

LOUISIANA Agriculture

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**Hammond
Research Station**
guides Louisiana nursery
and landscape industry
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Rice Research Checkoff Program Continues

Steven D. Linscombe

More than 40 years ago very far-sighted Louisiana rice industry leaders understood the importance of research to improve rice production technology. Through legislative action, the rice research checkoff program was established. As a result of an October 2013 Louisiana Supreme Court ruling, this highly successful program was declared unconstitutional. The court ruled that the checkoff program per se was not an issue, but rather the legislation that created it was flawed in the way the program was implemented. However, through the diligent efforts of numerous individuals, the checkoff was re-established in this year's legislative session. The new program will maintain the checkoff level of 5 cents per hundredweight of rough rice at point of first sale with a refund provision. The program will continue to be administered by a board made up of Louisiana rice producers. This board is appointed by the governor from nominations submitted by statewide rice producer organizations. The new Louisiana Rice Research Board will be made up of 15 members, who serve with no remuneration.

A few examples of the value of the checkoff program to the rice industry follow:

Louisiana rice yields have increased from 3,800 pounds per acre in 1972 (initial year of the checkoff program) to 7,500 pounds per acre in 2013. Much of this increase is attributable to new varieties and technology developed by LSU AgCenter scientists, whose projects have been partially funded by these checkoff funds. In fact, since 1972, 37 new rice varieties have been released by the Rice Research Station, and 19 of these have been released in the past 10 years. These include conventional long- and medium-grains, Clearfield long- and medium-grains and several specialty types, including Jazzman. The Jazzman varieties have actually created an entire new industry for Louisiana producers and processors. Several of these Louisiana-developed varieties are the only southern U.S. rice varieties approved by Kellogg's, which is a major purchaser of Louisiana rice.

Several years ago AgCenter scientists identified bacteria as the causal agent of the rice disease bacterial panicle blight. This has allowed for screening and selection of new varieties with more resistance to this disease. In addition, in 2011, scientists also identified several fields with a *Rhizoctonia solani* strain resistant to the strobil fungicides commonly used to control this major disease. They then quickly worked with industry and the Louisiana Department of Agriculture and Forestry to make Sercadis fungicide available the following year for use in those fields where resistance existed.

AgCenter scientists have conducted extensive research that has resulted in widespread adoption of conservation tillage systems. This allows for timelier planting and cost savings, as well as significant environmental benefits. Other research identified early zinc deficiency as the cause of the "mystery malady" syndrome, which had plagued many Louisiana rice fields for several years. Recently, the AgCenter has committed extensive resources to addressing the arsenic issue in rice. This research is paramount in providing science-based data to combat misinformation.

AgCenter entomologists have been instrumental in working with industry to make more effective, safer insecticides for use in rice production. This work has resulted in the development of several seed treatment insecticides that have done a better job of controlling major insects such as the rice water weevil. These seed treatment insecticides have also minimized detrimental effects of rice insecticides on nearby crawfish production fields. The entomologists have monitored the spread of the Mexican rice borer, a new pest of Louisiana rice production, and have been conducting pro-active research to minimize its detrimental effect.

AgCenter weed scientists are worldwide leaders in conducting research on controlling rice weeds more effectively and economically. These scientists are also noted for their groundbreaking work on controlling weeds that have become resistant to the herbicides used in the Clearfield production system.

These are just a few examples of how checkoff funds have returned dividends to the rice industry many times over. These research efforts are essential for the long-term viability of the Louisiana rice industry.

Steven D. Linscombe is a rice breeder and director of the Rice Research Station. He is also the director of the LSU AgCenter's Southwest Region.

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ON THE COVER: The Hammond Research Station in Hammond serves as a valuable resource for the nursery and landscape industry in Louisiana. This Victorian house once served as the residence for the director of the station. It now houses offices at the station. The flowers are lantanas – also known as ham and eggs because they turn both yellow as in eggs and pink as in ham, according to Dan Gill, LSU AgCenter extension horticulturist. See page 29. Photo by Igor Kamalov

Harrell to replace Saichuk as state rice specialist

Dustin Harrell, LSU AgCenter agronomist, has been selected to become the next Louisiana rice extension specialist. He will start the new job in January 2015 with the retirement of the existing rice specialist, Johnny Saichuk.

"Dustin will maintain a research program at the station in addition to taking on the additional responsibility of the extension education program for the rice industry in Louisiana," said Steve Linscombe, director of the LSU AgCenter Rice Research Station.

Linscombe said a doctorate-level scientist will be hired to assist Harrell in agronomy research.

The verification program that Saichuk conducted across the state will continue, Linscombe said. Under the program, the rice specialist works with a few farmers each year on fields in south and north Louisiana rice-growing areas, monitoring the crop closely from planting until harvest.

Linscombe said Harrell is "probably the best pure soil scientist we have had in that position in many years. He's done a lot of ground-breaking research to enhance productivity of both the first and second rice crops."

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

Saichuk said he's satisfied that he's retiring with the Harrell as the new rice specialist. "He's got all the tools he needs to do a good job. He's probably ahead of me when I started this job."

■ **Bruce Schultz**

3 AgCenter projects among first to get LIFT grants

Three AgCenter projects were among the 15 selected to receive the first round of LSU LIFT grants, which totaled \$500,000 across five of the campuses in the LSU System. LIFT stands for Leverage Innovation for Technology Transfer, and the grants are for developing proof for advancements that could lead to viable products or businesses.

Jeff Beasley, associate professor in the School of Plant, Environmental and Soil Sciences, received \$20,504. The grant will be used to integrate wireless sensor technology to simplify a new LSU irrigation and leaching control system designed to reduce irrigation consumption and potential nutrient leaching during nursery plant production. This technology will have the ability to help people in the ornamental industry better manage irrigation water resources. The others with him on the project are Ed Bush, also an associate professor in the school; Steve Hall, associate professor, Department of Biological and Agricultural Engineering; and Stacia Davis, assistant professor at the Red River Research Station.



Julie Anderson Lively, a researcher with the LSU AgCenter and Sea Grant, is developing an alternative bait for blue crabs that will be cheaper than the current bait, menhaden. The bait, made with shrimp waste and gelatin, will benefit Louisiana's crab and shrimp industries. Photo provided by Louisiana Sea Grant

Todd Shupe, professor in the School of Renewable Natural Resources, received \$39,844, which will be used for a project to reclaim preservatives and recycle treated wood to produce raw materials for spray-foam insulation. Others on the project are Rich Vlosky, also a professor in the school, and Jim Richardson, a professor in the LSU Department of Economics.

Julie Anderson Lively, assistant professor in the School of Renewable Natural Resources and Louisiana Sea Grant, received \$13,619 for developing a cost-effective blue crab bait from local seafood industry waste. ■ **Linda Foster Benedict**



Dustin Harrell. Photo by Bruce Schultz

4-H Food and Fitness Board learns about careers

The 24 members of the Louisiana 4-H Food and Fitness Board held their summer meeting in Baton Rouge July 15-17, where they were able to get some hands-on experience and career information from food industry representatives, said LSU AgCenter 4-H regional coordinator Lanette Hebert.

Their three-day visit included trips to the LSU AgCenter Food Incubator, Pennington Biomedical Research Center and Triumph Kitchen, a nonprofit organization that works with at-risk youth to teach them skills for work in the hospitality industry.

Many of the board's activities are funded through a \$60,000 National 4-H Wal-Mart Foundation grant, said Lanette Hebert, 4-H regional coordinator. Board members are responsible for the 4-H nutrition and fitness efforts in their parishes.

■ **Johnny Morgan**

Marsh Maneuvers teaches 4-H'ers about coast for 25 years

The Marsh Maneuvers 4-H summer camp is in its 25th year of teaching students about the ecology, anthropology, geology and hydrology of coastal Louisiana.

For four weeks in July, 4-H students from different parishes attend a five-day camp at Rockefeller Wildlife Refuge to learn about the coastal environment and its precarious future.

On each Thursday of the camp, students plant marsh grass along Bayou Petit Anse near Avery Island. Even though they have to trudge through mud and silty water, it's evident from the smiles on their muddy faces that they enjoy the experience.

Aleshia Mitcham, a freshman from Union Parish, said she surprised herself by enjoying planting marsh grass in mud and water. "It wasn't bad. It was really fun. Every step, it got funner," she said.

Mitcham will be relating what she learned at the camp to her classmates back home. "I'll tell them about coastal erosion and what they can do to stop it."

Ranna Robinson, a student at Algiers Technical Academy in Orleans Parish, said her favorite part of the camp was catching fish and crabs, but she was enjoying her own personal discovery of the marsh.

"We're learning all kinds of things we never knew," she said.

Robinson said she is eager to tell fellow classmates about the experience. "I'm going to tell them I had an awesome time at 4-H camp."

Mark Shirley, LSU AgCenter and Louisiana Sea Grant coastal resource specialist, has been conducting Marsh Maneuvers since it started. With funding help from the Youth Wetlands Program, Shirley conducts the classes and hands-on demonstrations. When he isn't talking about the coast, he's starting a game of volleyball or a spirited game of charades.

On Bayou Petit Anse, Shirley showed the students a canal dug decades ago where thick marsh grass was growing.



Mark Shirley, LSU AgCenter and Louisiana Sea Grant coastal resource specialist, explains benefits of marsh grass planting along Bayou Petit Anse. Photo by Bruce Schultz

"Thanks to a bunch of kids like you, an unprotected shoreline is now restored," Shirley told the group.

Shirley said Marsh Maneuvers first started as a summer camp experience only for Vermilion Parish 4-H junior leaders. "Then other parishes heard about it, and they wanted to do it," he said.

The camp began at Grand Terre near Grand Isle at a Louisiana Wildlife and Fisheries camp, which eventually became too dilapidated to use.

Marsh Maneuvers relocated west to Rockefeller Wildlife Refuge in 2004. Hurricane Rita hit the next year and damaged the facilities at Rockefeller, but repairs were made that allowed students to attend Marsh Maneuvers there in 2006, and the storm's aftermath provided a learning experience for the camp, Shirley said.

The Chenier Plains region, where Rockefeller Refuge is, differs considerably from Grand Terre, Shirley said. The current location provides more opportunity to see marsh in the freshwater, brackish and salt-water areas.

Students get a comprehensive overview of the coastal ecology, and they learn the marsh's role in producing seafood and serving as a storm buffer and wildlife habitat. Shirley said the Marsh Maneuvers lessons also include information on the importance of the coast to oil and gas production and how different ethnicities have adapted to the coastal environment.

He estimates 1,600 students have gone through Marsh Maneuvers. Some of the earlier participants now have children who are now going through it, Shirley said.

He said because of Marsh Maneuvers, some former students went into careers in related fields such as biology and ecology.

For example, Twyla Harrington became a Louisiana Sea Grant agent, and Anna Normand is getting her doctorate degree in wetlands soil chemistry, Shirley said.

But even students who end up working in a non-related profession will benefit from what they experienced, Shirley said. "They will have an appreciation for the coast, and that carries on for the rest of their lives. We're trying to create citizens who are aware of the coastal dilemma and what is occurring here." ■ **Bruce Schultz**



Matthew Campbell, of Union Parish, hauls marsh grass. Photo by Bruce Schultz



Jenna Kuttruff. Photo by Tobie Blanchard

Kuttruff promoted to department head

The LSU College of Agriculture has named Jenna Tedrick Kuttruff as the head of new Department of Textiles, Apparel Design and Merchandising.

Kuttruff has served as interim department head since it was established last fall. Prior to that, the department was a division in what was the School of Human Ecology, where she served as division head for two years. She holds the Doris Lasseigne Carville and Jules A. Carville Jr. Professorship.

"I want to help the department focus on the needs of the students and provide them with the education and skills that will allow them to contribute to and prosper in the textiles and apparel industries today and in the future," Kuttruff said.

Kuttruff received her bachelor's and master's degrees at Southern Illinois University in the Department of Clothing and Textiles with double majors in apparel design and merchandising. At the graduate level she received a minor in higher education. She earned her Ph.D. at Ohio State University.

Kuttruff subsequently taught textiles and apparel at Tennessee State University in Nashville and joined LSU's faculty in 1988 as the first curator of what is now the LSU Textile and Costume Museum.

"Dr. Kuttruff is committed to improving the profile of this newly formed unit while growing both its undergraduate and graduate programs and supporting faculty in their pursuit of teaching, research and service," said Bill Richardson, LSU vice pres-

ident for agriculture and dean of the LSU College of Agriculture.

The fashion design and fashion merchandising programs within the department were recently ranked among the best in the nation by Fashion-Schools.org.

■ **Tobie Blanchard**

College of Ag offers first dual enrollment class

Two high school agricultural science teachers spent a week at LSU preparing to teach a college-level course. Kelly Becnel and Danielle Newsom will teach Renewable Natural Resources 1001, which is the first course to be offered as part of the LSU College of Agriculture's dual enrollment program.

Students who take the course will get both high school credit and college credit.

Becnel will teach the course at Walker High School in Livingston Parish, and Newsom, who teaches at Abbeville High School in Vermilion Parish, will teach the course at the LSU AgCenter Vermilion Parish extension office to students from several high schools in the parish.

Becnel and Newsom worked with William Kelso and Reagan Errera from the college's School of Renewable Natural Resources. Kelso and Errera both teach Renewable Natural Resources 1001 at LSU. Kelso will be the professor of record for the college side of the class, but Becnel and Newsom will give all the instruction in the classroom.

Leslie Blanchard, assistant dean of the college, who is overseeing the dual enrollment program, said this program will serve as a valuable recruiting tool.



Leslie Blanchard is the assistant dean in the College of Agriculture. Photo by John Wozniak

The class will run for one semester. Blanchard said the College of Agriculture is planning to offer another dual enrollment course, Agriculture 1005 – Science and Society, at these schools in the spring of 2015. ■ **Tobie Blanchard**



Kathy Conerly. Photo by Olivia McClure

Conerly named FFA executive secretary

Kathy Conerly has been named executive secretary of Louisiana FFA. In her new position, she hopes to expand programs and use FFA to promote agriculture to Louisiana's next generation.

Conerly succeeds Ronald Mayeux, who passed away in April and was the executive secretary for seven years. FFA is affiliated with both the LSU AgCenter and the LSU College of Agriculture.

Conerly holds bachelor's degrees in horticulture and agricultural education and a master's degree in agricultural education, all from LSU. She taught agriculture for more than 30 years at Zachary High School.

FFA has great potential for growth in Louisiana, Conerly said. Many school officials are interested in improving or even starting agriculture programs, she said, because they provide unique experiential learning and career development opportunities. High school agriculture curricula cover a wide range of topics, exposing young people to career opportunities from agribusiness to veterinary science.

High schoolers enrolled in agriculture programs can join FFA, which is a national organization that promotes leadership and career development. FFA participants can attend conferences and compete for awards. ■ **Olivia McClure**

International Programs



Visiting scholars from Honduras Elam Aleman, Cesar Escalante and Mariano Sobalbarro with LSU Vice President for Agriculture Bill Richardson, second from left, at the Dean Lee Research and Extension Center field day on July 17. Photo by Olivia McClure

Honduran students get hands-on experience at AgCenter research station

Testing soybean varieties or studying cotton fertility in the heat of the Louisiana summer might not appeal to some LSU students. But three visiting scholars from Honduras have been doing just that at the LSU AgCenter Dean Lee Research and Extension Center in Alexandria, and they say it has been the experience of a lifetime.

Elam Aleman, Mariano Sobalbarro and Cesar Escalante are students from

the Universidad Nacional de Agricultura in Honduras. Aleman and Sobalbarro are working with AgCenter soybean specialist Ronnie Levy this summer to complete their undergraduate theses. They are helping with Levy's work on optimizing soybean yields as well as variety trials and development.

Escalante, a recent graduate of UNA who plans to attend LSU for a master's

degree in plant pathology, has been studying irrigation, fungicides, insecticides and fertility with AgCenter corn and cotton specialist Dan Fromme.

Because their university only offers a general agriculture degree, working at Dean Lee has exposed the scholars to areas of agriculture they weren't familiar with but, in some cases, are now interested in studying in graduate school at LSU.

"They're learning about everything from planting seed all the way through harvest, recording the data and relaying that information to the producers," Levy said. "That's important because in today's world, a lot of students in agriculture have the basic educational knowledge, but they don't have the practical knowledge of production."

The scholars say they've also enjoyed the extension work because it gives them a chance to meet people, practice English and learn about American culture. Escalante said he now knows not only how to design and manage experiments, but also how to share the results in a way useful to farmers.

"If you give knowledge to the producers, they can put it in practice and make progress," he said. "When I go back to my country, I will teach other people about extension. It's one way a country can go into the future." ■ **Olivia McClure**

Japanese company looks to AgCenter for expertise

Satellites in space may be far away, but two Japanese engineers are developing ways to use them to improve their country's rice crop.

Koji Wakamori and Dorj Ichikawa, chief engineers with the Japan Manned Space Systems Corporation (JAMSS), visited the LSU AgCenter on July 21-22 to discuss collaboration in remote sensing and data processing for agricultural purposes. They also attended the St. Landry Soybean and Rice Producer Field Tour and met with faculty at the AgCenter Rice Research Station.

Wakamori and Ichikawa, who work in JAMSS' business incubation center, spoke with AgCenter soil scientist Brenda Tubaña and nematologist Charles Overstreet, who use remote sensing in their research. They also heard from AgCenter engineer Randy Price and Tensas Parish agent Dennis Burns about unmanned aerial vehicles, or drones, which can be used to monitor crops and collect data.

"Developing appropriate collaborations with a diversity of public and private sector

international organizations is beneficial to strengthening the research, extension and training efforts of the AgCenter," said David

Picha, director of International Programs. "Much can be learned by collaborating with international agriculture firms, which can benefit Louisiana and the global community."

JAMSS is a private company that has designed modules used on the International Space Station and processes information from satellites. The company is now applying that technology to agriculture by helping farmers in the Japan Agriculture Union interpret data and imagery of rice paddies. They also monitor tomatoes in Australia and tea in Vietnam. ■ **Olivia McClure**

David Picha, director of LSU AgCenter International Programs, with Japan Manned Space Systems Corporation engineers Koji Wakamori and Dorj Ichikawa at the AgCenter Rice Research Station in Crowley. Photo by Susan Karimiha



Molecular Biology and Sugarcane Breeding in Louisiana

Niranjan Baisakh, Mavir Carolina Avellaneda, Andres Gutierrez, Arnold Parco, Nisar Khan, Jeff Hoy, Michael Pontif, Collins Kimbeng and Kenneth Gravois

Sugarcane is one of the most highly valued row crop in Louisiana, contributing \$2.79 billion to the state's economy when considering value-added components. In 2013, the crop was harvested from 439,256 acres with a yield of 34.3 tons of cane per acre, which translated to 1.46 million tons of raw sugar. This achievement has resulted from the combination of improved varieties, cultural practices and a growth-conducive cropping period.

New varieties are the life blood of Louisiana's sugar industry. Genetically improved varieties have sustained the productivity and profitability of the industry for more than 200 years. To date, sugarcane breeding has relied on intercrossing elite varieties, which are essentially derived from early hybrids of only a few clones within *Saccharum officinarum* and *S. spontaneum*. This has resulted in a narrowing down of the genetic base of the sugarcane gene pool, which can have negative repercussions, including low genetic gain for agronomic traits, which can lead to yield stagnation, and vulnerability to diseases and insect pests. Therefore, selection of the right parents with maximum genetic diversity is crucial in the primary crossing stage to realize maximum genetic gain in the next generation of new varieties.

Biotic stresses, such as brown rust and leaf scald diseases, and abiotic stresses, such as cold temperatures, cause considerable economic losses to the Louisiana sugar industry. Disease-resistant and stress-tolerant varieties are the most economical and environmentally friendly in an integrated crop management program. Growers suffer no direct

costs. However, sugarcane breeding is time-consuming, and variety development takes 13 years. In Louisiana, variety development has been primarily reliant on traditional selection based on observable characteristics. This is unpredictable because most traits in sugarcane are quantitatively inherited with low to moderate heritability, and their expression is highly influenced by environmental conditions. For example, rating for disease resistance based on the severity of symptoms can be misleading because disease development depends on weather conditions. Also, the durability of resistance can be limited by changes in the pathogen population that cause a resistant variety to become susceptible. Environmental variation masks the true genetic potential of plants, which makes identification and selection of the best progeny difficult.

Molecular markers, on the other hand, are unique DNA sequences linked with a particular trait of interest that are faithfully inherited over generations without being affected by the environment. Molecular markers are like landmarks on chromosomes that can direct us to select for a particular trait. Testing for the presence of a marker directly selects for a trait of interest. Selection based on molecular markers (marker-assisted selection – MAS) can be cost-effective. A large number of plants can be monitored for the presence of a gene or desired



Researchers use brushes to inoculate sugarcane leaves with *Puccinia melanocephala* spores for resistance to brown rust disease under controlled conditions. Photo by Mavir Carolina Avellaneda



After inoculation, the sugarcane plants are incubated under high humidity in a mist chamber to facilitate brown rust disease development. Photo by Mavir Carolina Avellaneda



Sugarcane plants grow in racks under controlled conditions for disease expression and rating. Photo by Mavir Carolina Avellaneda

able trait by a marker in the lab instead of erratic testing in the field.

Sugarcane, unlike rice, is not an easy crop for genetic studies because it has a highly complex genetic makeup. Identification of molecular markers for a particular trait is time-consuming. However, scientists at the LSU AgCenter are now developing molecular genetics tools to complement conventional breeding for development of improved varieties. Their approach is two-fold: 1) use modern molecular biology and genomics (genetics of the total gene pool of the crop) tools, such as gene expression, genetic mapping, etc., to identify molecular markers linked to a particular trait, and 2) use the molecular markers from the development pipeline in marker-assisted selection to enhance the efficiency of traditional breeding.

LSU AgCenter researchers are focusing on these objectives:

- **Maximizing genetic gain through desirable gene combination.** Using molecular markers, the genetic diversity of Louisiana sugarcane commercial germplasm has been characterized. In this way, useful genes from ancestral wild species are being tracked. This study provides an opportunity for informed selection of parents for crossing that will maximize hybrid vigor of the progeny.
- **Identification of molecular markers for disease resistance.** Molecular markers have identified the frequency and distribution of a brown rust resistance gene, known as *Bru1*, in the entire germplasm of sugarcane and related species in Louisiana. This effort led to identification of Louisiana sugarcane varieties that possess novel brown rust resistance

genes. The aim is to identify multiple genes contributing to disease resistance and markers linked to the genes. This will allow stacking of genes (gene pyramiding) through MAS that can provide a high level of durable resistance. Markers for resistance to leaf scald also are being developed.

- **Identification of molecular markers for cold tolerance.** AgCenter researchers have identified cold-responsive genes in a cold-tolerant energy cane (sugarcane bred exclusively for biomass). These genes are being mapped on the sugarcane chromosomes to identify molecular markers linked to cold tolerance genes. Identified genes and linked markers will be applied two ways: 1) selecting sugarcane with cold tolerance genes to extend the cropping season by protecting against occasional freezing temperatures and sugar loss due to subsequent bacterial invasion and 2) screening for cold tolerance genes in early generation hybrids to allow expansion of their cultivation as a second generation bioenergy crop outside of the traditional Sugar Belt.

Molecular marker technology has been successfully employed in other crops. Technology and a research team are now in place to enable integration of molecular marker technology with traditional sugarcane breeding. This will reap far-reaching benefits to the Louisiana sugar industry.

Niranjan Baisakh is an assistant professor in the School of Plant, Environmental and Soil Sciences. Co-authors are Mavir Carolina Avellaneda, Ph.D. student in the Department of Plant Pathology and Crop Physiology; Andres Gutierrez, Ph.D. student, and Arnold Parco and Nisar Khan, both postdoctoral research associates, all in the School of Plant, Environmental and Soil Sciences; Jeff Hoy, professor, Department of Plant Pathology and Crop Physiology; and Michael Pontif, assistant professor, and Collins Kimbeng and Kenneth Gravois, both professors, all at the Sugar Research Station.



Researchers at the Sugarcane Molecular Genetics Laboratory in the School of Plant, Environmental and Soil Sciences are, left to right, Nisar Khan, Arnold Parco, Niranjan Baisakh, Mavir Carolina Avellaneda and Andres Gutierrez. Photo by Olivia McClure

A Comparison of Bedding Sources for Commercial Broiler Production

Theresia A. Lavergne and William E. Owens

Pine shavings and rice hulls are the most widely used sources of bedding in commercial broiler production in Louisiana. The availability of these bedding sources decreases and their cost increases as the demand for these products, especially pine shavings, increases within the broiler industry or for other markets, such as wood products and building materials. Thus, the broiler industry always is looking for new sources of bedding that will not compromise production, efficiency of growth or animal well-being, as well as not increase ammonia emissions or phosphorus leaving the broiler houses.

Furthermore, because the nitrogen and phosphorus contents of litter make it a good source of fertilizer for forages and row crops, this must be considered when alternative bedding sources are evaluated. When compared to commercial fertilizer, litter is an economical source of fertilizer as long as it does not have to be transported long distances. However, the nutrient content of litter varies and needs to be analyzed and applied according to the needs of the crop.

To evaluate alternative bedding sources for the commercial broiler industry, research trials were conducted in the broiler research house at the LSU AgCenter

Central Research Station in Baton Rouge, and demonstration trials were conducted in the commercial broiler houses at the LSU AgCenter Hill Farm Research Station in Homer.

At the Central Research Station, a comparison of four bedding sources was conducted in three flocks of broilers. The bedding was new for the first flock and re-used for the second and third flocks. This is a common practice in the broiler industry. A total of 4,200 mixed-sex Cobb 500 broilers were used. The bedding sources were: 1) pine shavings, 2) rice hulls, 3) a pelleted blend of recycled newsprint and recycled cardboard treated with a proprietary chemical to adsorb ammonia, and 4) wood pellets. Each flock was reared for 42 days and fed a three-phase commercial feeding program. The bedding source used did not affect the body weight, average daily gain, average daily feed intake or feed efficiency in any flock when evaluated from day zero to day 42 of age.

For each flock, litter moisture was lowest for the wood pellet bedding, then for pelleted blend of recycled newsprint and recycled cardboard, and highest for pine shavings and rice hulls. Litter ammonium nitrogen was lower for the pelleted blend of recycled

Table 1. Summary of comparison of parameters for three flocks of broilers raised on wood shavings or cardboard pellet bedding. The data are means of one replication of each treatment over three flocks of broilers. Statistical analysis is not applicable.

	Wood Shavings	Cardboard Pellets
Feed conversion (feed:gain)	2.05	1.99
Average bird weight	8.74 lbs	8.98 lbs
Harvested paws	45.3%	61.4%
Ammonia levels		
Week 4	23.3 ppm/hr	15.8 ppm/hr
Week 6	35.5 ppm/hr	28.7 ppm/hr
Week 9	23.9 ppm/hr	23.4 ppm/hr
Moisture content	23.19%	22.98%



LSU AgCenter researchers are studying two new kinds of bedding to use in commercial broiler production houses – a pelleted blend of recycled newsprint and recycled cardboard treated with a proprietary chemical to adsorb ammonia, on the left, and wood pellets. They are comparing these to the two most widely used sources for bedding – pine shavings and rice hulls. Photo by John Wozniak

newsprint and recycled cardboard and for wood pellets than for pine shavings and rice hulls. Litter total phosphorus, total dissolved phosphorus and dissolved reactive phosphorus were lowest for wood pellets, then for the pelleted blend of recycled newsprint and recycled cardboard, and highest for pine shavings and rice hulls. Footpad dermatitis (lesions on the footpad) was not observed for any broilers on any treatment in any flock. The pelleted blend of recycled newsprint and recycled cardboard and wood pellets can be used as bedding for broilers and may have lower litter ammonium nitrogen, phosphorus and moisture content than pine shavings or rice hulls.

Additionally, the pine shavings and the pelleted blend of recycled newsprint and recycled cardboard were compared in the commercial broiler demonstration houses at the Hill Farm Research Station. The Hill Farm houses are 500 feet by 42 feet, solid wall houses, with tunnel ventilation, tube heaters, and stocked at approximately 22,000 birds per house. One house had pine shavings as bedding and the other had pelleted blend of recycled newsprint and recycled cardboard treated with a proprietary chemical designed to adsorb ammonia. The comparison continued for three flocks. Results are summarized in Table 1. Feed conversion was slightly better in broilers raised on the cardboard pellets (1.99 vs 2.05). Bird weight was higher and ammonia was lower for broilers raised on the pelleted blend of recycled newsprint and recycled cardboard. Percentage of harvested paws was higher (61.4 percent vs 45.3 percent) on cardboard pellets. This is important to the poultry industry because it has an export market for paws. Paws are primarily exported to China and Hong Kong. Bedding sources that can absorb ammonia will help improve paw quality. Paws have become a product that adds to the profit of the poultry industry as opposed to a product that used to be discarded. Overall, the cardboard pellets were superior as bedding material compared to wood shavings. However, the manufacturer of the pellets is currently not able to supply the pellets in sufficient volume to make it a viable alternative.

Each of the bedding sources used in these trials can be used in commercial broiler production. None of the bedding sources had a negative effect on broiler growth or efficiency of growth. However, the use of the pelleted blend of recycled newsprint and recycled cardboard treated with a proprietary chemical designed to adsorb ammonia or the wood pellets may improve litter quality and bird environment quality by reduced litter moisture, ammonium nitrogen and phosphorus. Also, all of these bedding sources still allow the litter to be used as fertilizer for forages or row crops.

Theresia A. Lavergne is a professor in the School of Animal Sciences, and William E. Owens is a professor at the Hill Farm Research Station, Homer, La.

SCIENCE NOTE

Measuring Carcass Quality of Crossbred Steers

Wayne E. Wyatt, David C. Blouin and Thomas D. Bidner

Steers with higher levels of Brahman breeding are often negatively perceived in terms of meat tenderness. Bonsmara is a South African breed created through crossbreeding of Afrikaner, Hereford and Shorthorn cattle. It is tropically adapted and believed to yield more tender cuts than Brahman-influenced cattle. The objective of this research was to evaluate steer calves for tenderness and carcass quality traits in breed combinations using tropically nonadapted Angus and tropically adapted Brangus cows with Braford (tropically adapted), Hereford (nonadapted) and Bonsmara (tropically adapted) sires.

Brangus dams were crossed with Braford, Hereford and Bonsmara sires, and Angus dams were crossed with Hereford and Bonsmara sires. Steers in the study totaled 63 Braford-Brangus (38 percent Brahman), 38 Hereford-Brangus (19 percent Brahman), 53 Bonsmara-Brangus (19 percent Brahman and 31 percent Afrikaner), 38 Hereford-Angus (no tropical adaptation) and 45 Bonsmara-Angus (31 percent Afrikaner).

Because backfat thickness varied among the breed types, the remaining traits were statistically adjusted to reflect a common backfat thickness.

The Hereford-Brangus steers tended to have heavier carcasses than their Braford-Brangus and Bonsmara-Brangus counterparts. Collectively, steers out of Brangus dams had heavier carcass weights than steers out of Angus dams.

The ribeye muscle area per 100 pounds of carcass weight provides a measure of muscling and varied among breed types. Steers out of Angus dams had collectively greater muscling than steers out of Brangus dams.

Breed types tended to vary in the percentage of carcasses grading USDA Choice or better, with the highest percentage in Hereford-Angus steers and the lowest percentage in Bonsmara-Brangus steers. Percentage of carcasses grading USDA Choice or better, however, was less dependent on the sire breed than on the cow breed. Consequently, steers out of Angus cows had a greater percentage of carcasses grading USDA Choice or better than those out of Brangus cows.

For the most part, USDA yield grades were similar among crossbreed types.

Not only were these steer carcasses uniformly tender across all crossbreed types, but they were exceptionally tender. A recent USDA certification procedure would have warranted a guaranteed "very tender" labeling on each of the crossbreed types in this study.

Data from this research indicate that the presence of Brahman breeding in the Brangus dams positively affected weight traits, whereas absence of Brahman breeding in the Angus dams positively affected carcass grade. Neither sire-breed nor dam-breed differences affected meat tenderness. In terms of sire-breed contributions, neither the extent nor source of tropical adaptation provided a distinct overall advantage in this study.

Acknowledgments: George Chapman of Bonsmara Natural Beef Company for providing funding for the project; Charles Looney of Ovagenix; the staff of the American Hereford Association; and the staff of the United Braford Breeders.

Wayne E. Wyatt is a professor at the Iberia Research Station, Jeanerette, La.; David C. Blouin is a professor in the Department of Experimental Statistics; Thomas D. Bidner is a professor emeritus in the School of Animal Sciences.



Figure 1. Eastern cottonwood in its third year grown on a retired agricultural field in southeast Arkansas. Photo by Hal Liechty, University of Arkansas at Monticello.

Benefits of Switchgrass and Cottonwood for Carbon and Nitrogen Capture on Retired Agricultural Fields in the Lower Mississippi Alluvial Valley

Michael A. Blazier, Hal O. Liechty, Matthew H. Pelkki, Jim J. Wang and Montgomery W. Alison

The Lower Mississippi Alluvial Valley is the 25 million-acre floodplain of the Mississippi River that extends from the confluence of the Mississippi and Ohio Rivers southward to the Gulf of Mexico. The region has abundant agricultural production, with approximately 17 million acres of farmland. This agricultural infrastructure, along with its central location within the United States, river and port access, and climatic and soil conditions that foster growth of a wide variety of crops, make the Lower Mississippi Alluvial Valley an attractive potential region for the development of bioenergy production facilities that produce energy and fuels from crops.

Private and public interests and investments in bioenergy are affected by concerns not only about its financial feasibility but also about the sustainability of bioenergy crop production. Since 2009, a collaborative research and extension effort between

the LSU AgCenter and the University of Arkansas at Monticello has focused on the production and ecological sustainability of eastern cottonwood (Figure 1) and switchgrass (Figure 2) as bioenergy crops in the Lower Mississippi Alluvial Valley. This study has focused on switchgrass and cottonwood because both were identified as model energy crops by the U.S. Department of Energy after a comprehensive evaluation of potential bioenergy crops. These two crops are being grown on retired agricultural fields with soil conditions that led to chronic low yields when in agricultural production.

These sites were selected because converting highly fertile agricultural lands to bioenergy crop production is unlikely because of the economic and social benefits associated with producing conventional agricultural crops on such sites. At these sub-optimal sites, cottonwood has produced up to

3 dry tons of above-ground biomass per acre per year, and switchgrass has produced up to 6 dry tons. In addition to providing this biomass as biofuel feedstock, research has shown potential ecological benefits associated with cottonwood and switchgrass.

Carbon

The bioenergy market is heavily influenced by domestic and international public policies that promote fuels that are relatively “carbon neutral,” by which carbon emitted during the cultivation of crops and burning of fuels is offset by capturing carbon in crop biomass (above- and below-ground) and in soil. Cottonwood and switchgrass have relatively high capacity to capture carbon above and below ground because they are perennial plants and have high growth rates.

At three locations in Arkansas and Louisiana over a three-year period, switchgrass had three times more carbon and cottonwood had 2 times more carbon in total above- and below-ground biomass than a soybean-grain-sorghum crop rotation that was conventional for similar soils. Switchgrass and cottonwood at these sites were similar in their above- and below-ground carbon allocation patterns, with each having approximately 70 percent of carbon above ground and 30 percent below ground.

Because of the differences and frequency in harvesting techniques, cottonwood and switchgrass differ in the accrual of biomass residue at the soil surface. Annual cottonwood leaf deposition forms a litter layer at the soil surface, but such a residue layer is much lower in switchgrass because most above-ground biomass is annually removed in harvesting. Greenhouse gas emissions from soil can also differ between cottonwood and switchgrass; in this study cottonwood had lower nitrous oxide (which is considered a greenhouse gas) emissions than switchgrass because it was only fertilized with nitrogen in its first year, whereas switchgrass was fertilized with nitrogen more frequently.

Previous land use can affect soil carbon trends when land is converted to cottonwood and switchgrass. The study sites

in Arkansas, which were in agricultural production until immediately prior to the establishment of the study, had 9 to 23 percent increases in mineral soil carbon three years after conversion to cottonwood and switchgrass. The study site in Louisiana had fields that were kept fallow and in pasture for several years prior to the study's establishment. At this site three years after conversion, mineral soil carbon decreased by 2 percent in switchgrass and 7 percent in cottonwood.

Nitrogen in soil water

Cottonwood and switchgrass are sometimes planted in buffers along waterways on farms in the area due in part to their propensity to enhance water quality by preventing erosion and filtering nutrients. At the Arkansas and Louisiana study sites, eastern cottonwood and switchgrass have shown lower nitrogen concentrations in leachate water than soybean and grain sorghum rotations grown on the same sites. Soybean and sorghum rotations had 5 to 10 times higher concentrations of nitrate as nitrogen, organic nitrogen and total nitrogen in soil water to a 1-foot depth than cottonwood and switchgrass. Nitrate nitrogen leaching losses at some locations were 20 to 40 times greater in the soybean-sorghum rotation than in cottonwood and switchgrass. The soil water nitrogen concentrations from soybean and sorghum likely were higher than cottonwood and switchgrass because of soybean's nitrogen fixation and the presence of living roots year-round in cottonwood and switchgrass. In contrast, soybean and sorghum roots were an annual source of nitrogen as they decomposed after the fall harvest.

Study implications

Results from this study indicate that if cottonwood and/or switchgrass were to increase in the landscape of the Lower Mississippi Alluvial Valley with the development of bioenergy production facilities that require such feedstocks, these crops could enhance the region's capture of carbon and nitrogen in biomass and soil. This increase in carbon and nitrogen sequestration can improve air and water quality. A more immediate implication of these results is that the hardwood-switchgrass buffer systems being established within the landscape to protect water quality appear effective at reducing nitrogen losses from farms.

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Michael Blazier is an associate professor at Hill Farm Research Station, Homer, La.; Hal O. Liechty is George R. Brown Endowed Professor, and Matthew H. Pelkki is a professor and Clippert Chair in the School of Forest Resources, University of Arkansas at Monticello. Jim J. Wang is a professor in the School of Plant, Environmental and Soil Sciences, and Montgomery W. Alison is an extension specialist at the Scott Research/Extension Center, Winnsboro, La.



Figure 2. Switchgrass grown on a retired agricultural field in northeast Louisiana. Photo by Hal Liechty, University of Arkansas at Monticello.

Management Practices of Louisiana and Texas Rice Growers

Bryce Blackman, Troy Autin, Natalie Hummel, Anna Mészáros, M.O. Way, Michael Stout and Debra Davis

Knowing how producers adopt new production practices is vital to research and program planning. Production practices in Louisiana rice have changed dramatically over the past decade. For example, herbicide-tolerant Clearfield varieties are now planted on nearly 60 percent of rice acres annually, the use of drill-seeding and hybrid varieties has increased, and seeding rates have decreased.

During this same period, the most important change in insect pest management has been the introduction of insecticidal seed treatments for managing the rice water weevil, an early-season pest that is consistently a major yield-reducer. The three currently available seed treatments are Dermacor X-100, CruiserMaxx Rice and NipsIt INSIDE. These seed treatments are effective against the rice water weevil and help protect the investment in expensive Clearfield and hybrid seed. In addition to new seed treatments, new insecticides have been introduced for managing the rice stink bug, which is the major late-season pest of Louisiana rice.

From 2008 to 2012, annual surveys were conducted to determine pest management practices in the rice industry in Louisiana and surrounding rice-producing states. Questions focused on sampling practices, insecticide use patterns and man-

agement tactics. Following each growing season, surveys were distributed during production meetings, through email and via a rice insect blog. Over five years, 851 surveys were completed from five states, with the majority (86 percent) from Louisiana and Texas. Survey respondents identified themselves as rice farmers (62 percent), consultants (20 percent), dealers (4 percent), and others, including extension agents and industry representatives (15 percent).

The average Louisiana respondent had more than 31 years of experience in rice production. More than 50 percent of farmers in Louisiana and Texas selected print media, consultants and production meetings as their top sources of information on integrated pest management practices (Figure 1).

The presence of rice water weevils in fields was reported by approximately 90 percent of respondents across all years. Respondents were asked to note tactics used against rice water weevils in one or more of the fields for which they were responsible (Table 1). Less than 10 percent of respondents used no management tactics. Responses showed that seed treatments were rapidly adopted after the introduction of Dermacor X-100 in 2008, and seed treatments of Dermacor X-100 and CruiserMaxx Rice were the most widely used management tactics in the last two

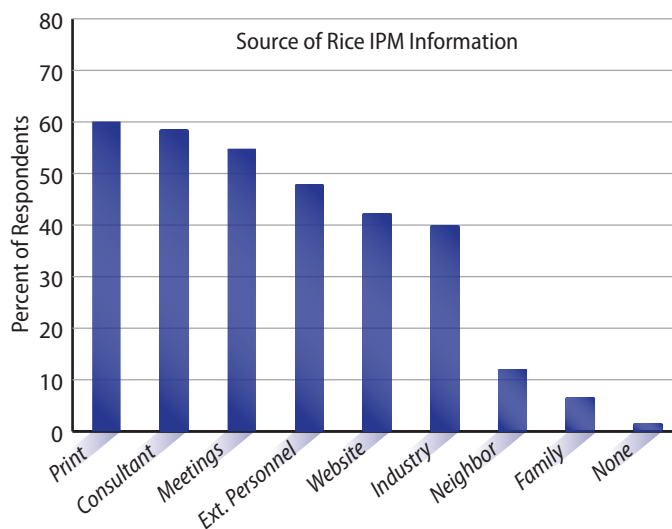


Figure 1. Percentage of respondents that use various sources of information on management of rice insects in Arkansas, Louisiana, Missouri and Texas.

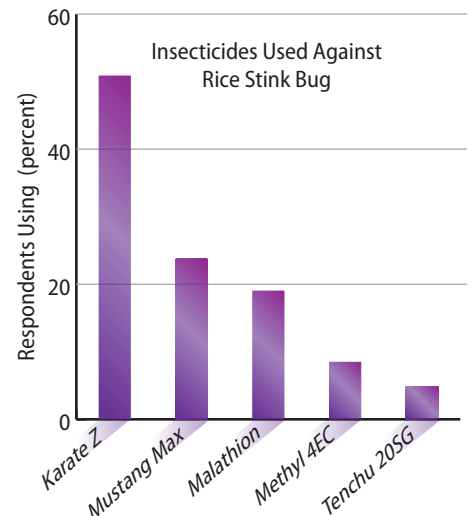


Figure 2. The five insecticides most widely used to manage rice stink bug populations as reported by 446 Louisiana respondents over 5 years. Tenchu 20SG did not have a full label in Louisiana until 2013 and was used under a Section 18 emergency label from 2010-2012.

years of the survey. The increase in the use of seed treatments corresponded with decreased use of pyrethroid insecticides and a reduction in draining of fields for weevil control from 43 percent in 2008 to 18 percent in 2012. Factors that likely contributed to the rapid and widespread adoption of seed treatments include ease of use and effectiveness against the rice water weevil and minor pests.

Respondents observed rice stink bugs in 79 percent to 89 percent of their fields over the survey period. More than 90 percent of respondents sampled for stink bugs from 2009 to 2012. Approximately 35 percent of farmers in Louisiana reported not spraying for stink bugs from 2009 to 2012, while 46 percent sprayed once per season. Only 14 percent of Louisiana farmers made two pesticide applications for rice stink bugs, and less than 5 percent sprayed three or more times. The majority of respondents treated their crops with the pyrethroid insecticides Karate Z or Mustang Max, while some respondents used the organophosphate insecticides malathion and methyl parathion (Figure 2). Recently, LSU AgCenter entomologists showed that after 50 years of use, malathion is ineffective against rice stink bugs, and methyl parathion use in rice is no longer allowed by the U.S. Environmental Protection Agency. Respondents chose not to alternate chemistries from one year to the next. During the

survey period, a new insecticide, Tenchu 20SG (a neonicotinoid), was tested against rice stink bugs and shown to be as effective as Karate Z. Use of Tenchu 20SG grew from 8 percent in 2011 to 16 percent in 2012 before receiving a full label in 2013 after the survey ended.

These surveys provide a valuable picture of producer practices while highlighting a need for more options for managing rice pests. Repeated use of insecticides in the same chemical class eventually will lead to insecticide resistance in the target insect. Heavy reliance on Dermacor X-100 for rice water weevil control and pyrethroid insecticides for rice stink bugs is cause for concern from a resistance management standpoint. Additionally, the use of draining fields to combat rice water weevils must be reexamined to ensure that it is cost-effective.

Even as more resources become available on the Internet, the use of print media and face-to-face meetings remain important to rice farmers. This survey demonstrates the continuing need for extension personnel to communicate relevant research to producers in person and through print publications.

Acknowledgments: The authors are grateful for the support of numerous extension agents and rice industry participants. This survey was supported in part by the Louisiana Rice Research Board and the USDA Southern Region IPM Program.

Table 1. Percentage of Louisiana respondents who reported using the listed methods to control or prevent rice water weevil infestations in one or more of the fields for which they were responsible. Respondents may have been responsible for managing pests in multiple fields and may have used multiple tactics in a single field; this explains why the sum of all categories for each year is greater than 100 percent. NipsIt INSIDE was used by only one respondent in all five years.

Method used to control rice water weevil (2008-2010)		2008	2009	2010	2011	2012
Cultural control	Delayed application of permanent flood	13	25	19	15	20
	Early planting to avoid infestation	18	31	25	23	39
	Drained field	43	37	30	20	18
Pre-plant	Dermacor X-100 seed treatment	17	51	63	53	64
	CruiserMaxx Rice seed treatment	N/A	N/A	19	26	36
Pre-flood	Pyrethroid impregnated on fertilizer	21	27	30	10	10
	Treatment with Trebon	9	8	3	3	0
	Foliar spray of pyrethroid	36	31	31	15	13
Post-flood	Foliar pyrethroid spray	39	45	34	16	20
	Treatment with Trebon 3G	20	13	4	1	0
Nothing		6	2	1	4	0

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Efficacy of Wetlands for Storm Damage Mitigation

J. Luke Boutwell and John V. Westra

Each year, tropical storms and hurricanes threaten the lives and livelihoods of Louisiana residents. In the past decade, powerful hurricanes have caused billions of dollars in damages to coastal communities. Even less-powerful tropical storms can cause widespread damage and interrupt economically important activities. The largest component of coastal storm damage is property loss from storm surge inundation.

Modern trends in coastal dynamics do not favor the alleviation of these damages. Coastal regions along the Gulf of Mexico are seeing relatively rapid population growth, which is expected to continue. Growing populations increase coastal vulnerability by placing more human and economic resources in areas that are known to be at-risk of storm damage. Additionally, hurricanes are expected to become more frequent and increasingly severe as sea temperatures, the fuel for hurricanes, rise.

Coastal wetlands are known to be an effective means of reducing storm surge energy. However, rapid wetland loss is reducing the capacity of natural coastal systems to mitigate damages. In recognition

of these notions, Louisiana plans to allocate \$50 billion through 2061 for wetland restoration and conservation projects, many of which are intended for storm impact reduction. The basis for these investments – that wetlands have the potential to reduce wave and storm surge energy – is well founded in physical science research. However, little is known about the context in which wetlands are most protective and the degree to which that protection is economically valuable.

Many factors influence the degree of damage inflicted by a coastal storm. Three factors are of interest in this research project. First, the amount of valuable property that is at risk of damage is expected to influence the severity of a storm impact. Second, because stronger storms generally produce a greater storm surge, the intensity of the storm can be expected to affect the resulting damages. Finally, the magnitude of damages will be influenced by the degree to which a region is protected from storm surge. In this analysis, the protection provided by wetlands is of particular interest.

An analytical method called factor analysis is used to explore the relationship between damages and the three factors of interest (economic risk, storm intensity and wetland protection). Through factor analysis, data describing each of these factors are combined in a manner that allows for the examination of the associations between each factor and economic damages. The factors are composed of two variables each, and the damage variable is included to observe how it is associated with the other factors.

The data used to describe economic risk are population and an estimate of the value of property and infrastructure that are vulnerable to storm surge flooding in each parish. For storm intensity, minimum barometric pressure and maximum sustained winds at landfall describe the factor. Finally, the presence of two wetland types, marine wetlands and estuarine wetlands, are used to represent the wetland protection factor.

The results of the factor analysis suggest that economic damages are most closely associated with the wetland protection factor. The economic damage variable and the wetland protection factor,

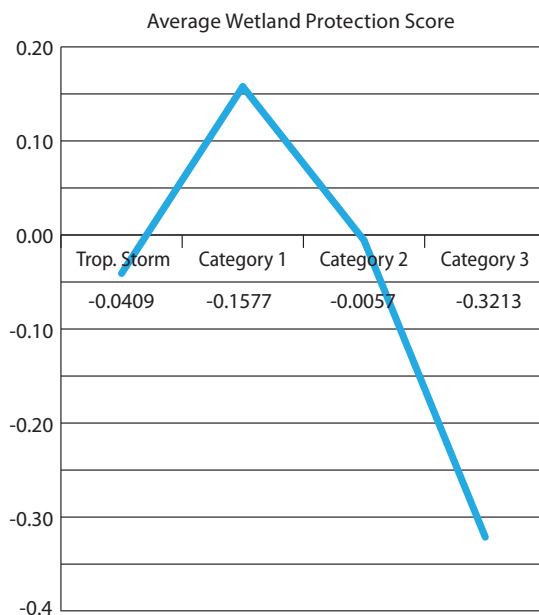


Figure 1. Average Wetland Protection Score. This figure shows the degree to which wetlands are observed to mitigate storm damages. A score of zero is the average for all parishes. Positive values indicate stronger damage reduction and negative values indicate weaker damage reduction.

which has a positive correlation with the wetland data, have a correlation of -0.361, suggesting that the presence of wetlands is associated with reduced storm damages. This value implies that the wetland protection factor embodies approximately 13 percent of the variance observed in tropical storm and hurricane damages. Considering the magnitude of storm damages, which are regularly in the hundreds of millions of dollars, this result suggests that wetlands are quite valuable for storm-damage mitigation. But from which storms do wetlands provide the greatest degree of protection?

To address this question, scores for the wetland protection factor are computed for each parish impacted by a storm used in the factor analysis. These wetland-protection scores describe relative to the sample average the degree to which wetlands are observed to have reduced economic damages for a parish that was impacted by a storm. A score of zero implies that that parish experienced a reduction in damages consistent with the relationship described in the wetland protection factor. Positive scores imply stronger damage reduction; negative scores suggest weaker damage reduction, although damage reduction is still observed.

The average scores for each category of coastal storm used in the analysis are shown in Figure 1, which shows a reduced capacity for wetlands to mitigate damages from stronger storms. This is thought to be the result of a physical threshold, beyond which the attenuating effects of wetlands for wave energy reduction are overcome by the static rise in water levels associated with storm surge. This result is important because it highlights the limitations of wetlands for use as damage mitigation measure for the most powerful storms. However, the findings also underscore the importance of wetlands in mitigating storm damage from more frequent, less-powerful tropical storms or weaker hurricanes.

To illustrate this phenomenon, maps that show the degree to which damage reduction is observed are provided in figures 2a and 2b. “Warm” colors indicate positive wetland protection scores; “cool” colors indicate negative wetland protection scores.

These findings are important for providing context under which hurricane protection strategies can be generated. For strong hurricanes, additional measures (i.e., sea walls, levees, flood gates, etc.) will be necessary to protect coastal communities. However, for more common and less-intense tropical storms or weaker hurricanes, wetlands provide a valuable means of damage mitigation. Additionally, wetlands provide multiple benefits, such as fisheries habitat,

recreational opportunities and water quality. These notions are central to the decisions faced by coastal resource managers. Understanding the appropriate application of mitigation strategies will be crucial for insuring cost effective damage mitigation in the future so that coastal communities can maximize the use of scarce resources.

J. Luke Boutwell is a graduate research fellow and John V. Westra is a professor in the Department of Agricultural Economics and Agribusiness.

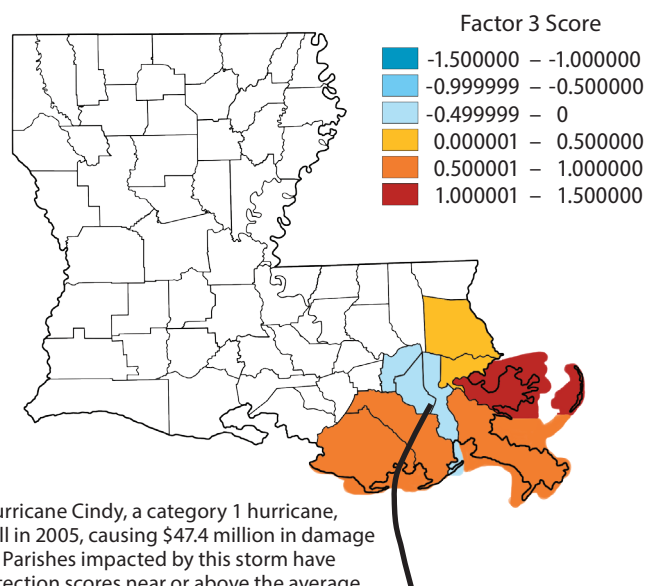


Figure 2a. Hurricane Cindy, a category 1 hurricane, made landfall in 2005, causing \$47.4 million in damage in Louisiana. Parishes impacted by this storm have wetland protection scores near or above the average for the sample, indicating a stronger negative relationship between wetlands and economic damage.

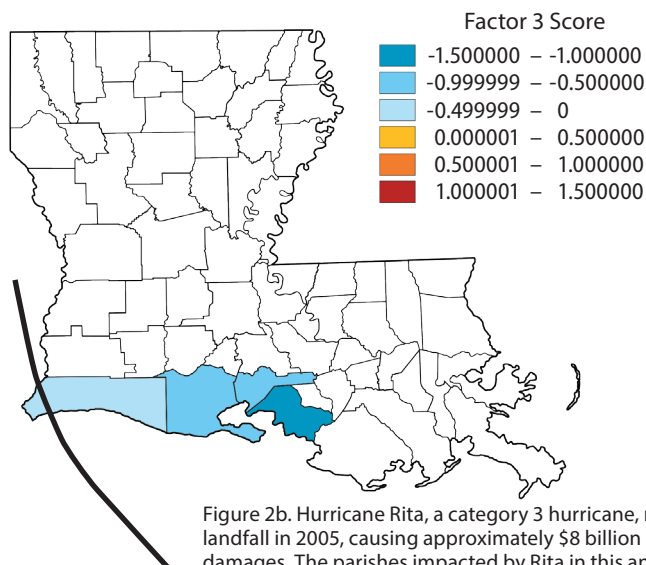


Figure 2b. Hurricane Rita, a category 3 hurricane, made landfall in 2005, causing approximately \$8 billion in damages. The parishes impacted by Rita in this analysis have factor protection scores significantly below the average for the sample. Before landfall, Rita was the strongest hurricane ever recorded in the Gulf of Mexico with sustained winds over 180 mph.

Fishermen's Blood-Sucking Nemesis, the Greenhead Horse Fly, As a Bioindicator of Marsh Health after the 2010 Oil Spill

Claudia Husseneder and Lane D. Foil

LSU AgCenter researchers investigated populations of the saltmarsh greenhead horse fly (*Tabanus nigrovittatus*) as bioindicators of marsh health in the aftermath of the April 2010 Macondo oil spill in the Gulf of Mexico.

Acute oiling in the Gulf of Mexico subsequent to the Deepwater Horizon platform collapse created visible impact on highly prominent vertebrates, particularly birds, marine mammals and turtles along the coast. In addition, coastal residents near oil-impacted areas recognized a suspicious absence of insects that usually “bug” fishermen in the marsh, such as the greenhead horse fly. This observation led the researchers to hypothesize that the oil residue affected the invertebrate ecosystems in tidal marshes and that horse fly residents of the marsh community could serve as bioindicators for wetland health because they require both aquatic and terrestrial habitat for survival. To test this hypothesis, the researchers first compared population abundance based on a census of trapped horse flies between areas of the marsh that were not affected by oil intrusion and those that have been affected by the oil spill. Second, they used genetic markers to compare population genetic and mating structure between populations from nonoiled and contaminated areas.

The researchers chose *T. nigrovittatus* as an entomological model for coastal ecology studies and as a bioindicator of the impact of the intrusion of oil into coastal marshes because this species is one of the few insect species native and bound to coastal marshes ranging from Texas to Nova Scotia. Its larvae are the top predators in the marsh and thus vulnerable to changes in the environment. Active adults would have developed as larvae in the marshes over the nine to 12 months prior to emergence, and thus adult populations can be direct indicators of marsh quality after prior insults.

The entomologists studied the impact of the 2010 oil spill on horse fly population abundance and genetics in Louisiana marshes. Horse fly populations were sampled biweekly from nonoiled and oiled locations immediately after the oil spill in June 2010 until October 2011, with canopy traps baited with dry ice, which is known to attract female horse flies. Nonoiled trap sites were located in southwestern Louisiana (Ship Channel in Cameron Parish, Rockefeller Wildlife Refuge at the border of Cameron and Vermilion parishes and Cypremort Point in St. Mary Parish). Oiled trap sites were located on Grand Bayou, Grand Isle and Elmer's Island in southeastern Louisiana.



The saltmarsh greenhead horse fly, *Tabanus nigrovittatus*. Photo by Claudia Husseneder



Canopy traps baited with dry ice, which attracts female horse flies, were set up at sites in four locations along the coast. Photos by Claudia Husseneder

Adult horse fly capture rates showed severe crashes of horse fly abundance in oiled areas. Trap data indicated that the adult horse flies had been affected immediately after the oil reached Grand Isle, Elmer's Island and Grand Bayou (an average of 1.27 to 4.8 flies captured per hour in 41 trap days); both of these areas are notorious for greenhead attacks each summer. In comparison, fly activity remained significantly higher at the nonoiled locations at Cypremort Point and Cameron (an average of 36.6 to 92.2 flies per hour in 60 trap days).

In 2011, the researchers found no significant change in the adult horse fly populations compared to 2010. However, there were site specific results that indicated potential recovery of horse fly populations. For example, there were two trap sites at the Grand Bayou location where 21 to 24 flies per hour were captured in August 2011. The significance of these data is that there are potentially islands of recovering marsh within affected areas.

Genetic markers revealed that the majority of oiled populations went through a "genetic bottleneck," a loss of genetic diversity, because of a severe reduction in population size, fewer breeding parents and fewer migrants among populations as compared to populations from areas not affected by the oil spill.

Similar to the immediate impact on the adult population, horse fly larvae were also affected. Larvae were isolated from 80 percent of the substrate samples obtained in 2011 from Cameron, 75 percent of samples from Cypremort Point (nonoiled areas), 38 percent of the sediment samples from Grand Bayou, but were absent in all samples from Grand Isle (oiled areas).

The next steps in this research are to describe the invertebrate food web of horse fly larvae and assess marsh health by conducting chemical and toxicity



Map of the four locations each with four to five trap sites for adult horse fly collections in 2010 and 2011. Nonoiled locations in west Louisiana (Cameron Parish and Cypremort Point in St. Mary Parish) and oiled locations in east Louisiana (Grand Bayou in Plaquemine Parish and Grand Isle and Elmer's Island in Jefferson Parish)

analyses of sediment samples and genetic analyses of larval guts from archived (2010-2011) and new collections several years after the oil spill. The goal of future studies is to establish links of toxic components found within marsh sediment samples with the absence of developing horse flies as well as elements of their food web and compare these data to healthy marsh ecosystems.

The techniques developed to measure the elements of the food web could be used for time- and cost-efficient screening to survey marsh health and potential need for remediation. Thus, the fishermen's nemesis could serve as a model for environmental impact assessment. Perhaps, it is of some comfort to keep in mind that blood sacrifice to a plethora of greenheads is one sign of a healthy marsh ecosystem.

Claudia Husseneder and her co-author, Lane D. Foil, are professors in the Department of Entomology. Foil is the Pennington Chair for Wildlife Research.

Beginning Farms: How Does Louisiana Compare?

Ashok K. Mishra and Krishna H. Koirala

The U.S. agriculture population is poised to make a dramatic change because more than 50 percent of current farmers are likely to retire in the next five years. U.S. farmers over age 55 control more than half the farmland, while the number of farmers replacing them has fallen. The need for beginning farmers is paramount both at the national level and in Louisiana.

In 2012, beginning farms, which are those in which the operators have managed a farm or ranch for 10 years or less, accounted for 25 percent of the nation's 2 million family farms. About 26 percent of farms in Louisiana are classified as beginning farms. Beginning farmers are defined by the U.S. Department of Agriculture Farm Service Agency as "those operators who are responsible for the day-to-day farming decisions, with less than 10 years of experience farming their current farm."

LSU AgCenter researchers compared beginning farms in Louisiana with those in the Delta region (Louisiana, Arkansas and Mississippi) and the rest of the United States. The source of the data is the 2012 Agricultural Resource Management Survey conducted by the National Agricultural Statistics Service and Economic Research Service. Specifically, the researchers profiled and compared beginning farms and farmers in Louisiana with farmers in other states terms of acres in operation, rental rates, enterprise specialization, farm typology, government payments, net farm income and balance sheets. The researchers also examined the socio-economic attributes of the farm operators and households. This analysis may aid elected officials in evaluating policy that should be revised, extension agents in targeting gaps in their parishes that can be proactively addressed, and farm operators in rightly assessing the landscape of their profession as they look toward the future.

Comparison of Beginning and Established Farms in Louisiana

A comparison of socio-economic attributes and income between established and beginning farmers in Louisiana is provided in Table 1. Most farmers – both established and beginning – own their farms. Most established farms are operated by farmers 65 years old or older; the largest percentage of beginning farms are operated by farmers 45-54 years old. High school graduates tend to be the operators of established farms, and college graduates tend to be the operators of beginning farms. Beginning farms

in Louisiana are likely to specialize in beef cattle and field crops, whereas half the established farms – like the national trend – are likely to specialize in beef cattle. About 16 percent of beginning farms in Louisiana receive government payments, an average of \$1,421 per household, compared to \$3,939 per household for established farms.

Total farm household income for beginning farms is lower (\$109,808) than established farms (\$114,936). Regarding the source of farm household income, the share of farm income (net farm business income) in total household income is higher for established farms (41 percent) compared to only 6 percent for beginning farms. The off-farm income is much higher for beginning farms (94 percent) than established farms. This is likely due to the fact that beginning farm operators have higher educational attainment (51 percent have graduated college) and are more likely to be engaged in off-farm income-generating activities, such as an off-farm business or off-farm employment for wages or salaries.

Beginning Farm Attributes in Louisiana

Operator Age

Louisiana is home to 7,871 beginning farms, which is 27 percent of all the farms in the state. Figure 1 indicates that the biggest share of these farm operators (37 percent) are between the ages of 35 to 49 years. This compares to 53 percent in the rest of the Delta and 33 percent nationwide. The next largest share in Louisiana of beginning farm operators is over 65 years old (29 percent), compared to 8 percent in the rest of the Delta and 12 percent nationwide. The largest group of beginning farmers nationwide (37 percent) are between 49 and 64 years of age.

Educational Attainment

Educational attainment of beginning farm operators in Louisiana is unique in that in all cases beginning farm operators are better educated, according to Figure 2. Louisiana has the highest share (51 percent) of beginning farm operators who have graduated college, compared to the Delta region (31 percent) and rest of the United States (34 percent). Perhaps this may indicate that college-educated farm operators are better suited for enterprises that are conducive to a farming lifestyle, but work off the farm for primary sources of income. On the other end of the spectrum, only 0.1 percent of begin-

ning farm operators in Louisiana have less than a high school education.

Farm Tenure

Nationwide and in Louisiana, owners are operating beginning farms – 74.5 percent in the United States and 75.4 percent in Louisiana, according to Figure 3. Conversely, Louisiana has the fewest beginning farms operated by tenants (1.3 percent). About 23 percent of the beginning farms in Louisiana are operated by part-owners. Tenancy rate is the highest in the United States (about 10 percent) followed by Delta region (5 percent).

Table 1. Comparison of socio-economic attributes and income between established and beginning farms in Louisiana

	Established farms	Beginning farms
Number of farms	21,228	7,871
Share of farms	73.0%	27.0%
Tenure status		
Full owner	67.9%	75.4%
Part owner	22.8%	23.4%
Full tenant	9.3%	1.3%
Operator age		
Younger than 35 years	1.4%	13.2%
35-44 years	8.7%	16.0%
45-54 years	26.0%	33.9%
55-64 years	30.8%	7.7%
65 years or older	33.1%	29.2%
Operator education		
Less than high school	18.6%	NONE
High school	43.6%	24.6%
Some college	19.1%	24.6%
College graduate	18.7%	51.2%
Enterprise Specialization		
Cash grains (barley, oats, sorghum, rice, corn, wheat) and soybeans	8.4%	8.4%
Other field crops (cotton, peanut, tobacco, sugarcane)	15.2%	23.3%
High value crops (vegetables, fruits, nursery, melons, strawberries, sweet potatoes)	6.0%	NA
Beef cattle	56.3%	37.1%
Poultry	2.5%	NA
General livestock (sheep, goats, horses, dairy)	11.5%	31.2%
Government payments		
Government payments received	19.4%	15.9%
Average government payment per household	\$ 3,939	\$ 1,421
Income indicator		
Net cash farm business income	\$61,538	\$ 12,623
Net farm business income	\$46,912	\$ 6,066
Off-farm income	\$68,824	\$103,742

Agricultural Resource Management Survey 2012, Economic Research Service, U.S. Department of Agriculture, Washington, D.C.

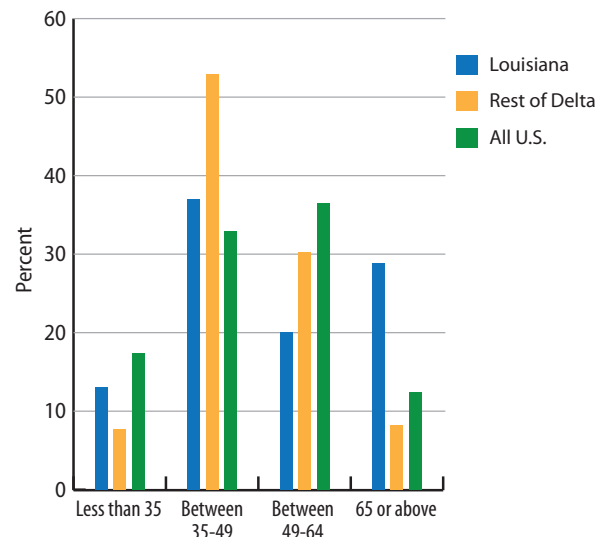


Figure 1. Age distribution of beginning farmers. Agricultural Resource Management Survey 2012, Economic Research Service, U.S. Department of Agriculture, Washington, D.C.

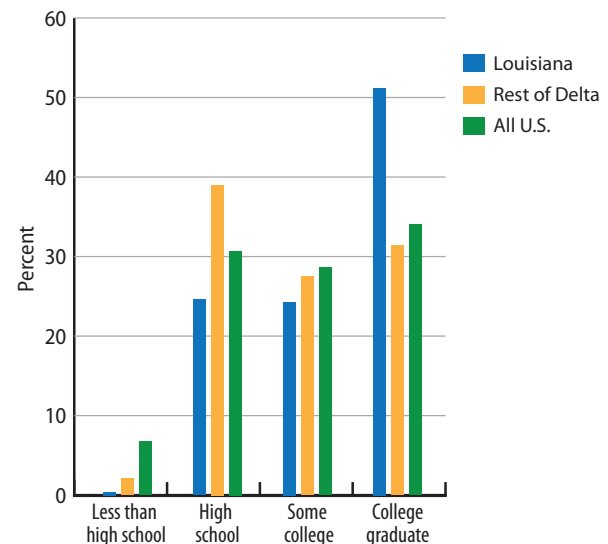


Figure 2. Distribution of educational attainment of beginning farmers. Agricultural Resource Management Survey 2012, Economic Research Service, U.S. Department of Agriculture, Washington D.C.

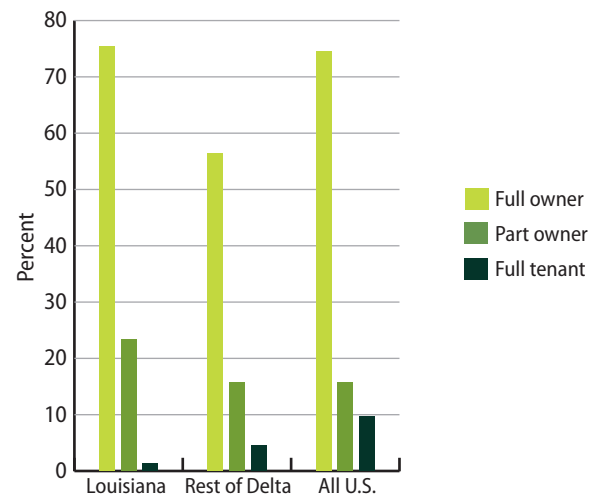


Figure 3. Farms tenure distribution. Agricultural Resource Management Survey 2012, Economic Research Service, U.S. Department of Agriculture, Washington, D.C.

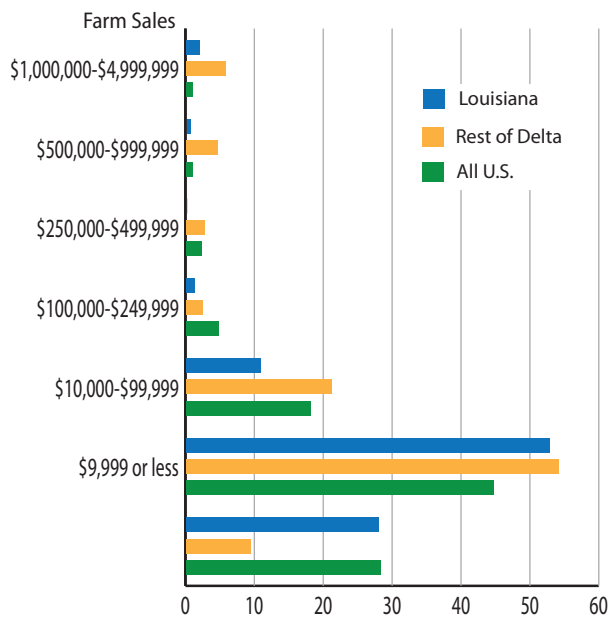


Figure 4. Distribution of beginning farms gross value sales. Agricultural Resource Management Survey 2012, Economic Research Service, U.S. Department of Agriculture, Washington, D.C.

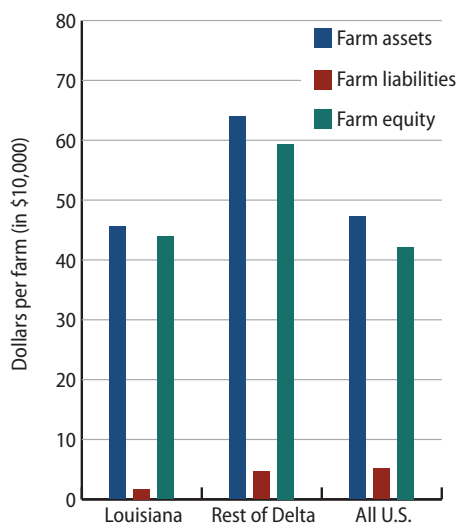


Figure 5. Comparisons of assets, liabilities and equity. Agricultural Resource Management Survey 2012, Economic Research Service, U.S. Department of Agriculture, Washington, D.C.

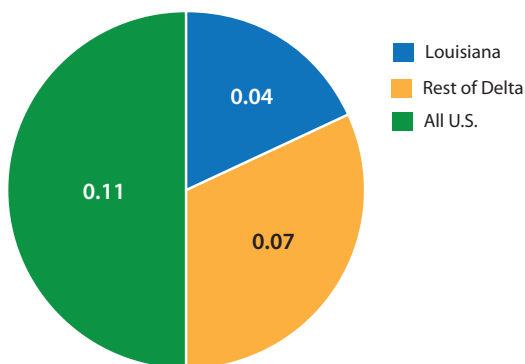


Figure 6. Comparison of dept/asset ration of beginning farms. Agricultural Resource Management Survey 2012, Economic Research Service, U.S. Department of Agriculture, Washington, D.C.

Value of Farm Sales

A puzzling picture emerges regarding the gross value of farms sales (a measure of total farm sales). Figure 4 shows that about 28 percent of beginning farms in Louisiana and in the nation as a whole do not make any money farming. This could be attributed to two factors: (1) during 2012, the year the data were collected, the farms may not have sold any farm products; (2) many beginning farmers may want to live on the farm but their main source of income may be off the farm. A large percentage of beginning farms have farm sales of less than \$10,000.

Farm Assets, Debt and Equity

When comparing total farm assets and liabilities of beginning farms, Louisiana ranks below that of the rest of the country and Delta region, according to Figure 5. Total assets of beginning farms, \$456,100 are slightly lower than the national average (\$472,600). Beginning farms in Louisiana have the least liabilities, about \$17,053, followed by Delta region (\$46,585) and the rest of the nation (\$51,271). The Delta region has the best balance sheet when it comes to beginning farms. They have the highest assets and second highest liabilities, perhaps a sign they are using the debt efficiently. Farm equity refers to the net worth (or wealth of the farm), and it is highest in the Delta region (\$593,206) followed by Louisiana (\$439,023). The debt-to-asset ratio, which is the ratio of total liabilities and total assets, is an indicator of borrowing capacity of the farm and is used by bankers to loan money to farmers for farm production. The higher the ratio, the greater risk is associated with the firm's operation and would lead to higher interest rate charged to the farmer. Figure 6 shows that for beginning farms the debt-to-asset ratio is lowest in Louisiana and the highest in the rest of the country. This implies that Louisiana's beginning farms have higher borrowing capacity, compared to rest of the Delta region and the nation.

Farm Income

While beginning farm operators in Louisiana may have significant amounts of assets and equity, gross cash income is the lowest when compared to beginning farmers in the Delta region and the rest of the United States, according to Figure 7. Gross cash income of beginning farms in Louisiana lags significantly (\$41,254) behind beginning farms in the Delta region (\$79,349) and the national average (\$47,094). A similar trend is observed with cash expenses, indicating that beginning farms in Louisiana are less efficient when it comes to controlling expenses. Net cash farm income of a beginning farm in Louisiana is higher (\$12,623) than in the rest of the country (\$6,569). However, it is lower than beginning farms in the rest of Delta region (\$14,025). The net farm income, the value taken home as returns to labor and management, earned by beginning farms in Louisiana (\$5,383) is significantly lower, about 50 percent, than beginning farms in the Delta region and about a third less than beginning farms in the United States.

Conclusion

The beginning farms in Louisiana are vital to the agricultural economy of the state. Beginning farm operators in Louisiana are highly educated, compared to their counterparts in the Delta and rest of the United States. In accordance, off-farm income contributes more than 94 percent of total beginning farm household income. About 16 percent of beginning farms in Louisiana, in 2012, received government payments compared to 20 percent of established farms. The average government payment received by beginning farm household in Louisiana (\$1,421) was 36 percent lower than established farms (\$3,939) in 2012. The highest share (37 percent) of beginning farms in Louisiana are operated by operators 35 to 49 years old. In some aspects, beginning farms in Louisiana are leading the nation, such as debt-asset ratio and educational attainment. Unfortunately, beginning farms in Louisiana are lagging behind the national average and the rest of the Delta region in some other categories, including gross cash income, net farm income, farm assets and efficiency.

Ashok K. Mishra is Donald E. Welge Endowed Professor, and Krishna H. Koirala is a graduate research assistant, both in the Department of Agricultural Economics & Agribusiness.

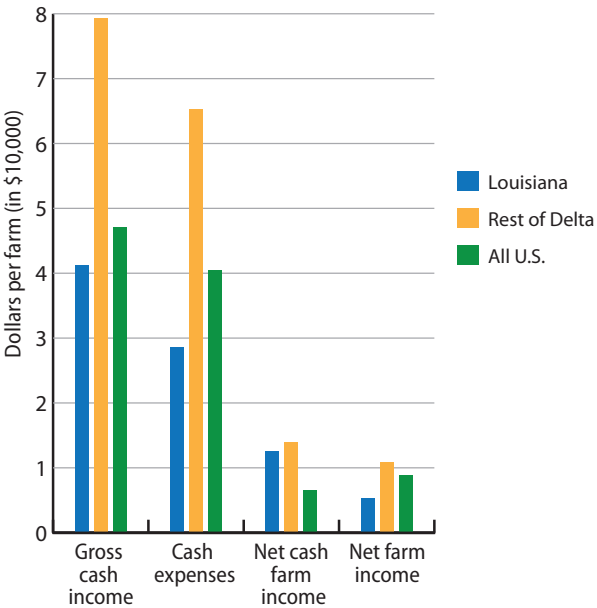


Figure 7. Comparisons of farm business income of beginning farms. Agricultural Resource Management Survey 2012, Economic Research Service, U.S. Department of Agriculture, Washington, D.C.



John Patrick of St. Francisville makes hay for winter cattle feeding. He has been a participant in the LSU AgCenter Master Cattle Producer program. Photo by Kathy Kramer



The Forestry Building on the LSU campus in 1964. Provided by LSU Office of Communications & University Relations



Paul Burns, 94, former director of the School of Forestry, still comes into his office in the School of Renewable Natural Resources building once or twice a week. Photo by Olivia McClure



Director of the School of Forestry Paul Burns, left, at the Forestry Building's dedication in 1956, with an unidentified person. Provided by LSU Office of Communications & University Relations

Flashback to '55: A Big Year for Forestry at LSU

Olivia McClure

The Old Forestry Building on LSU's Baton Rouge campus is old for its 58 years. Its stairs, which lead to a dust-coated second floor, creak unsettlingly. Many ceiling tiles are either stained or missing.

Because of those conditions, LSU's Office of Facility Services plans to demolish the building two or three years from now.

Not much is left in the Old Forestry Building besides a few chairs and some empty file cabinets. Bulletin boards remain decorated with faded displays from 2012, when the most recent tenant, the School of Human Resource Education and Workforce Development, relocated to Coates Hall.

As one roams the dim hallways and vacant offices, however, the building's signature feature still stands out — walls paneled with several different types of native Louisiana woods, from red cypress to magnolia to white oak.

When administrators broke ground for construction of the building, a newspaper clipping supplied by former school director Paul Burns reported "the new modern building ... [would] greatly increase the scope

of forestry education at LSU." It cost \$300,000.

That was in 1955 — a big year for forestry at LSU. Burns, who had only been the director for a few months at the time of the groundbreaking, would have a new building in which to shape the future of the school.

At first, however, 35-year-old Burns wasn't sure about coming to LSU. A native of Tulsa, Okla., who earned his doctorate at Yale University, Burns worried about moving to Baton Rouge — the city where the first bus boycott of the Civil Rights Movement took place two years earlier.

"The South was no place to be at that time," Burns said. "But they wanted to pay twice as much as I was making."

Burns said he became interested in forestry as a young boy because he enjoyed exploring the woods near his family's home. Later, he realized a career in forestry also offered a chance to express love for humanity — a value he believes should be central not only in life, but also in forestry.

"I wanted to be outdoors, and I wanted to help people in a way that

I knew how,” he said. “That’s what I ended up with, forestry.”

In Louisiana, a heavily forested state where logging and sawmills had long had a presence, Burns put his expertise and concern for the environment to work. When he arrived, the forestry program had already come a long way from its humble beginning in 1911, when horticulture professor J.G. Lee introduced an “Elements of Forestry” course.

Thirteen students graduated from the forestry school in 1955. The next year, that number jumped to 36. In 1976, when Burns resigned as director, there were 85 graduates.

Now 94 years old, Burns still drops by his memorabilia-stuffed office in the Renewable Natural Resources building once or twice a week.

His former office in Old Forestry has since been occupied by the director of the School of Vocational Education, which moved into that building in 1986. Like forestry, vocational education, which was later renamed the School of Human Resource Education and Workforce Development (SHREWD), underwent a number of changes during the time it spent in

Old Forestry. Both programs had to modernize and expand curricula and research to meet evolving needs.

Most people at LSU today have always known the building as the Old Forestry Building — an appropriate name, many would say, given the condition it is in. In recent years, maintenance issues have plagued it.

When the Forestry Building opened, LSU was much more spacious and even had a working dairy farm. Over time, the campus has grown in every way imaginable, Burns said. There are more students, more faculty, more buildings and more degree programs.

As those things grew, so did the forestry program, which in 1984 expanded into the School of Forestry, Wildlife and Fisheries, and in 2002 became the School of Renewable Natural Resources. In 1986, the school moved into a new \$7 million facility that is about three times larger than its previous home.

The Old Forestry Building will temporarily house faculty and staff displaced by upcoming renovations to Patrick F. Taylor Hall, according to LSU Facility Services.

Even though LSU will then no longer have a building on its campus containing the word “forestry,” forestry will always be important to the university and to Louisiana. In 2013, the state’s forestry product industries were worth \$2.88 billion.

“Foresters have a rapport with nature, a feeling for the good earth and the importance of protecting and preserving our forests, streams and wildlife,” Burns told the Baton Rouge Advocate in 1976. “Man must live in harmony with nature and with each other in order to survive.”

Those principles, which guided Burns throughout his life and career, are summed up by a bumper sticker taped above his desk. It reads: “For a forester, every day is Earth Day.”

That was probably easy to remember for the students and professors who worked in the Old Forestry Building, whose wood-paneled walls surrounded them with the resources they were charged with protecting through education and research.

Olivia McClure is a graduate assistant in LSU AgCenter Communications.

SCIENCE NOTE

Comparing Calf Production from Brangus and Bonsmara Cows

Wayne E. Wyatt and David C. Blouin

Because Brahman cattle have been associated with poor temperament and meat quality, researchers have been looking at crosses involving the tropically adapted Brahman breed and comparing them to crosses involving another tropically adapted breed, Afrikaner. Brangus is an American breed that is 3/8 Brahman and 5/8 Angus, and Bonsmara is a South African breed that is 5/8 Afrikaner and 3/8 Hereford and Shorthorn. This study examined cow-calf productivity of both Brangus and Bonsmara cows.

A total of 30 Brangus and 30 Bonsmara cows born in 2005, 2006 and 2007 were used in the study to examine cow herd performance. Each breed was divided into two herds to accommodate a statistical analysis of herd data for the 2010 and 2011 calf crops.

At weaning when calves were removed from the cows, 5-year-old Brangus and Bonsmara cows weighed almost the same. The cows weighed a little more than 1,200 pounds each and had similar acceptable body condition scores (a subjective measure of body “fatness”). They were also similar in terms of pregnancy rate (95 percent for Brangus and 92 percent for Bonsmara), live-calf delivery rate (91 percent for Brangus and 89 percent for Bonsmara) and live calf weaning rate (83 percent for Brangus and 78 percent for Bonsmara). Average calving date was February 25 for Brangus and March 2 for Bonsmara. Bonsmara calves weighed 7 pounds more at birth than their Brangus counterparts. Average daily weight gain from birth to weaning was greater for Bonsmara than for

Brangus calves. These trait differences remained during the preweaning phase, and Bonsmara calves were 3 percent heavier at weaning than their Brangus counterparts.

Despite the greater preweaning and weaning performance of Bonsmara compared to Brangus calves, the ratios of calf weights to their dam’s weight at weaning were the same, indicating a similar efficiency between the two breeds. These ratios were multiplied by weaning rates to obtain estimates of herd efficiency, which were again similar.

Wayne E. Wyatt is a professor at the Iberia Research Station, Jeanerette, La., and David C. Blouin is a professor in the Department of Experimental Statistics.

Addressing Community Health with Garden-Based Nutrition Education

Grace Peterson, Joan Almond, Diane Uzzle, Cathy Judd and Gwen Fontenot

Many people in Louisiana face nutrition-related health challenges, including diabetes, heart disease and obesity, all of which can positively impacted by choosing healthful food. The U.S. Department of Agriculture in its My Plate campaign encourages people to eat more fruits and vegetables by including them in every meal. A recent study by the Pennington Biomedical Research Center found that only 11.7 percent of Louisiana youth eat the daily recommended servings of vegetables and only 5.9 percent eat the daily recommended servings of fruit.

There are four major barriers to nutritious food access. One is that some people live in “food deserts,” where there are no stores or markets nearby with fresh and healthful food. Second, some people may not have financial access because nutritious food can be expensive. In addition, there are two knowledge barriers to choosing nutritious food – knowing what to eat and knowing how to prepare it in a healthful manner.

Extension agents in the LSU AgCenter Northwest Region are addressing the multidimensional factors involved in changing the attitudes and behaviors of people at risk for nutrition-related diseases through a program called FIT (Food Initiative Taskforce) for

Kids. This program teaches participants basic skills to connect with nutritious food. Youth participants and adult volunteers learn about planting fruits and vegetables, garden maintenance, harvesting, processing, and then preparing, presenting and enjoying the final product. Participants learn about the importance of agriculture in their lives by having direct experience with every part of the food system.

The purpose of these programs is to target not only short-term objectives of behavior change like trying new foods and increasing physical activity, but also to facilitate more enduring changes in behavior and attitude. The long-term goal is to promote healthy life style choices and build strong communities.

The FIT for Kids after school and summer programs consist of lessons that involve youth participants in six components of the food system – production, processing, distribution, acquisition, consumption and waste. Youth learn leadership, communication and business skills. They engage in physical activity as they work side-by-side in the garden. They engage their community at “Taste-a-thon” events where they demonstrate different recipes using fresh produce they have grown and harvested. Youth become advocates for access to healthful food and discuss their understanding and concerns with city and parish policymakers.

One highlight of the FIT for Kids program is Veggie of the Month, featuring seasonal produce. The lessons take participants from seed to plate, teaching essential gardening skills such as planting and garden care, how to recognize when the vegetables are ready for harvesting, how to harvest them, and how to prepare them in a healthy and nutritious manner. At the end of the lesson, participants are given seeds and planting instructions for the vegetables to take home, encouraging further family involvement. Veggie of the Month is versatile and can be delivered in a variety of settings and to a wide range of audiences. Area agents have delivered these lessons at schools, churches, community centers, gardens and health clinics to people of all ages.

Four vegetables featured in the Veggie of the Month program are cool-season crops – broccoli, carrots, sugar snap peas and Swiss chard. Most of the recipes received high marks from participants, with many reporting that they prepared the dish for their families at home. Combined evaluation results from programs delivered in Webster and Bienville parishes indicated that 53 percent of participants enjoyed



Youth involved in the FIT for Kids after-school program show broccoli they grew in their garden at Valencia Park Community Center in Shreveport. Photo by Grace Peterson



Community garden volunteer Cookie Coleman teaches youth how to safely peel and grate carrots at a Veggie of the Month program held at the Community Renewal Allendale Friendship House in Shreveport. Photo by Grace Peterson



Children participating in the FIT for Kids after school program make veggie stir-fry with garden vegetables at Valencia Park Community Center in Shreveport. Photo by Grace Peterson

the taste of the sugar snap pea recipe, 77 percent enjoyed the broccoli, and 89 percent liked the carrot recipe. However, the Swiss chard recipe was the favorite with 95 percent of participants reporting positive taste test results. In Bienville Parish 77 percent of participating 4-H families reported having planted the vegetable seeds they received.

The success of FIT for Kids is due to numerous collaborations, including a long-standing partnership with the City of Shreveport. Louisiana Master Gardeners and community gardeners provide volunteer support for garden education. Local chefs contribute their knowledge and support, and volunteers from the LSU Health Schools of Medicine and Allied Health provide health screenings.

Grace Peterson is an area nutrition agent in the Northwest Louisiana Region, based in Bossier City. Her co-authors are Joan Almond, Diane Uzzle and Cathy Judd, also nutrition agents in the Northwest Region, and Gwen Fontenot, a family and consumer science and 4-H agent in Natchitoches Parish.



During the Veggie of the Month program at Weston High School in Weston, La., Cathy Judd, nutrition agent in the Northwest Region, serves a snow pea dish. Photo by Melissa Foshee



Grace Peterson, LSU AgCenter area nutrition agent, second from left, provides information for growing winter vegetable crops for participants of the Veggie of the Month program at the Northwest Louisiana Interfaith Pharmacy in Shreveport. Left to right are Janet Martin, executive director of the Northwest Louisiana Interfaith Pharmacy; Peterson; and Rosemary Cole, Louisiana Master Gardener, Northwest Chapter. Photo by Darius Tammami

Evaluation results from the FIT for Kids programs indicated most participants increased their knowledge of a healthful diet, tried new foods, ate more vegetables and learned gardening skills. As one volunteer, a retired assistant principal, commented, "The students actually enjoyed preparing and eating the vegetables!"

Goss's Wilt: A New Corn Disease in Louisiana

Clayton A. Hollier and Raghuwinder Singh

Goss's wilt is a bacterial corn disease new to Louisiana. During the 2013 growing season, it was observed in north-eastern Louisiana and reported for the first time. Its previous range was Nebraska to Indiana and from southern Minnesota to the panhandle of Texas, but it had never been detected in the Deep South.

Goss's wilt is a bacterial disease caused by *Clavibacter michiganensis* subsp. *nebraskensis*. Field symptoms were found in mid-June in East Carroll, Madison, Tensas and West Carroll parishes. Classical foliar and stalk symptoms were observed with the greatest damage occurring in the center of 50- to 75-foot diameter circles, while less severe symptoms and, therefore, less damage occurred at circles' edges.

This disease can have two distinct phases: a leaf blight phase and a systemic wilt phase.

Leaf blight is the most commonly observed symptom, but it is easily confused with other diseases and abiotic disorders. Corn plants with Goss's wilt exhibit long, large, tan lesions in the centers or on the edges of leaf blades. The margins of these lesions may have a water-soaked appearance. Black flecks, or freckles, can be observed within the lesions. These flecks can be large and cannot be rubbed off plant tissue. Early in the morning or after a rain, symptomatic leaves exhibit a bacterial ooze, or exudate, on lesion surfaces. Dried bacterial exudate is shiny, especially in direct sunlight. During dry weather, Goss's wilt symptoms are easily confused with drought stress or leaf scorch from chemical burn. Leaf blight symptoms can also be misidentified as nutrient deficiency, chemical injury, Stewart's wilt (caused by a different bacterial organism) or northern corn leaf blight.

In the systemic wilt phase of the disease, infected plants may exhibit drought stress symptoms and wilt or die prematurely. In this phase of the disease, infected vascular tissue will have orange-to-brown discoloration, which is caused by bacteria moving within the plant's xylem tissue.

Confirmation of Goss's wilt can be made by the LSU AgCenter Plant Diagnostic Laboratory.

The bacterium that causes Goss's wilt survives the winter primarily in infected crop residue and, to a lesser extent, on the soil surface. Research from several states indicates that under more arid conditions, the pathogen can only survive for 10 months on the residue at the soil surface. The bacteria enter any part of the corn plant through wounds, such as those caused by hail and heavy winds. Wind-driven rain can spread the bacteria. Although the bacteria can enter wounds created by insect feeding, insects are not known to transmit the bacteria.

Preventing disease development is important in reducing economic losses from Goss's wilt. Hybrids with partial resistance to the disease are available, and producers that have experienced Goss's wilt problems should check with seed dealers to find out more about the availability of resistant varieties.

Adopting production practices that diminish disease pressure will also reduce economic losses. Rotating out of corn production for one year will allow crop residue to break down and reduce bacterial populations. Tillage and other practices that encourage residue decomposition will also reduce the amount of bacteria present to infect the following corn crop. Good weed management techniques are necessary to control grass weed species that can serve as a source of the disease.

Goss's wilt is caused by bacteria, so fungicides will not prevent or manage the disease. Copper products have been used to control bacterial diseases in other crops; however, these are not economically viable options for large, field-scale use in corn production. The best management strategy for Goss's wilt is to use a combination of the previously discussed management practices to minimize economic losses.

Clayton A. Hollier is a professor and Raghuwinder Singh is an assistant professor in the Department of Plant Pathology & Crop Physiology.



Water-soaked leaf lesions of Goss's wilt. Photo by Clayton Hollier



Dark green to black spots, sometimes called freckles, near the edges of expanding lesions. Photo by Clayton Hollier

Hammond Research Station: A Resource for Commercial Growers and Home Gardeners

Allen D. Owings

The LSU AgCenter Hammond Research Station is devoted to horticulture research and extension programs that aid the commercial nursery and landscape industry as well as home gardeners. Its mission is to conduct research on environmental and production factors that affect quality and sustainability of plants in the landscape.

Projects at the station include evaluating herbaceous ornamental landscape plants, studying landscape roses, managing the thrips insect pest for nursery growers and landscape professionals and conducting nutrient management studies.

The station annually conducts one of the largest herbaceous ornamental plant trial in a multi-state area. These multi-year trials are used to introduce and recommend the

best varieties and new plants for Louisiana and the Gulf Coast region. Hundreds of visitors view these evaluations each year. The program also is helpful in selecting Louisiana Super Plants.

A multidisciplinary team research project on thrips emphasizes management – variety selection, fertilizer and water – and the use of biocontrols and action thresholds to manage thrips more effectively and economically.

Landscape nutrient management research provides appropriate fertilization guidelines for optimum growth and bloom of plants while reducing over-application and runoff from the landscape. The ability of landscape plants to remove, or filter, nitrogen and phosphorus from runoff water is being evaluated for use in stormwater mitigation systems.

New plant growth regulators and application technology are being evaluated for improved production efficiency and reduced landscape maintenance costs. Information is provided to growers and landscape maintenance companies.

Production methods used by wholesale growers can affect a plant's ability to tolerate environmental stresses in the landscape. Research at the Hammond Research Station is continuing to identify the most effective production methods and proper use of fertilizers and water along with plant selection. This research can identify methods for lowering landscape costs and reducing the use of environmental resources.

Researchers at the station also select and breed potential new ornamental plants for the state's nursery and landscape industry.

In 2013, horticulture professor Charles Johnson, from the School of Plant, Environmental and Soil Sciences, and Daniel Wells, a newly appointed post-doctoral researcher in horticulture, began studying potential new varieties of *Vitex* (chaste tree) and *Crateagus* (native hawthorn). Several species of each plant are included in breeding, hybridization and selection.

Louisiana Master Gardeners are actively engaged in activities at the station. Nursery, landscape and garden center professionals view research activities at the station each year at a spring industry open house and a landscape horticulture field day each October.

The station hosts landscape pest management programs in addition to certification programs for Louisiana's nursery and landscape professionals. The Margie Jenkins Azalea Garden Horticulture Lecture Series is also a popular event each year.

More information about work being done in landscape horticulture by the LSU AgCenter Hammond Research Station is at www.LSUAgCenter.com and on the station's Facebook page.

Allen D. Owings is a professor of horticulture at the Hammond Research Station in Hammond.



LSU AgCenter horticulturist Allen Owings leads the care and maintenance tour during a Hammond Research Station field day in 2013. Topics centered around the caladium sun trial, phosphorus fertilizer landscape studies, organic fertilizer landscape demonstration and rose varieties. Photo by Johnny Morgan



LSU AgCenter researcher Yan Chen discusses her work with sun and shade performance of caladium varieties. Photo by Johnny Morgan

Agricultural Producer Attitudes and Biobased Businesses

Richard P. Vlosky, Roger Smithhart, Paul Darby and Michael Blazier

Biomass from agricultural crops is a major potential source of feedstock for renewable energy. It has several advantages, such as lowering carbon dioxide emissions and stabilizing energy dependence. Although the U.S. produces about 3 percent of its total energy from renewable resources, the development and expansion of a biomass industry in the U.S. will require the use of bioenergy crops and agricultural residues. The availability of biomass for energy production from cropland in the United States is about 194 million dry tons annually, which is about 16 percent of total plant material produced.

Louisiana and Mississippi are rich in biomass resources, with approximately a third of each state in farmland acreage. Total farmland in Louisiana is a little more than 8 million acres, 29 percent of the total land area. Family or individual owners account for 85 percent of farm ownership in Louisiana. Mississippi has more than 11 million acres of farmland, which is 38 percent of the state's total land area. Family or individual owners account for 86 percent of farm ownership in Mississippi. In both states, around 90 percent of agricultural farms are less than 999 acres. The decisions of these farmers could affect supply and sustainability issues associated with producing renewable energy from agricultural crops.

The purpose of this research was to survey agricultural producers to identify willingness to participate in new biobased businesses. LSU AgCenter researchers sent questionnaires to 2,964 randomly selected agricultural producers in the 18 county Delta region of Louisiana and Mississippi to discern perceptions regarding biobased industry participation and potential opportunities. A total of 50 unusable surveys and 749 usable surveys were returned. The overall adjusted response rate for this survey was 25.7 percent.

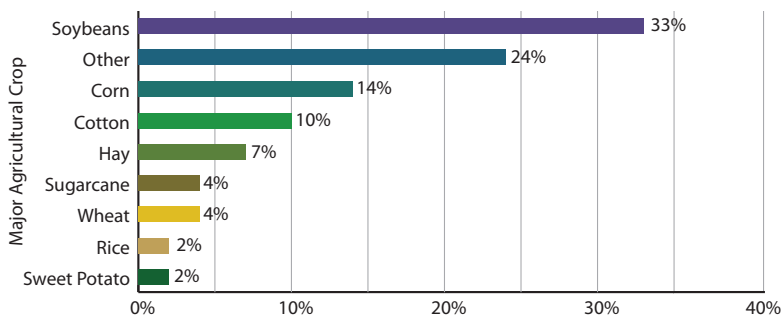


Figure 1

Results

About 59 percent of respondents owned less than 250 acres of land, with 82 percent individual or family owners. Soybeans were the most cited crop planted (33 percent of respondents), followed by "other" – trees, grain sorghum and fruits (24 percent), corn (12 percent) and cotton (10 percent) (Figure 1).

Almost 52 percent of respondents believed biomass harvesting will help diversify the management activities of their agricultural land. When asked if they believe agricultural residues from harvesting activities should be used for bioenergy production, a little more than 63 percent agreed, while 12 percent disagreed. A narrow majority (51 percent) were willing to participate in activities specifically geared to biomass production, such as dedicated energy crops. In addition, 56 percent of respondents agreed that economically viable technologies exist for converting agricultural biomass into bioenergy.

Respondents were asked if they would participate in a biomass-to-bioenergy market with an option of "No," "Yes" or "Not Sure." More than 17 percent said they would not participate, and 26 percent said they would participate. However, the majority of respondents (57 percent) were unsure if they would participate in a biobased market.

Summary

The biomass-driven energy sector is in its early stages. Although many respondents think technology exists for producing energy or fuels from agricultural crops and that agricultural residues from harvesting activities should be used for bioenergy production, most were unsure whether they would participate as a supplier. This and other questions that had significant neutral responses indicate a low level of familiarity with emerging biobased markets. As more studies are done, information should be disseminated to farmer clientele to keep them abreast of potential business opportunities or advancements in biobased technologies.

Richard P. Vlosky is Crosby Land & Resources Professor of Forest Sector Business Development, and Roger Smithhart and Paul Darby are former graduate students in the School of Renewable Natural Resources. Michael Blazier is an associate professor at Hill Farm Research Station, Homer, La.

Overview of the Louisiana Crawfish Industry

Narayan Nyaupane, Jeffrey Gillespie and Robert Boucher

As the largest U.S. crawfish producer, Louisiana had 1,265 crawfish farms covering more than 182,000 acres in 2013, according to the Louisiana Summary of Agriculture and Natural Resources published by the LSU AgCenter. Crawfish demand is greater than supply in the U.S., with a substantial portion of peeled crawfish imported from China. Given the importance of this industry, understanding the status of production and production practices can be used to target research, extension and policy activities.

Following is a brief overview of Louisiana crawfish production using data from a survey of Louisiana crawfish producers conducted in 2008. An eight-page questionnaire sent to 770 Louisiana crawfish producers yielded 75 usable responses.

Farm characteristics and producer demographics

On average, the Louisiana crawfish producers who responded to the survey had 662 acres of land, of which 211 were in crawfish production. Thirty-seven percent of the producers owned all of the land used for the crawfish operation, while 51 percent of the total crawfish land was rented. Of the land rented, 57 percent was under a cash lease, 27 percent was under a share lease, and 16 percent was under a combination cash-share lease. The farms in this sample do not differ greatly from estimates in the 2005 Census of Aquaculture.

The average age of crawfish producers was 54 years. Twenty-nine percent held at least a bachelor's degree, and only 7 percent did not have a high school diploma. Average percentage of farm income derived from crawfish production was 34 percent, and average percentage of household income derived from the farm was 53 percent. The average producer had been farming crawfish for 20 years.

Production systems used

Crawfish are raised using six production systems, and some producers used more than one. Of the producers studied, 45 percent raised crawfish as a single crop with rice forage, and 28 percent double-cropped crawfish with rice. A rice-crawfish-fallow rotation and single-crop crawfish with a non-planted forage crop were each used by 27 percent. Single-crop crawfish with other planted forage was used by 11 percent, and a rice-crawfish-soybean rotation was used by 7 percent.

Water management and harvesting practices

On average, 14 days were used to flood crawfish ponds on first flood to an average water depth of 7.4 inches. Producers replaced all or a portion of their crawfish pond water on average once a season to maintain the dissolved oxygen content. Average annual water usage was 53 inches per acre. Sixty percent of the producers used subsurface wells, and 55 percent used surface water pumped from rivers, canals or marshes. In addition, 89 percent captured and stored rainfall to reduce pumping costs, 66 percent minimized sediment loading when draining ponds, 40 percent reused pond water, 36 percent used tail-water (excess water) for irrigating crops, 44 percent conducted soil tests, 80 percent avoided pumping/draining at the same time, 96 percent installed outlets to drain water, and 95 percent used water retention during summer drawdown.

Producers used an average of 15 traps per acre for harvesting crawfish. Most (97 percent) used boats as their main method for harvesting crawfish while 3 percent harvested by walking.

Marketing practices used

Among the practices employed prior to sale, 63 percent of producers graded their crawfish, 32 percent washed their crawfish, and 5 percent purged their crawfish (emptied digestive tracts). Eight percent owned and/or ran a commercial crawfish peeling operation. Marketing channels included wholesale markets (64 percent), direct to consumers (30 percent), retailers (23 percent) and processors (18 percent).

Cost of crawfish production

The average cost of production and breakeven crawfish selling prices for 2010-2014 are based on results of the 2008 crawfish survey and input-price surveys conducted annually. Average breakeven crawfish selling prices required to cover direct (variable) expenses ranged from \$0.74 per pound to \$1.18 per pound, depending upon the production system. Average breakeven crawfish selling prices required to cover total expenses ranged from \$0.57 per pound to \$0.91 per pound, depending upon the production system.

Summary

On average, Louisiana crawfish producers used nearly one-third of their total farmland for crawfish production and received 34 percent of their total farm income from crawfish operations. A majority of the land was leased. The single-crop crawfish with rice forage system was the most commonly used, followed by rice-crawfish-double-crop, rice-crawfish-fallow rotation and single-crop crawfish with nonplanted forage crop, which were used by 27-28 percent each. Grading was a frequently used pre-marketing practice whereas most of the producers sold their crawfish via wholesale markets.

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Inside:

By using the tools of molecular biology, AgCenter scientists are trying to reduce the time it takes to develop new, disease-resistant sugarcane varieties. See page 8

The amount of phosphorus in chicken litter, which is used to fertilize crop fields, can be reduced by using new types of litter. See page 10

Research is showing potential ecological benefits from planting cottonwood and switchgrass on poor agricultural land. See page 12

Researchers explore the effects of the BP oil spill in the Gulf of Mexico in 2010 on the greenhead horse fly. See page 18



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