhizomes or within the leaf base.

Steve Williams, City of Shreveport, and Bentley Fitzpatrick, LSU AgCenter research associate, release weevils on Cross Lake in March 2013. Photo by Stephen Micinski

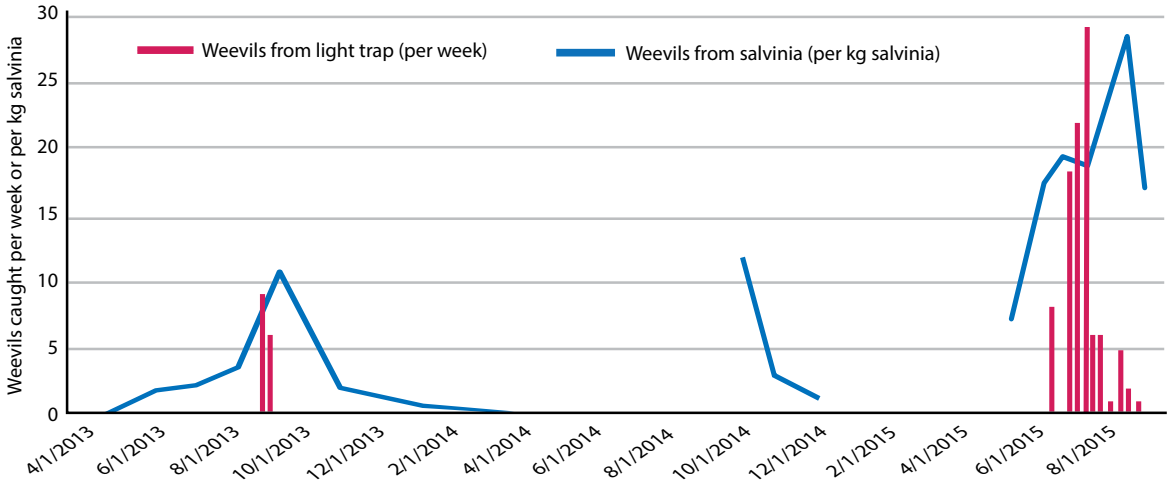
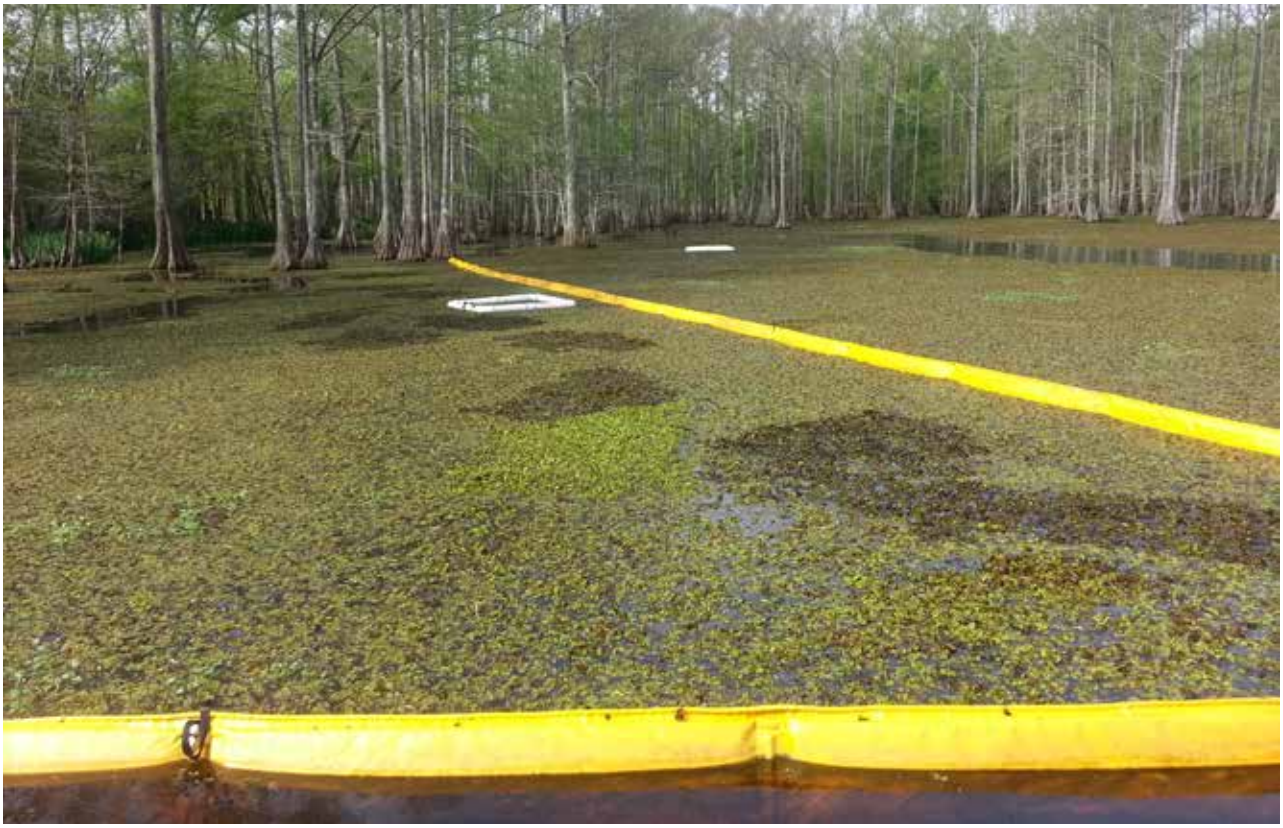


Figure 1. Salvinia weevil population changes after releases on Cross Lake in 2013-2015 and weevil light trap captures during the same period.

Although the weevil is controlling giant salvinia in south Louisiana, it has not been successful in north Louisiana. This is because the weevil is less cold tolerant than the giant salvinia. Thus, a cold winter in north Louisiana may kill off the weevils but only kill back the giant salvinia, while small protected pockets of the plant remain on area lakes. In the spring, the giant salvinia simply outgrows efforts to control it because of the absence of an established weevil population.

Salvinia weevil. Photo by Scott Bauer, USDA Agricultural Research Service



Release area in 2015 on Cross Lake. Dark areas are weevil-infested salvinia that had been collected from the AgCenter weevil nursery in Houma. Photo by Stephen Micinski

This research documented the problem of salvinia weevil winter survival in north Louisiana.The work also demonstrates the potential to use natural selection to establish a cold-tolerant weevil population.

Bobby Johnson, City of Shreveport, helps set up a black-light trap near a weevil release area in 2013. Photo by Stephen Micinski

Research conducted on Cross Lake centered on monitoring weevil populations after release and collecting any weevils that survived the winter to establish a cold-tolerant weevil colony for further study. In addition, a bucket-type, black-light trap was operated on the lake near the release sites to document the weevils' flight activity.

Weevil releases were made on Cross Lake from 2013 through 2015. After release each year, the population was monitored throughout the year and a light trap was operated to determine the weevils' flight activity.

In 2013, weevil numbers sampled from the salvinia release sites increased from 0.2 weevils per kilogram of salvinia in May to 10.8 weevils per kilogram in late September (Figure 1). From Jan. 5-7, 2014, 40 hours of continuous freezing temperatures were recorded on Cross Lake. These temperatures are generally considered lethal to salvinia weevils. On Jan. 14, 10 samples were collected from the 2013 release sites, and 16 weevils were recovered. These weevils were used to start a cold-tolerant weevil colony in 500-gallon tanks in a greenhouse at the Red River Research Station. This colony was tested in 2015 for cold tolerance by measuring their "supercooling" point, which is the point that represents the temperature at which the weevil's body water freezes. These weevils were found to be more cold-tolerant than weevils collected from other locations in Louisiana and from a cold-tolerant collection made in Australia. After this date, no more weevils were found in samples from Cross Lake in early 2014. This may have been because 93-98 percent of the salvinia did not survive the winter that year.

Due to the harsh winter of 2013-2014, giant salvinia on Cross Lake was killed back to small pockets located in protected areas often in association with other aquatic weeds. Because of the small amount of surviving salvinia, no weevil releases were made until August 2014. Although weevil numbers rose to 11.7 weevils per kilogram of salvinia in early October, numbers again declined, and no weevils were found to have survived the winter in early 2015.

Weevils were released again in April 2015 and by early September had risen to 28.4 weevils per kilogram of salvinia. Weevil numbers declined during fall 2015.

This research documented the problem of salvinia weevil winter survival in north Louisiana. Light-trap captures show that the weevils fly in response to increasing population levels or a decrease in food quality. The work also demonstrates the potential to use natural selection to establish a cold-tolerant weevil population. Further research is needed to determine what level of cold tolerance is needed to survive the winters in north Louisiana.

Other research efforts are focused on evaluation of agricultural row covers for the creation of winter refugia for weevils and on the optimization of weevil release methods to maximize the colonization of an area. In addition, the cold tolerance of weevil populations from South America is being evaluated in the laboratory.

Acknowledgements: Louisiana Department of Wildlife and Fisheries for funding.

Stephen Micinski is an associate professor, and Bentley Fitzpatrick is a research associate at the Red River Research Station in Bossier City; Bobby Johnson is a biologist, and Steve Williams is an environmental control officer with the City of Shreveport.

Researchers Look to South America for Help in Controlling Invasive Water Weed

Bruce Schultz

The idea sounded simple enough: To rid Louisiana of giant salvinia, an invasive species choking the waterways, return to the plant's origin and find the insect that feeds on this weed.

In South American countries where giant salvinia is native, the salvinia weevil feeds on the plant. So the insect was brought to Louisiana where it could feed on the aquatic weed.

Giant salvinia is an invasive species that came to the U.S. in the 1990s from South America. It grows rapidly and forms dense mats on the water surface, creating a cover that shuts out sunlight.

The weevil plan, started in 2008, worked well. Its successes include monitored sites in Lafourche Parish where infestation levels of giant salvinia were reduced by 90 percent within three years. But there was one hitch: Salvinia weevils can't tolerate the cold weather of north Louisiana as well as the plant can, according to LSU AgCenter entomologist Rodrigo Diaz.

So now Diaz has developed a new strategy to return to areas of South America that have winters similar to north Louisiana to find weevils that can survive cold temperatures.

Alana Russell, a graduate student, has been collecting the insects from Uruguay and northeast Argentina, which are along the same latitude as the Shreveport area.

Weevils found in Louisiana can survive 32 degrees Fahrenheit for eight days, but the weevils from Argentina can withstand freezing for 11 days. "The hypothesis is the weevils in Argentina have adapted to colder temperatures," Diaz said.

Australia has been using the weevil to control giant salvinia, Diaz said, and the insects have been able to adapt Down Under through three decades of natural selection.

But the control efforts for north Louisiana are not resting solely on developing a cold-tolerant weevil. To help the insects survive winter, AgCenter entomologist Steve Micinski is working on a plan to cover several patches of giant salvinia with pine straw to protect the insect from the cold with the goal of helping enough weevils survive the cold to keep pace with the rapidly growing giant salvinia.

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

Diaz is working on a similar project, but with a fabric covering over patches of giant salvinia during the winter to see if it is effective at insulating weevils from cold temperatures.

"So when spring comes, we'll have surviving weevils," Diaz said. "Biological control of salvinia is a numbers game. Salvinia grows fast, and weevils can't keep up."

In the cold, weevils become dormant and stop laying eggs. Giant salvinia also becomes dormant but starts growing as soon as warmer temperatures arrive. "The rate of growth of salvinia is so fast, and that is the problem," Diaz said.

Weevils also don't move fast, he said, and they seldom fly. They usually move by catching a ride on floating mats of giant salvinia.

Diaz is also looking at more efficient methods of distribution to maximize successful colonization. Until now, the weevils have been released at one location in an infested lake, but it's possible that a wider release would be more effective, he said.

Even if the new population of weevils from South America is more cold-hardy, that doesn't mean they can immediately be released into the affected area. Federal approval must be obtained first for their distribution, Diaz said. "It's difficult to say when this is going to happen."

Also, export permits must be obtained from the countries where the weevils are found.

Adult weevils feed on the growing buds of giant salvinia, Diaz said. "But it's the larvae that do most of the damage." Larvae burrow into the plant and cause it to collapse and sink, he said.

Herbicides have limited success on giant salvinia. If an herbicide only reaches the top part of a plant, it will die, but the rest of the plant can regrow, Diaz said. And it's physically impossible to get to every location where giant salvinia is growing, he said.

Giant salvinia can be controlled in lakes with a drawdown of water, but that's not an option for Cross Lake because it is Shreveport's water source.

To produce a stock of weevils, the insects initially were grown in a pond on private property in Terrebonne Parish, but it has been replaced by a site on LSU AgCenter property in south Louisiana.

The weevils are not sold. Instead, the LSU AgCenter provides the insect to the Louisiana Department of Wildlife and Fisheries for distribution in affected areas.

Bruce Schultz is a writer and photographer with LSU AgCenter Communications.

Mexican Rice Borer Continues Spread in Louisiana

Blake Wilson, Michael Stout, Julien Beuzelin and Thomas E. "Gene" Reagan

The Mexican rice borer (Figure 1), *Eoreuma loftini*, is a damaging pest of grass crops including rice, sugarcane and corn. The invasive species was first detected in Texas in 1980 and spread eastward reaching Louisiana in 2008. This pest has potential to cause significant yield losses in rice and sugarcane if infestations are left unmanaged. For more than a decade, entomologists with the LSU AgCenter have been monitoring the pest's eastward expansion and working to develop effective management tactics to protect Louisiana's rice and sugarcane.

Distribution and Range Expansion

Since 2000, Mexican rice borer populations in Texas and Louisiana have been monitored with traps (Figure 2). These traps are baited with a female sex pheromone that attracts male moths and are effective at detecting Mexican rice borer populations even at low densities. Because only the males, which do not lay eggs, are attracted to the traps, there is no risk of increasing the spread of this species through trapping efforts.

Since 2008, the species has spread eastward at an average rate of 10 to 15 miles per year. The Mexican rice borer has now been found in nine Louisiana parishes, including almost all of the major rice-producing parishes in southwest Louisiana: Calcasieu, Beauregard, Allen, Cameron, Jefferson Davis, Acadia, Vermilion, Evangeline and St. Landry parishes (Figure 3). The pest now infests sugarcane on the western edge of the sugarcane production area in Calcasieu, Jefferson Davis and Vermilion parishes. Rates of expansion are anticipated to increase as greater amounts of infested sugarcane are being transported to sugar mills farther east.

Pheromone traps are also used to identify "hot spots" of high Mexican rice borer populations. An extensive monitoring program involving more than 75 pheromone traps has recorded population levels across southwest Louisiana for the past three years. Spatial analysis using Geographical Information Systems was used to map Mexican rice borer populations (Figure 4). High trap captures occurred across Calcasieu and Cameron parishes in 2013. By 2014, populations in southern Jefferson Davis Parish had reached damaging levels. In 2015, high trap captures were recorded across Jefferson Davis Parish and in parts of Acadia Parish. These data indicate that once established in a new area, Mexican rice borer populations can reach damaging levels in just a few years. Captures in the more northern parishes of Beauregard, Allen and Evangeline remained low in each year. This suggests cooler winter temperatures at higher latitudes might reduce the potential for damaging infestations to develop in these areas.

Biology and Pest Status

Female Mexican rice borer moths lay their eggs on leaves and stems of rice, sugarcane, corn and numerous weedy grasses. Early larval feeding on plant surfaces causes characteristic orange-tan lesions in rice (Figure 5a). Yield losses occur when larvae then bore into stems and feed internally. Feeding that occurs on young rice and sugarcane often results in plant death. In rice, feeding that occurs after panicle initiation often results in a panicle that does not produce grain, which is referred to as "whitehead" (Figure 5b). In 2013, infestations in some fields in Calcasieu Parish caused nearly 4 percent of plants to have whiteheads, resulting in yield loss.

Figure 2. Mexican rice borer pheromone trap. Photo by Blake Wilson

Figure 1. Mexican rice borer, *Eoreuma loftini*, larvae (a) and adult (b). Photos by Bruce Schultz (a) and Anna Meszaros (b)

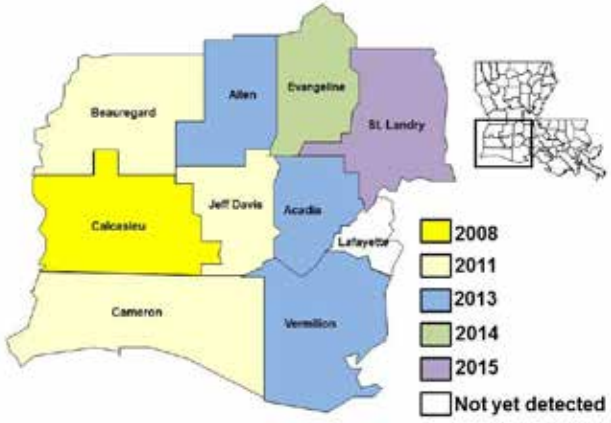


Figure 3. Mexican rice borer expansion in Louisiana, 2008–2015.

The Mexican rice borer is the primary pest of sugarcane in Texas and has proven difficult to manage because of the feeding habits of the larvae that shelter them from beneficial insects and insecticides. Infestations in Louisiana sugarcane were first detected in 2012 in Calcasieu Parish. Contrary to expectations, however, these infestations have been slow to develop. Mexican rice borer injury in Louisiana sugarcane has remained below 3 percent bored internodes in each of the past three years. Nevertheless, the potential for development of damaging infestations remains high, and drought conditions are known to exacerbate Mexican rice borer problems.

Pest Management

Control of the Mexican rice borer can be achieved through a combination of tactics. The insecticidal seed treatment Dermacor X-100 applied to rice for control of the rice water weevil provides effective control of stem borers. Foliar applications of pyrethroid insecticides are labeled for stem borer control in rice, although timing recommendations have not been developed. Additionally, early planting and removing rice stubble after harvest will aid in reducing infestations.

In sugarcane, reduced-risk insecticides, including insect growth regulators and diamides, have shown some potential for effective Mexican rice borer management. However, timing of insecticide applications is made difficult by overlapping generations and the cryptic nature of larvae. The threshold to trigger an insecticide application for control of the sugarcane borer, another pest of sugarcane, can also be used for the Mexican rice borer. This threshold is 5 percent of stalks with larvae on plant surfaces, and mixed infestations of the two borer species can be treated as a complex. Additionally, sugarcane varieties with some levels of resistance to the Mexican rice borer have been identified. In both sugarcane and rice, pheromone traps can be used to alert growers for the presence of potentially damaging populations and might help growers decide whether to use foliar insecticides.

Mexican Rice Borer Here to Stay

Because the Mexican rice borer feeds on weedy grasses and multiple crop hosts, there is no chance of eradicating the pest or preventing further range expansion. The invasive pest is expected to continue spreading eastward at its current rate, but much more rapid expansions can occur. An isolated population of the pest was detected in central Florida in 2012. This is thought to be the result of human-aided movement, although the nature of this movement remains unclear.

LSU AgCenter entomologists along with the Louisiana Department of Agriculture and Forestry will continue to monitor range expansion and alert growers when the pest has been detected in new areas. Increased awareness of the Mexican rice borer and cooperative efforts among LSU AgCenter personnel, rice and sugarcane growers, and other stakeholders will be needed to reduce the impact of this new pest. Involving growers and other stakeholders in the pheromone trap monitoring program is one way to improve early detection and awareness of this pest. If you are interested in obtaining pheromone traps to monitor fields, contact Mike Stout at mstout@agcenter.lsu.edu.

Researchers from the LSU AgCenter and Texas A&M were recently awarded a grant from the U.S. Department of Agriculture to study additional tactics for minimizing the impact of Mexican rice borers in Louisiana rice and to educate stakeholders about this new threat. Experiments are being conducted to determine optimal rates of Dermacor X-100 for control of both rice water weevils and Mexican rice borers, and commercial varieties are being evaluated for possible resistance. The effect of silicon and nitrogen fertilization on borer infestations will also be assessed, and yield reductions from borer infestations will be quantified. The overall goal of this USDA-funded grant is to develop and implement a multitactic management program for the Mexican rice borer that is compatible with the management programs for the other members of the pest complex in Louisiana rice.

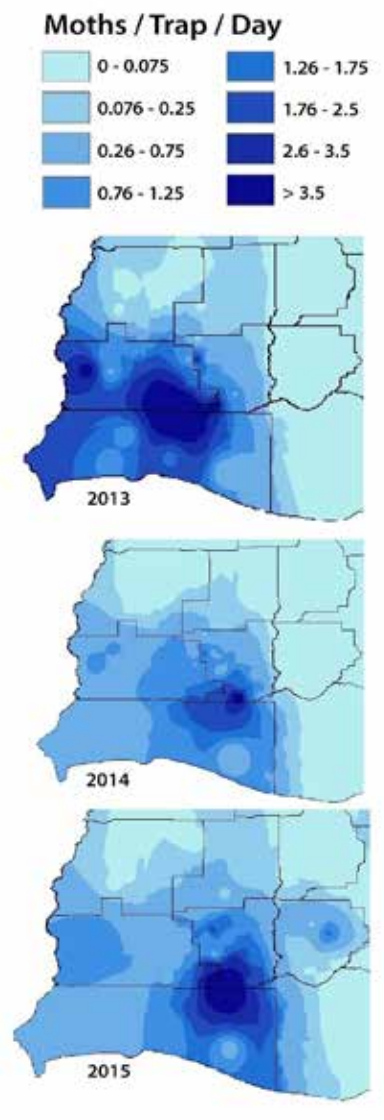


Figure 4. Mean daily trap captures for Mexican rice borer pheromone traps in southwest Louisiana, 2013–2015.

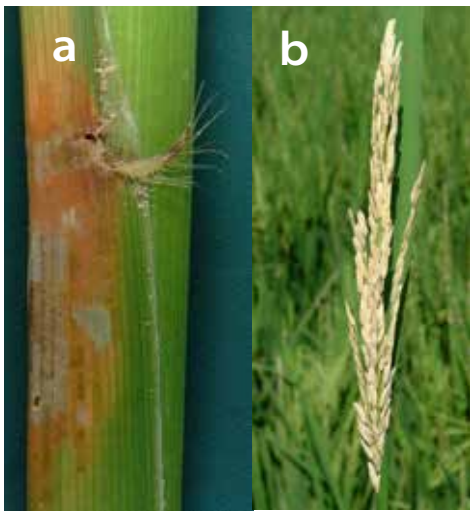


Figure 5. Mexican rice borer injury to rice (a) larval feeding lesion (b) whitehead. Photos by Johnny Saichuk

Blake Wilson is a graduate student in the Department of Entomology. Michael Stout holds the L.D. Newsom Professorship in Integrated Pest Management in the department. Julien Beuzelin is an assistant professor at the Dean Lee Research and Extension Center in Alexandria. Thomas E. "Gene" Reagan holds the Austin C. Thompson Distinguished Endowed Professorship in Entomology.

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Evolution of the Louisiana Crawfish Industry

Much of the southern and eastern part of Louisiana has a geography especially suitable for crawfish aquaculture – flat terrain, abundant water resources and clay soils. This is a crawfish pond in Kaplan. Photo by Ray McClain

Ray McClain

The crawfish industry in the southern United States can be dated back to at least the late 1800s, though there is some evidence to suggest that commercial trade in crawfish existed during the early 1800s as well. Markets were typically limited to those individuals and communities near the local fishery, and the "seasons" were likely restricted to a few weeks at best. Today, live crawfish can be found almost year-round, from early fall to August in some years, although the supply fluctuates greatly within the extended season.

The advent of crawfish aquaculture is responsible for this extended season and for increasing the supply exponentially over the past several decades. Crawfish yields from the capture fishery tend to fluctuate greatly from year to year and have experienced a general decline in the past 25 years (Figure 1). Over the same period, land area in Louisiana devoted to crawfish aquaculture has grown from 120,654 acres in 1990 to 225,789 acres today. Total annual crawfish production has increased from 61.1 million pounds to 127.5 million pounds, and total annual farm-gate value of pond-reared crawfish has increased from $34.1 million to more than $172.1 million during the past quarter century.

Crawfish aquaculture in Louisiana has continued to expand while other established aquaculture industries, such as catfish and baitfish production, have substantially waned, and some budding aquaculture industries like redfish and hybrid striped bass culture foundered within the state. Conversely, crawfish aquaculture in the U.S. outside of Louisiana has gone nowhere, with fewer than 7,500 total acres in production.

Proliferation and success of the crawfish industry in Louisiana can be attributed to several factors. Coupled with a well-established seafood harvesting, processing and distribution infrastructure, much of the southern and eastern part of Louisiana has a geography especially suitable for crawfish aquaculture – flat terrain, abundant water resources and clay soils. In addition, some 450,000 acres of rice production with established levee and irrigation systems and a desirable crop residue following the rice harvest provide farmers with assets highly desirable for crawfish culture. Low commodity prices over the past several decades and rising popularity of Cajun cuisine with crawfish as an iconic menu item gave rice farmers further incentive to incorporate crawfish into their farming system.

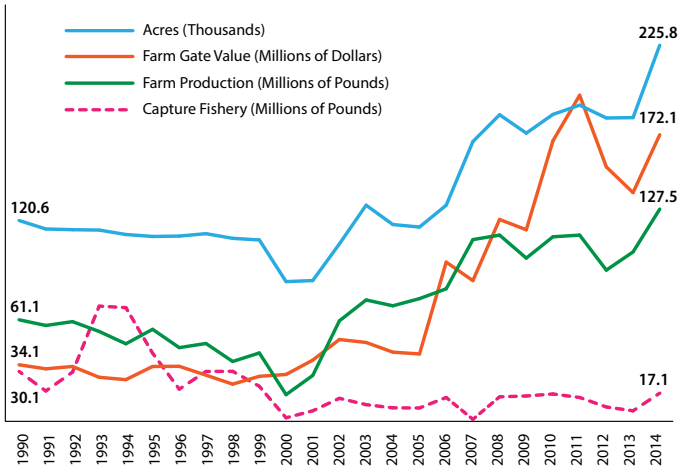


Figure 1. Estimated annual production of farmed and wild-caught crawfish and total acreage devoted to crawfish aquaculture in Louisiana over the previous 25 years. (Louisiana Summary of Agriculture and Natural Resources 2015, LSU AgCenter)

Wholesale and retail prices for live crawfish vary widely not only year-to-year but also within seasons because of wide swings in supply and demand. Photo by Ray McClain

While Louisiana produces the lion's share of live crawfish in the United States, markets extend well beyond Louisiana. Major markets can be found in metropolitan areas across the South, such as Little Rock, Dallas, Houston, Austin, Mobile, Jackson, Memphis and Atlanta. Wholesale and retail prices for live crawfish vary widely not only year-to-year but also within seasons because of wide swings in supply and demand. Expansion of the Louisiana crawfish industry and a diversification of the strategies used to produce crawfish have helped mitigate supply and price variations to some degree.

Crawfish aquaculture methods have evolved into two main strategies that account for slightly different seasons relating to market availability, albeit with a significant overlap in peak production during early spring. Strategies that rely on crawfish being produced in the same field year after year, whether as the sole crop harvested or in rotation with a rice crop, typically are capable of supplying markets the earliest after ponds are flooded in the fall. Crawfish not captured from the previous season that survived the summer draw-down period will make up a majority of the harvest early on. This allows producers to realize a harvest before the young-of-the-year crawfish reach market size later. Harvesting in "permanent" ponds often begins in November, but it is not unusual to find some yield in late October.

Farming operations that typically grow crawfish in rotation with a rice crop in a field rotational approach rarely begin harvesting in earnest before January, and often it's February or later. The reason for the later start in these systems is that when fields are in a rotation pattern and are not flooded and managed for crawfish the previous season, insufficient "holdover" crawfish exist. The bulk of the first harvests in these cases will be composed almost solely of young-of-the-year crawfish, which are spawned and recruited to the pond in the fall. It takes several months, depending on weather conditions, for the first wave of recruits to reach acceptable market size in harvestable numbers. Harvesting may be intermittent or sporadic early on for either of these production strategies. But as temperatures begin to warm in the spring, yields can greatly increase and then taper off at different rates.

Typical harvest profiles for these two different production strategies are depicted in Figure 2 from data generated over 10 consecutive years. The bars in the graph represent the average percentage of total annual yield achieved by month. Notice that harvests from permanent ponds began in November, peaked in April, and were completed by the end of May. Harvesting from the rotational ponds did not begin until January and also peaked in April, but harvesting continued into July. Thus, because of the complementary nature of these two production strategies, crawfish are made available to the public from November (and sometimes earlier) through July (and sometimes later), although supply is limited at the ends of the spectrum.

While crawfish yields from the wild crop or capture fishery may not be as high as they once were, that harvest often begins later in the spring (April or May) and may last well into the summer. The supply from the wild, especially when numerous, can have a significant contribution and further extend the availability of crawfish to the public. So, while crawfish may be available for nine or 10 months of the year, the supply is far from consistent; thereby, consumers typically still see the results of supply and demand in action regarding prices.

Brent Theunissen, research associate at the H. Rouse Caffey Rice Research Station, harvests crawfish. Photo by Ray McClain

Major markets for Louisiana crawfish include metropolitan areas across the South, such as Little Rock, Dallas, Houston, Austin, Mobile, Jackson, Memphis and Atlanta. Photo by Ray McClain

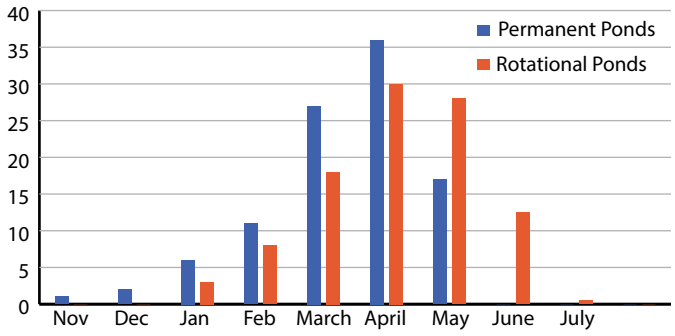


Figure 2. Average percentage of total annual yield, by month, for crawfish harvested from experimental ponds managed over a 10-year period to simulate either permanent (i.e., consecutive production in the same location) or rice-crawfish field-rotational systems of production.

Ray McClain is a Doyle Chambers Distinguished Professor at the H. Rouse Caffey Rice Research Station in Crowley.

Louisiana's Primary and Value-Added

Wood Products Industry and the Great Recession

Richard P. Vlosky

Forests cover 14 million acres or almost half of Louisiana and are an important part of Louisiana's history, culture and economy. Louisiana's forests represent an important resource for the state, both in terms of income to landowners and as inputs to the forest products industry. The harvest of timber, which is Louisiana's No. 1 agricultural crop both in terms of gross income and value-added processing, supports a solid wood forest products industry that consists of primary and secondary manufacturing establishments. Primary products are produced directly from logs such as lumber and plywood. Secondary products use primary products as input for re-manufacturing and include furniture, cabinetry, doors, flooring and millwork.

The largest demand sector for primary wood products is new home construction, also termed housing starts. Housing can be single family or multifamily, including apartments, condominiums and townhomes.

The secondary wood product sector follows because new homes include floors, doors and millwork. Also, when people move into new homes, they typically purchase new furniture.

According to Federal Reserve Economic Data (FRED), seasonally adjusted annual housing starts in the U.S. reached a peak of 2.2 million in the 2005-2006 period (Figure 1). Accordingly, the wood products industry was extremely healthy with record production and employment. However, the "Great Recession" of 2007-2008 marked two consecutive years of significant reductions in housing starts, severely harming the U.S. forest products sector, both primary and secondary. Housing starts have never fully recovered.

Louisiana's forest sector followed this sharp contraction in the national economy that began toward the end of 2007. From 2007 to 2008, the total sawlog harvest decreased by 326 million board feet (29 percent) to a cut of 970.9 million board feet. Pine sawtimber harvest decreased by 30 percent, to a total statewide harvest of 833.2 million board feet. The hardwood sawtimber harvest fell to 137.7 million board feet in 2008, which was a 21 percent decrease.

LSU AgCenter researchers conducted studies of Louisiana's primary and secondary wood product sectors in 2007 and 2014. In 2007, 620 surveys were sent to employers with a response rate of 14 percent. In 2014, 405 surveys were sent with a response rate of 19 percent. The respondents were not necessarily the same between the two years, and no paired comparisons were made. For the primary sector, the total number of part-time employees is estimated to have decreased 85 percent while full-time employees decreased almost 17 percent, indicating that this sector had not rebounded from the recession (Figure 2a). For the secondary sector, part-time time employees are estimated to have decreased 26 percent with full-time employees increasing 9 percent (Figure 2b). Although the secondary sector is tied to new housing starts, it is possible that manufacturers have either developed new markets or have shifted production to the repair and remodel demand sector.

Companies in each sector were asked if they planned to increase employees over the next five years. In 2007, for the primary sector, 38 percent of respondents said yes with an average increase per company of eight employees (Figure 3a). In 2014, the percent of companies saying yes declined to 23 percent, but the average number of employees anticipated to be added per company was 17. This suggests a mixed sentiment of whether the housing economy will increase or not. For the secondary sector, the percent of companies that indicated plans to increase employees declined from 49 percent in 2007 to 32 percent in 2014. In this case, a concurrent decline in the anticipated average number

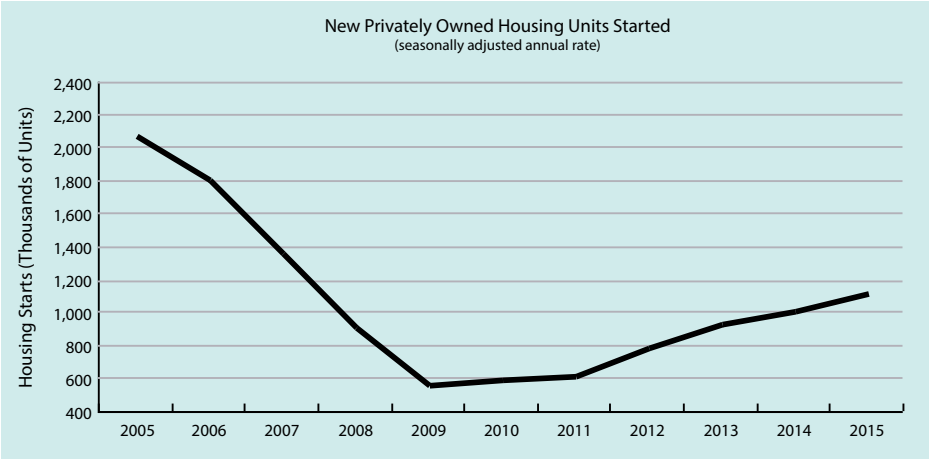


Figure 1. New Privately Owned Housing Units Started (seasonally adjusted annual date).
Source: U.S. Census Bureau

of employees to be added declined as well between 2007 and 2014 (Figure 3b).

Finally, respondents were asked reasons they did not have plans to increase employees over the subsequent five years. For the primary sector, in 2007, the main reason was "Lack of Markets," which corresponds to the decline in housing starts(Figure 4a). However, in 2014, the main reason was "Workmen's Compensation Costs" followed by "Can't Find Adequate Labor." With layoffs in the sector, many past employees went on to other careers or retired. The pattern is almost the same in the secondary sector, indicating the connection to housing starts in 2007 and cost inflation to hire new employees in 2014 (.

Results from these studies indicate that until housing starts rebound to pre-recession levels, both the primary and secondary wood products sectors in Louisiana will be depressed.

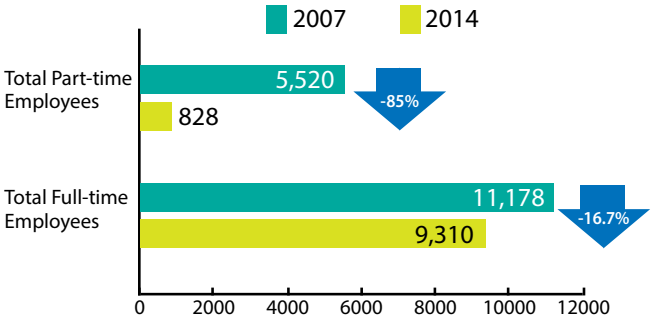


Figure 2a. Estimated Employees for the Louisiana Primary Wood Products Sector (extrapolated to total number of companies).

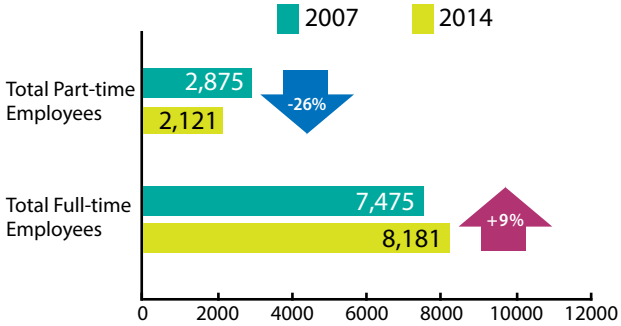


Figure 2b. Estimated Employees for the Louisiana Secondary Wood Products Sector (extrapolated to total number of companies).

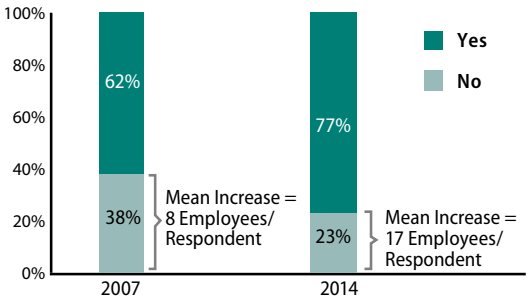


Figure 3a. Plans to Increase Number of Employees in the Succeeding Five Years in the Louisiana Primary Wood Products Sector (percent of respondents).

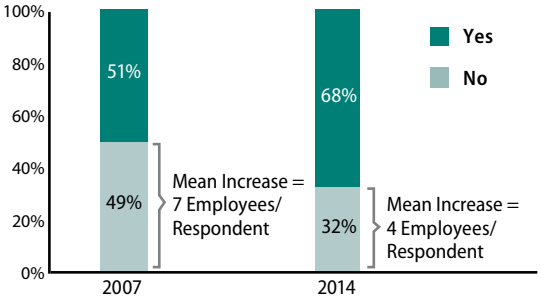


Figure 3b. Plans to Increase Number of Employees in the Succeeding Five Years in the Louisiana Secondary Wood Products Sector (percent of respondents).

2007	2014	
Lack of markets for my company's products	28%	22%	Workmen's compensation costs
Can't find adequate labor	21%	26%	Can't find adequate labor
Workmen's compensation costs	17%	4%	Can't afford to train employees
State taxes	17%	30%	Labor health costs are too high
I do not want to grow the company	14%	26%	Wages required to hire new employees
Labor health costs are too high	14%	13%	I do not want to grow the company
Federal taxes	4%	9%	Federal taxes
Local taxes	3%	17%	State taxes
Can't afford to train employees	3%	13%	Local taxes
Wages required to hire new employees	0%	9%	Lack of market for my company's products

Figure 4a. Reasons for not having plans to hire new employees in the Louisiana primary wood products sector (percent of respondents) (multiple responses possible) (2007 n=29, 2014 n=23)

2007	2014	
Lack of markets for my company's products	28%	34%	Can't find adequate labor
Workmen's compensation costs	28%	31%	Workmen's compensation costs
Can't find adequate labor	26%	25%	Wages required to hire new employees
Can't afford to train employees	20%	22%	I do not want to grow the company
Labor health costs are too high	18%	21%	Labor health costs are too high
Wages required to hire new employees	18%	16%	Lack of market for my company's products
I do not want to grow the company	14%	11%	State taxes
State taxes	10%	11%	Local taxes
Local taxes	10%	9%	Can't afford to train employees
Federal taxes	4%	9%	Federal taxes

Figure 4b. Resons for not having plans to hire new employees in the Louisiana Secondary Wood Products Sector (percent of respondents) (multiple responses possible) (2007 n=51, 2014 n=44)

Richard Vlosky is the director of the Louisiana Forest Products Development Center and the Crosby Land & Resources Endowed Professor of Forest Sector Business Development in the School of Renewable Natural Resources.

This is a panorama view of test plots at the H. Rouse Caffey Rice Research Station in Crowley. This LSU AgCenter facility was established in 1909 and was the first rice experimental station in the United States. Its mission is to improve rice production in Louisiana. Photo by Bruce Schultz

Keeping Rice Production in Louisiana Sustainable

Steven D. Linscombe

Sustainable agriculture is the production of food and fiber using practices that will ensure the ability to continue to do the same into the future. Sustainable agriculture is based on the principle that we must meet the needs of the present without compromising the ability of future generations to meet their needs.

In rice production huge strides have been made in sustainability over the past two decades simply from significant per-acre yield increases. U.S. rice yields have increased from 5,621 pounds per acre in 1995 to 7,572 pounds per acre in 2014. The inputs to produce the crop – including fertilizer, water, energy for pumping, pesticides and seed – have changed little in those 20 years. So, if you consider the output per unit of input, there has been a substantial improvement in sustainability.

Other sustainability considerations include the conservation of soil and water resources for rice production specifically and all agricultural production in general. Agricultural producers and industry leaders have long understood the importance of maintaining these resources. In fact, this understanding led to the creation of the Soil Conservation Service in 1935, whose main function was working with producers and landowners to minimize the effect of agriculture and forestry production on soil loss. The name of this agency was later changed to the Natural Resources Conservation Service to recognize its expanded role, especially in the areas of water conservation and quality.

Louisiana rice production can cite specific examples of improvements in conservation. Ten years ago, most southwest Louisiana rice was grown using a seeding method known as water seeding-pinpoint flooding. This method was used as a means of cultural control of the weedy relative of rice known as red rice. It involved working a seedbed in the water before seeding and then draining the field shortly after broadcast seeding, which was done with an airplane. One drawback of this system was the necessity of draining fields while the flood water still contained a large amount of suspended soil sediments that remained from the seedbed preparation in the water. This could lead to soil erosion from the rice field, as well as increasing the sediment load of the receiving water body. This practice, however, is used much less today because most producers have adopted the use of Clearfield technology, which allows for drill or dry broadcast seeding. In addition, many rice producers have incorporated minimum or no-till techniques into their production systems. This further minimizes soil loss and improves water quality.

Another area often cited in reference to sustainable agriculture is reducing the "carbon footprint" in farming. This is a general reference to the production of greenhouse gases associated with climate change, mainly carbon dioxide (CO_2), nitrous oxide (N_2O) and methane (CH_4). In many instances, attempts are made to measure the carbon footprint of every activity associated with the production of a crop, as well as that crop's end products. For example, in rice this would include not only the carbon equivalent production associated with the field of rice itself but also that associated with the production of the fuel, fertilizer and pesticides needed to produce, harvest and dry the crop, as well as those associated with the processing, transportation, packaging, etc., necessary to make the end product available on the grocery store shelf. In some cases in Europe, food products are being labeled with the estimated carbon footprint associated with that product.

Rice has somewhat of a negative reputation in this area because there is a fairly large amount of methane produced, primarily as a result of the aquatic nature of rice production. It is interesting to note that the amount of methane produced in an acre of rice is much lower than that produced by an acre of vegetative marsh along the Louisiana coast. This is because the

rice field is only flooded a few months each year while marshland is flooded year-round. Some might consider it ironic that Louisiana rice production is being questioned because of the methane produced, while every effort is being made to maintain and expand the coastal marshes.

Rice is grown as an irrigated crop in the United States and thus must use a large volume of water. While it might be possible to modify some practices to reduce water use, this is not an area where huge changes can be made in U.S. commercial rice production while maintaining profitability.

Sustainability in agriculture is also measured by how a crop's production affects the biodiversity of the region where it is grown. Here rice production gets a gold star. The environmental conditions under which rice is grown produce excellent biodiversity and provide habitat for a multitude of species. The co-production of crawfish in many rice fields in the fall and spring following rice harvest in Louisiana only enhances the region's environmental quality.

Rice production in southwest Louisiana is primarily in the coastal prairies, which are just to the north of coastal marshes. It is well-documented that this region is facing a substantial problem related to the annual losses to the state's coastal marshes, especially fresh and intermediate marsh. Thus, rice production in this area will only become more important in providing habitat to waterfowl, as well as other water birds.

In southern Louisiana many rice fields are flooded prior to planting beginning in January or February. These fields provide ideal habitat for high-priority shorebird species such as sandpipers, dowitchers, yellowlegs and stilts. These fields are also frequented by rosette spoonbills as well as egrets and herons. Later in the growing season, after the rice has been established and the plants are flourishing, this becomes excellent habitat for numerous species such as rails, gallinules and fulvous whistling ducks.

Steve Linscombe is the director of the H. Rouse Caffey Rice Research Station, which holds a field day every year in late June or early July. People from all over the world have attended these field days. Photo by Bruce Schultz

The rice fields and coastal marshes of southwest Louisiana typically provide habitat for more migratory waterfowl than any similarly sized region in the continental United States. Rice fields also provide excellent waterfowl habitat in all U.S. rice-producing states. Thus, in the area of biodiversity, rice is a model crop.

Steven D. Linscombe is American Cyanamid Professor for Excellence in Plant Genetics, Breeding and Variety Development. He is also the director of the LSU AgCenter Southwest Region and the H. Rouse Caffey Rice Research Station.

Annual Tomato Field Day
Grows into Popular Community Event

Johnny Morgan

Every year since 2009, the LSU AgCenter has hosted the St. James Parish Tomato Field Day at Raymond "T-Black" Millet's farm in Paulina.

Held the first week of June, the field day typically draws a crowd of 150-200 people. Over the years it has become a community event, attracting tomato enthusiasts from neighboring parishes as well.

There was one exception to the annual rule, however. LSU AgCenter extension agent Craig Roussel said in 2014, many parts of the parish had a serious problem with flooding the day before the field day.

"So we canceled. We knew the community would be pulling together to help their neighbors out, and we didn't want to interfere with that," he said.

The field day consists of a field tour, presentations and a free jambalaya lunch. Helping people grow better tomatoes is the goal. But the field day also offers the value of fellowship.

Preparing for the field day begins in December when tomato varieties are selected for the upcoming spring. Roussel looks for new varieties that have a good disease resistance package and have good reports from other states in the southeast U.S. Some of these varieties may have also been tested in LSU AgCenter variety trials.

Seeds of the selected varieties are then ordered from various seed companies, and the students in the Vocational Agriculture Class at Lutcher High School help by growing the transplants in their greenhouse. They also help, if available, transplant in the field around mid-March.

During the field tour, LSU AgCenter agents and specialists discuss the different tomato varieties, highlighting their disease resistance and their plant and fruit characteristics. Insect pests, weeds and herbicides are also discussed.

"It's important for us to address some of the challenges that growers have to deal with and provide them with a variety of solutions," said Mariah Simoneaux, LSU AgCenter extension agent. "These guys have techniques that have worked for them for years, but they are still open to new ideas."

Morning Glory and Red Morning are two early-maturing tomato varieties that were on display at the St. James Parish Tomato Field Day in Paulina on June 4, 2015. These are just two of the many favorite varieties of growers in south Louisiana. Photo by Johnny Morgan

LSU AgCenter agent Craig Roussel prepares judges for the tomato and cucumber taste test during the St. James Parish Tomato Field Day. Roussel gave the characteristics of the different varieties of tomatoes, cucumbers and bell peppers. Photo by Johnny Morgan

St. James Parish and the surrounding area have many small growers who sell tomatoes locally to grocery stores and at roadside stands. Many of them still prefer the older varieties, so the field day tries to showcase some of the newer varieties that have better disease resistance and higher production capabilities.

Most new tomato varieties are determinate types that grow to a predetermined height and stop because the terminal bud is a flower bud. An effort is made to get producers to consider growing determinate tomatoes and change their production methods to accommodate these varieties to maximize production, Roussel said.

Even though tomatoes are the main attraction, for the past couple of years several bell pepper and cucumber varieties have been added to the field day.

Other features added include the announcement of the winners of the 4-H Youth and Adult Spring Garden Contest. Also, a tomato taste test is conducted where participants can vote on the best-tasting variety. For the past two years to increase the friendly competition, a "Biggest Tomato Contest" has been included, which brings in individual tomatoes weighing more than a pound.

Roussel said community support and involvement provide the greatest satisfaction.

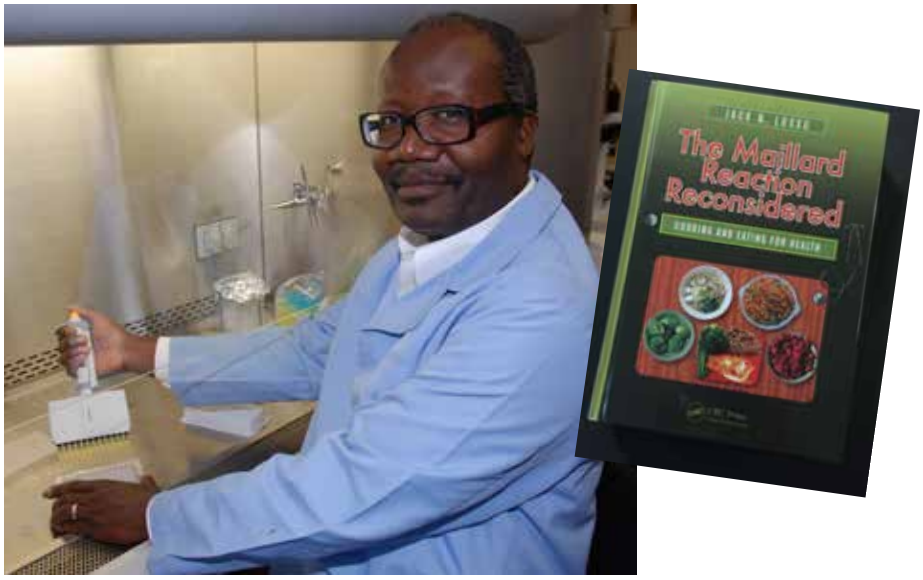
"My first year with this field day was 2012," he said. "I was absolutely amazed by the turnout, involvement and support – and to see growers producing some of the varieties that we have grown for the field day."

Johnny Morgan is a specialist with LSU AgCenter Communications.

Eat More Raw Food, Less Fried Food, No Burned Food

Losso's new book gives guidance on cooking for health

Linda Foster Benedict



Jack Losso, a professor in the School of Nutrition and Food Sciences at the LSU AgCenter, has just published a book, "The Maillard Reaction Reconsidered: Cooking and Eating for Health," in which he provides the science information on why people should avoid foods cooked at high temperatures for short periods of time. Photo by Olivia McClure

LSU AgCenter food scientist Jack Losso wants to help people eat better so they can be healthier.

Losso, who directs the Chronic Degenerative Disease Prevention Laboratory in the School of Nutrition and Food Sciences, has so much to say about the topic that he's written a 425-page book "The Maillard Reaction Reconsidered: Cooking and Eating for Health." It's available in hardback and as an e-book for a Kindle. A soft cover version will be coming out in the summer of 2016.

The Maillard reaction refers to the discovery by French chemist and physician Louis-Camille Maillard (1878-1936) that the reactions of sugars and proteins in the body play a role in diseases such as diabetes and hypertension.

In his book Losso explains how food preparation affects this reaction and how eating too many foods prepared at high temperatures that cause excessive browning, charring or burning may be harmful.

He takes aim at some popular foods – including bacon, peanut butter, pizza and lasagna – and recommends that people severely limit the consumption of these foods in the way they are often prepared.

Losso explains in the book how cooking produces both desirable and undesirable chemicals.

"As the cooking temperature increases, the Maillard reaction generates a mixture of flavorful, often toxic, and sometimes carcinogenic compounds," he said.

Frying bacon creates the most harmful conditions for the Maillard reaction, he said. The sugars and proteins in bacon, when heated, produce advanced glycation end products, known as AGEs, which play a role in the development of diseases, particularly diabetes. The proteins and fat, when heated, produce advanced lipid oxidation end products, known as ALEs, which also trigger adverse health effects.

Bacon is also high in salt and not recommended for people watching their blood pressure.

Losso has meticulously pulled together research studies and goes into great detail about how the accumulation of too many AGEs and ALEs and other chemicals in food can be harmful.

Peanut butter is full of AGEs and ALEs, he said, yet children are fed it sometimes daily.

"They would be better off eating raw peanuts," he said.

Losso said people with nut allergies can sometimes better tolerate raw nuts rather than nuts that are heated or cooked in other foods.

More than half his book is dedicated to recommendations on how to eat healthier and cook food to avoid the harmful effects of the Maillard reaction.

For example, pizza is safer to eat by heating it at less than the traditional temperature of 375 degrees or higher, he said.

He recommends using canola, sunflower or safflower oil to prepare pizza because these oils have a higher smoke point than the baking temperature. The smoke point of oil is the temperature at which the oil begins to break down and form acrolein, which is given off as a toxic gas.

"Eating pizza with beer or sweetened, carbonated beverages exacerbates the unhealthy effects," he said, adding that the beverage of choice is water.

Macaroni and cheese is healthier cooked on the stove top rather than baked, during which the temperatures are higher.

"Try to avoid high temperatures, short times, or HTST," he said. That's an acronym he suggests people remember.

Losso encourages people to eat more vegetables and fruits – at least five servings per day, which is the official recommendation from the U.S. Departments of Agriculture and Health and Human Services.

Even though he points out many problems with popular foods in his book, his message is not so much to fear food as it is to know your food.

"Everything in moderation is always good advice," he said.

His book is available through Amazon.

Linda Foster Benedict is the associate director for LSU AgCenter Communications and editor of Louisiana Agriculture.

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