

LOUISIANA Agriculture

Assuring Our Future Through Scientific Research and Education

Vol. 60, No. 2, Spring 2017
Published Since 1957

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steps up to
meet the world's
growing demand
for agricultural
professionals



Our Graduates Solve World Problems

Bill Richardson

Helping to solve the world's problems sounds like a lofty or even elusive goal, but that is what we are preparing our students for in the LSU College of Agriculture. Our students will be the innovators, the decision-makers and the policy developers who will work to improve food security, protect natural resources, and advance the health of animals and individuals. At our essence, we are training students to feed and clothe a growing population that cannot prosper without advances in agriculture.

It is our faculty and graduate students on the forefront of that advancement through their research. In these pages you will read about our departments and the work they are doing to better the lives of the people of this state, this country and the world. You will see examples of the research graduate students are conducting that will improve animal reproduction, advance our understanding of insects, safeguard our marshes and allow the agricultural industry to grow food efficiently and abundantly.

This is my second stint as dean of the College of Agriculture. I served as dean in the mid-1990s and eagerly returned to this role in 2013. A lot has changed in 20 years. Our students can share information and connect to the world in a way we could hardly imagine two decades ago. But these students still share a passion for agriculture with their predecessors. In this issue, we reconnect with some of our alumni who have made their marks in various agriculture industries and are a reflection of what a degree in agriculture can do.

Despite some proclamations, agriculture is not a dying field. It is thriving here at the College of Agriculture. We are attracting bright students not only from Louisiana but from other states and countries around the world to our undergraduate and graduate programs. These students understand the value of a degree in agriculture and upon graduation are met with job prospects that allow them to pursue their dreams of making a difference in communities, having an impact on individuals, and yes, even helping to solve world problems.

Bill Richardson is the LSU vice president for agriculture and dean of the College of Agriculture.



The College of Agriculture's dean's staff hosted a tailgate party for students and their families on Oct. 15, 2016. Left to right are: Amanda Martin, director of recruitment and retention; Jennifer Neal, director of student services; Leslie Blanchard, assistant dean; Maria Cazes, director of operations; Brandon Guillory, academic coordinator; Tobie Blanchard, communications coordinator; Bill Richardson, dean; Lindsey Kelly, director of alumni affairs; Gigi Gauthier, internship coordinator; and Gina Eubanks, associate vice president and diversity director.

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Louisiana Agriculture is published quarterly by the Louisiana Agricultural Experiment Station. Subscriptions are free. You may also subscribe to a Web version of the magazine, which is available at www.LSUAgCenter.com. Please go to the "Louisiana Agriculture Magazine" site if you would like to receive an email notification when a new issue is online. For more information or to subscribe, please contact:

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ON THE COVER: Students who study natural resources ecology and management, such as Kathryn Peytavin, participate in field work. Peytavin was a student in Bret Collier's wildlife management class, where the students captured and banded ducks in the Mississippi River, including this male wood duck. Photo by Bret Collier

AgCenter hosts international meeting on technology transfer

The LSU AgCenter hosted administrators from several universities for an international conference on the best ways to disseminate technology and information to the public. The Visegrad University Association Technology Transfer Symposium held April 2-8 included rectors and deans from universities in the Czech Republic, Dominican Republic, Honduras, Hungary, Poland, Slovakia, Russia and Ukraine as well as dignitaries from embassies. The AgCenter is the only U.S. institution in the association, according to AgCenter Vice Chancellor John Russin. The AgCenter has organized numerous student exchanges with Visegrad universities, notably with the Slovak University of Agriculture in Nitra, Slovakia, and Mendel University in Brno, Czech Republic. Additionally, faculty from the AgCenter have visited those universities to identify opportunities to collaborate on research and outreach endeavors, and vice versa.



Blake Wilson named rice, sugarcane entomologist

Blake Wilson has been hired as an assistant professor of field crops entomology with the LSU AgCenter. His primary responsibilities will be research and extension relating to rice and sugarcane insects. An area of focus is improving the economics and sustainability of integrated pest management for rice. Another focus is on management of major insect pests in sugarcane, including the sugarcane borer and the Mexican rice borer, and rice insect pests that include the rice water weevil, rice stink bug and stem borers.



Experts discuss irrigation at water symposium

LSU AgCenter economist Naveen Adusumilli, below, was among the speakers at the Louisiana Groundwater, Surface Water and Water Resources Symposium on the LSU campus April 11-12. He spoke about improving irrigation efficiency and water quality and how he helped develop a rate structure for the North Caddo Irrigation District, which includes the Natural Resources Conservation Service Red Bayou project. It pumps water from the Red River into the bayou so farmers have surface water for irrigation. Most farmers now pay the irrigation district about \$65 per acre-foot of water. The rate structure includes a fee based on how much water is used, which Adusumilli said encourages efficiency. It also ensures the district will have funds for future equipment repairs.

Other AgCenter speakers included Changyoon Jeong, who discussed his research on improving water quality with a constructed wetland like the one at the AgCenter Red River Research Station in Bossier City, which consists of two ponds. Louisiana Master Farmer Program coordinator Ernest Girouard told about a project in which he and Jeong are monitoring water quality on a Vermilion Parish rice and soybean farm that reuses runoff collected in a reservoir. As the water circulates through the system, nutrients also get reused, reducing pollution in nearby waterways.



Scale insect is causing widespread wetland damage

This open area of marsh shows damage to roseau cane from a small insect called the Phragmites scale, which is key to the survival of Louisiana coastal marsh, said LSU AgCenter entomologist Rodrigo Diaz. So far, the insect has damaged a considerable amount of roseau cane in Plaquemines Parish from Venice to the mouth of the Mississippi River. The roots of roseau cane hold marsh soil in place, and it helps with coastal land loss. "By far, it's one of the best plants for preventing erosion," Diaz said. The insects originate from China or Japan, but how they got to Louisiana is uncertain. Diaz said it has only been in the past few weeks that the scale was identified by the U.S. Department of Agriculture.



Youth learn outdoor skills at 4-H Survivor Camp

Nearly 70 seventh- through 12th-graders from 10 parishes in north Louisiana participated in 4-H Survivor Camp at North Toledo Bend State Park for three days in March, where they learned outdoor survival skills while working together as teams to complete tasks and compete in contests. "We're trying to give the kids a sense of belonging, and this camp is designed to develop trust and to help them work on their communication skills," said Donny Moon, LSU AgCenter agent in Winn Parish. Because phone reception was almost nonexistent, the campers had to focus on more traditional technology like compasses, maps and the scenery itself, Moon said.



Sensory Services Lab seeks 'Tiger Tasters'

Before new food products make it to market, they often go through consumer testing. The Sensory Services Lab in the LSU AgCenter School of Nutrition and Food Sciences is set up to help companies conduct sensory evaluations, consumer preferences and product research. To conduct taste tests, the center needs taste testers. Researchers with the center are compiling a database of individuals who could be called upon to participate in these consumer tests. Ashley Gutierrez, the sensory lab manager, said anyone 18 years or older can sign up to be a Tiger Taster with the lab. "This is a great opportunity to help shape new products," Gutierrez said. Tiger Tasters can sign up by filling out a brief survey that collects demographic information. The information is used to help companies get a panel of tasters that best suits their needs. Learn more by searching for Sensory Services Lab at www.LSUAgCenter.com.

Smith named Udall scholar, publishes book

Madelyn Smith, a sophomore from Lafayette studying natural resource ecology and management, spent the past year photographing and collecting stories from Louisiana communities threatened by coastal erosion. The book that resulted from her work, *Louisiana Gone*, is filled with black-and-white images and essays that detail life along Louisiana's vulnerable coastline.

Smith is a 2017 recipient of the Udall Undergraduate Scholarship, which is awarded to only 50 college sophomores and juniors in the country and recognizes a student's commitment to issues related to the environment. She believes her book played a role in her receiving the scholarship. As an Udall scholar, Smith will travel to Tucson, Arizona, this summer for a conference with other Udall scholars, where they will be charged with trying to find a solution to an environmental issue.



Kunlin Song wins distinguished dissertation award

Kunlin Song, at right, a recent Ph.D. graduate in the School of Renewable Natural Resources, is the recipient of this year's LSU Alumni Association Distinguished Dissertation Award in Science, Engineering and Technology with his dissertation, "Application of Biomass in Nanocomposites and Drilling Fluids." His major professor was Qinglin Wu, at left. The winning dissertation demonstrated a mastery of research techniques, ability to do original and independent research, and skill in formulating conclusions that in some way enlarge upon or modify an accepted idea and contribute to knowledge. In 2015, Kunlin won a prestigious second-place Wood Award given to the best graduate research papers by the Forest Products Society. Kunlin's work has been published in *Fuel*, *Journal of Thermal Analysis and Calorimetry*, *ACS Applied Materials and Interfaces*, *Industrial & Engineering Chemistry Research*, *Colloids and Surface A: Physicochemical and Engineering Aspects*, and *Journal of Natural Gas Science and Engineering*.



LSU takes top honors at national poultry judging contest



The College of Agriculture poultry judging team won numerous awards at this year's U.S. Poultry Foundation Ted Cameron National Poultry Judging Contest held April 5-7 on the LSU Baton Rouge campus. The LSU team placed first overall in the contest, and four team members were named overall finalists.

Individual winners were Kurtlyn Givens of Arkadelphia, Arkansas, who was the overall high individual in the contest; David Smith, of Opelousas, second high individual; Nicole Cutrer, of Covington, fourth high individual; and Chris Harris, of Baton Rouge, fifth high individual overall.

The team included, left to right: Dennis Ingram, professor and coach; Karen Robbins, assistant coach from Folsom; Smith; Cutrer; Givens; Harris; Trent Dugas, assistant coach from Loreauville; and Brandon Cheron, assistant coach from New Orleans.

Five students receive University Medals at commencement



Five College of Agriculture students received University Medals during the college's commencement ceremony on May 12 in the LSU Maddox Field House. The University Medal was established as an award for LSU undergraduate students graduating with the highest grade point average in their class.

Earning University Medals were, left to right: Kelly Forschler, a nutrition and food sciences major from New Orleans; Mackenzie Gremillion, an animal sciences major from Baton Rouge; Allison Poche, an animal sciences major from Baton Rouge; Jennifer Parent, a nutrition and food sciences major from New Orleans; and Elizabeth Weltman, a double major in natural resource ecology and management and sociology from Baton Rouge.

"This is an outstanding achievement," said Bill Richardson, dean of the College of Agriculture and LSU vice president for agriculture. "We are very proud of these students for their accomplishments."

College lauds alumni, students at spring awards ceremony

The College of Agriculture recognized outstanding alumni and students at its spring award ceremony on March 30. Award recipients included, left to right: Maj. Gen. Glenn Curtis, outstanding alumnus; Melissa Siebert, outstanding young alumna; Matt Foster and Jancee Rice, who each won the Ray and Dorothy Young Award in Louisiana Row Crop Integrated Pest Management; Brad Frazier, K.C. Toups Memorial Les Voyageurs Award; Jean Pittman, Gerald and Norma Dill College of Agriculture Alumni Association Outstanding Senior; and Fran DeVille, outstanding alumnus.



A Changing World Demands Sustaining Our Natural Resources

Allen Rutherford

The School of Renewable Natural Resources has a long history of natural resource teaching, research and outreach, beginning with the first forestry class taught in 1911. Subsequently, the original Department of Forestry evolved from the School of Forestry and Wildlife Management to the School of Forestry, Wildlife, and Fisheries, and finally the current School of Renewable Natural Resources. The name changes reflect historic changes in the program from a forestry program to a comprehensive program that supports the original intent but also encompasses wildlife conservation, fisheries, aquaculture, wetlands, watershed ecology, forest products, ecological restoration, forest enterprise and pre-veterinary wildlife medicine.

It is estimated that by 2050, a growing world population will neces-

sitate a 70 percent increase above 2005 food production levels, thus putting tremendous pressure on water resources and our natural environments. Multidisciplinary approaches are needed to solve water needs for agriculture while sustaining fish, wildlife and timber resources along rivers and streams. Furthermore, sea levels are expected to rise by up to 3 feet in the next century, and innovative approaches to marsh restoration and management are needed to support the seafood and wildlife associated with these wetlands. The U.S. Department of Agriculture projects there will be a 5 percent increase in job openings for food, agriculture, renewable natural resources and environmental occupations between 2015 to 2020. The interdisciplinary nature of our school combined with the vast wetland, upland and agricultural resources in Louisiana

provide an exceptional environment for training tomorrow's local and global leaders, while sustaining Louisiana's habitat-dependent economy and culture.

The LSU School of Renewable Natural Resources is internationally known for its interdisciplinary approach to natural resource conservation. Louisiana provides an unparalleled environment for training graduate and undergraduate students in a host of ecosystems. A variety of plant and animal habitats — including rivers, coastal marshes, pitcher plant bogs, agricultural wetlands and upland forests — dominate the Louisiana landscape. The Louisiana culture and economy are dependent on these habitat types that support diverse plant and animal populations. The school is recognized nationally and internationally for its expertise in ecology, management and conserva-

Derrel Wilright bands ducks in the Mississippi River with Bret Collier's wildlife management class. Photo by Bret Collier



tion. Faculty work locally, nationally and internationally on a wide range of conservation and management issues with partners including the U.S. Fish and Wildlife Service, Nature Conservancy, International Crane Foundation, Louisiana Department of Wildlife and Fisheries, and numerous other state and federal agencies, nongovernmental organizations and industry. The global impact of our school is significant, with faculty offering technical assistance in numerous countries, including China, Russia, Myanmar, Vietnam, Cambodia, Thailand, Brazil and Russia. Researchers from Thailand, South Korea, China, Zambia, Brazil, Honduras and other countries visit our school for training.

Current research in the school includes a diversity of topics: value-added uses of forest products, including biomass; medicinal plants; conservation and management of game and nongame fisheries and wildlife species; control of feral hogs; management issues pertaining to hydrologically degrading forested and coastal wetlands; impacts of the BP oil spill on bird populations and conservation of endangered species; forestry management and stand dynamics,

marketing, economics, biometrics, urban forestry and forest-related safety; global climate change; and fisheries and aquaculture nutrition, physiology, genetics and ecology.

As a result of these research projects, faculty in the school have developed management plans to preserve Atchafalaya River basin habitats, advanced methods to restore coastal forests and coastal wetlands, increased waterfowl habitats, improved crab baits, elucidated game species ecology, identified the impacts of invasive species on native populations and developed wood-based artificial turf for sports fields. They have invented wood-based batteries, created wood-based drilling fluid additives called TigerBullets, used bio-based nanotechnology to create environmentally friendly products, developed a new way to analyze remote sensing data and developed bioactive screening methods to assess medicinal plant viability for natural drug creation. They have also developed tree growth methods to maximize landowner profits, improved methods for forest inventory, enhanced land expectation value formulas to optimize forestry practices, and

improved our understanding of conservation and biodiversity of aquatic and terrestrial ecosystems.

Diverse career options are available to graduates of our school. Careers in natural resources include education, technology, conservation, management, research and planning. Many of our students pursue careers with state agencies (Department of Wildlife and Fisheries, Department of Natural Resources, Department of Agriculture and Forestry), federal agencies, (U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, U.S. Forest Service), natural resource consulting groups, natural resource industry (Weyerhaeuser, International Paper) and nongovernmental organizations (Nature Conservancy, National Wildlife Federation, Ducks Unlimited). We find that whichever career route our students take, they all want to make a difference in the world by managing, conserving and developing forestry, forest products, and wildlife and fisheries resources.

Allen Rutherford is director of the School of Renewable Natural Resources and associate dean of the College of Agriculture. He holds the Bryant A. Bateman Professorship in Forestry, Wildlife and Fisheries.

Luke Laborde, (second from left) assistant professor in the School of Renewable Natural Resources, captures and bands ducks on the banks of the Mississippi River with a wildlife class. Photo by Bret Collier



Just Below the Surface

Determining Patterns of a Critical Underwater Resource

Kristin DeMarco

Ask any fisherman or duck hunter in coastal Louisiana, and they'll tell you that some of the best habitats for fish and waterfowl are areas that are loaded with underwater grasses. In technical terms, these plants just under the water surface are known as submerged aquatic vegetation. Submerged aquatic vegetation grows in shallow waters off the northern Gulf of Mexico coast and is one of the most productive ecosystems in coastal landscape. However, because submerged aquatic vegetation is harder to see, it often takes a back seat in conservation efforts. The structure created by these underwater forests provides excellent fish habitat in areas that would otherwise be mud bottom and is a primary food source for many species of wintering waterfowl. Because submerged aquatic vegetation changes the physical structure of the habitat, it is considered an ecosystem engineer, supporting diverse populations of fish and wildlife species and performing valuable ecosystem services by improving water quality and clarity as it takes up nutrients and stabilizes sediment.

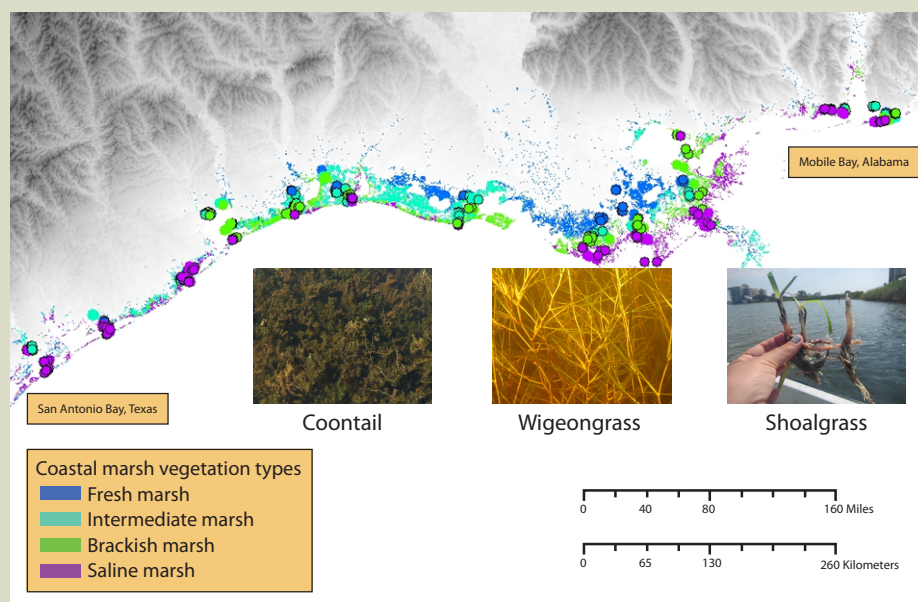
Across coastal landscapes, submerged aquatic vegetation communities can develop over a wide salinity range, and beds will form in freshwater interior marsh ponds, brackish marsh creeks and bayous, navigation canals, as well as saline protected bays. This ability for the beds to persist across the entire range of salinities in the coastal marshes is a critical characteristic for creating high-quality waterfowl habitat; many duck species require a variety of habitats to meet foraging and resting needs. Despite the known importance of submerged aquatic vegetation in coastal ecosystems, basic baseline data and maps describing its geographic coverage in the northern Gulf of Mexico, especially shallow marsh ponds, are lacking. Additionally, how changes in salinity, water depth, water clarity and exposure to waves will affect the presence of this vegetation in shallow wetland waters is poorly understood.

To learn more about submerged aquatic vegetation as a coastal resource, LSU AgCenter researchers developed the first dataset describing this vegetation across the coastal landscape. They traveled from San Antonio Bay, Texas,

to Mobile Bay, Alabama, during the summer growing seasons from 2013 to 2015. Field data from almost 400 randomly selected sites of submerged aquatic vegetation communities were collected, primarily from an airboat, across coastal marshes. Analyses from these data indicate that saline marsh waters are less likely to support submerged aquatic vegetation because of the interaction between salinity and waves. But when submerged aquatic vegetation in saline waters was able to colonize, it tended to form meadow-like beds and cover larger areas. Shallow waters in fresh, intermediate and brackish marshes supported higher and similar amounts of submerged aquatic vegetation, although species communities were distinctive among marsh zones. The most frequently occurring species encountered were *Ruppia maritima*, or wigeongrass, and *Ceratophyllum demersum*, or coontail, both highly desirable types of waterfowl forage.

To understand how submerged aquatic vegetation coverage might change with the seasons, researchers again went out to collect field data closer to home in Barataria Bay, Louisiana, where they sampled the vegetation habitats every six to eight weeks in 2015. Results indicate that submerged aquatic vegetation growth in fresh marsh shallow waters is significantly hindered in the summer season because of the presence of floating aquatic vegetation, especially from the exotic invasive water hyacinth (*Eichhornia crassipes*). Floating aquatic vegetation will often grow so thick on the water surface that submerged species will die from lack of light.

LSU AgCenter researchers have joined forces with state and federal agencies and are currently developing a spatial model that will predict the likelihood of submerged aquatic vegetation occurrence in Louisiana coastal waters based on environmental conditions. The maps associated with this model are the



Submerged aquatic vegetation study sites and marsh types in the northern Gulf of Mexico.

first to geographically represent the distribution of vital submerged aquatic vegetation resources in coastal Louisiana and will be a valuable research and management tool. These maps and models are necessary to plan for conservation and restoration of coastal habitats as restoring this vegetation is essential to protect fish and wildlife populations in a changing climate. Mapping submerged aquatic vegetation resource availability is a particularly pressing need in the northern Gulf of Mexico. Sea-level rise is predicted to inundate much of the coastal zone, changing salinity zones inland and increasing shallow open-water areas, dramatically altering the areas potentially able to support submerged aquatic vegetation habitats. The data, modeling tools, maps and quantification of ecological processes collected in this work are much needed by coastal researchers and will lead to more informed coastal habitat management on a landscape scale.

Kristin DeMarco is a doctoral student in the School of Renewable Natural Resources.



Kristin DeMarco shows the healthy roots of shoalgrass at a site in Grand Bay, Alabama. Photo by Eva Hillman



In order to categorize the submerged aquatic vegetation, researchers take soil cores of the plant roots and collect the vegetation to take back to the lab to determine below- and above-ground biomass. Kristin DeMarco holds the above-ground submerged aquatic vegetation collected at site in Brazoria County, Texas. Photo by Eva Hillman

Students Prepare for the Animal Industry

Phil Elzer

Louisiana's animal industry is valuable, contributing millions of dollars to the state economy each year as well as providing countless opportunities for recreation, food and more. This industry has evolved considerably in recent decades. Technology now plays more of a role in animal production than ever before, and people are increasingly conscious of how animals are cared for and what impact they have on the environment. The School of Animal Sciences is working to meet the challenges of today's industry through research, outreach and teaching efforts.

Our faculty and graduate students work together on research on reproductive efficiency in cattle and horses, ruminant nutrition, muscle quality of livestock, vaccine development and gene therapies. These focus areas are among the most crucial to the Louisiana animal industry. Research on these topics helps producers develop more reliable and consistent products. Vaccine research contributes to improved animal health, which is key to any successful livestock operation.

None of this work would be possible without AgCenter research stations, including the Reproductive Biology Center in St. Gabriel, the Dean Lee Research and Extension Center in Alexandria, the Hill Farm Research Station in Homer and the Bob R. Jones-Idlewild Research Station in Clinton. Students in the School of Animal Sciences visit the Southeast Research

Station in Franklinton for lessons on forage quality and dairy production. These facilities provide space for research projects and field trials.

Faculty members are involved in a number of extension activities that make research-based information accessible to those who need it. AgCenter research stations regularly hold cattle and forage field days. These events give attendees a chance to meet our personnel, learn about their latest research and see demonstrations on pasture care, forages, nutrition, waste management, reproduction and genetic improvements.

Animal sciences faculty also help coordinate livestock programs for youth in 4-H and FFA clubs; lead livestock training programs for 4-H agents; serve as advisers to producer groups and governmental agencies; assist with parish-level Master Cattleman and Master Horseman classes; and make farm visits to answer producers' questions.

To ensure the continued success of these activities and the animal industry, the School of Animal Sciences curriculum has recently undergone important changes. Until this academic year, the school awarded an undergraduate degree in animal, dairy and poultry sciences. We have retitled the degree to be one in animal sciences, reflecting a new focus on providing students a well-rounded education in all aspects of this field.

Our goal is to give students the scientific background they need to be successful, whether they pursue a career as a cattle rancher, veterinarian or laboratory researcher, or even in related fields such as the pharmaceutical and food industries. It is critical that students are knowledgeable of animal science as a whole and understand how different specialized areas are linked.

New undergraduate classes are being offered on basic animal husbandry, equine topics and meat products. Laboratory components have been added to a number of existing courses. There also is a new mechanism to provide course credit to students who complete internships, which are highly encouraged. Internships enhance the students' classroom education and give them real-world experience that makes them more attractive job candidates upon graduation.

Through research and education, the School of Animal Sciences gives producers the information they need today while making scientific discoveries that will benefit them tomorrow. Above all, our desire is to make sure animals, humans and the environment are all safe and healthy. We believe our school plays a valuable role in accomplishing this in Louisiana.



Morgan Richard, left, an animal sciences alumna, worked with professor Cathy Williams to conduct research on dairy cows. Photo by Tobie Blanchard

Phil Elzer is director of the School of Animal Sciences and associate vice president for animal sciences and natural resources. He holds the Meraux Foundation Supreme Champion Livestock Professorship.



Dana Bryant, a sophomore in animal sciences, holds a baby goat as she talks to visiting students during the 2017 College of Agriculture Ag Week event. Photo by Tobie Blanchard



Animal sciences student Nikhol Kelley rides away from the last obstacle of the barrel racing event during the 78th annual Block and Bridle Rodeo in 2015. Proceeds from the student rodeo benefit local charities. Photo by Olivia McClure

Hormonal Approach to Inducing Early Ovulation in Mares

Erin L. Oberhaus and Donald L. Thompson Jr.

An industry-imposed birthday of January 1 for most registered horse breeds has created an incentive for horse owners and breeders to produce foals as early in the year as possible. However, this becomes difficult because of the mare's long gestation period of 330 to 345 days and the seasonal nature of the mare's reproductive cycle. Mares in Louisiana typically enter a period of reproductive inactivity, known as seasonal anestrus, in late October and do not return to a regular cycle, or cyclicity, until early April. Therefore, advancing the first ovulation of the season is desirable for breeders in order to produce maximally competitive foals — those born close to the January 1 birthdate — and has led to years of study of spring transition in mares and numerous attempts to develop pharmacological therapies for inducing early cyclicity.

Much effort is invested yearly in the effort to manipulate the mare's reproductive cycle so she ovulates in mid-February. The common method used in the field to induce early cyclicity is artificial lighting. This has proven to be labor intensive and cost prohibitive for most farms. Of the pharmacological therapies that have been tested, the most promising is the use of prolactin (a pituitary hormone) or dopamine antagonists such as sulpiride or domperidone that stimulate prolactin. Elevated prolactin during seasonal anestrus stimulates follicular growth and hastens ovulation in most, but not all, mares. It is unclear how prolactin induces early ovulation, but it is suspected that prolactin acts directly on the ovary.

Ten years of experimentation at the LSU AgCenter has revealed success rates of mares ovulating early range from 50 to 90 percent in mares treated with a combination of estrogen and either domperidone or sulpiride. Because all mares did not respond to treatment, the current research project was designed to identify factors that might indicate whether a mare responds to stimulated prolactin with early ovulation.

In this experiment, mares in seasonal anestrus were treated with injections of estrogen and sulpiride in mid-January. Mares that responded with early ovulation did so approximately 10-15 days after treatment. These mares tended to have higher body condition scores and higher concentrations of the hormones leptin and insulin, which might indicate that their nutritional status was superior to mares that did not respond. Nutritional status is an important factor in reproductive success in many species, so it is not surprising that nutrition may have affected the ovarian response to stimulated prolactin.

Ovaries also were assessed to determine what changes occurred in response to stimulated prolactin.

The ovarian follicles that were induced earlier produced just as much estrogen, progesterone and prolactin as the follicles occurring naturally later in the spring. The early-induced follicles also contained just as many receptors for luteinizing hormone, the hormone responsible for ovulation. Receptors for luteinizing hormone in the ovary are required for the hormone to exert its action and cause ovulation. This indicates that the early ovulatory follicles are just as mature and capable of ovulating a fertile egg as their later-season counterparts. Pregnancy rates were 75 percent in mares induced to ovulate early. This is an important aspect of the proposed treatment in terms of its practical use in the equine industry.

Ongoing research at the LSU AgCenter continues to focus on identifying a practical approach for the use of these dopamine antagonists in mares. An understanding of the ovarian changes that occur in the presence of prolactin will allow researchers to identify cause-and-effect relationships between prolactin and ovarian function. This knowledge could help generate new or better protocols to induce early cyclicity in more mares and may also be applicable in artificial reproductive technologies such as embryo transfer and in vitro fertilization.

Erin L. Oberhaus is a Ph.D. candidate and Donald L. Thompson Jr. is the Ralph and Lela Boulware Professor of Animal Sciences in the School of Animal Sciences.



Erin Oberhaus, a Ph.D. student in animal sciences, prepares to draw blood from a horse at the LSU AgCenter horse unit. Photo by Tobie Blanchard

WHAT STUDENTS STUDIED IN 2016

70	Ag Business	
30	Ag and Extension Education	
385	Animal Sciences	
37	Environmental Management Systems	
293	Natural Resource Ecology and Management	
250	Nutrition and Food Sciences	
60	Plant and Soil Systems	
194	Textiles, Apparel, and Merchandising	

College of Ag

NUMBERS AND RECRUITMENT

For the past five years, the LSU College of Agriculture's student population has hovered around 1,300, and the breakdown in what students study has stayed relatively steady. Animal sciences attracts the largest number of students with nearly 400. Natural resource ecology and management is second with close to 300.

Amanda Martin, director of recruitment and retention for the college, has developed a recruitment strategy aimed at reaching more students in a more personal way.

Martin and her team present or set up booths at high school college fairs, conferences, university-organized events and other off-campus venues. The college also hosted 800 prospective students and their families on campus during the 2016-2017 school year. Some of these students attended new on-campus recruiting events designed to give them an up-close look at the College of Agriculture and life on campus. The recruiting team also made more than 600 personal calls to prospective and admitted students. Martin is working with the college's student ambassador team, Les Voyageurs, to include them in the recruitment effort, and plans are to get alumni involved in recruiting as well.

With the new efforts, the college has seen an uptick in the number of students applying and admitted to the college for fall 2017.

Martin said recruiting plans for the 2017-2018 year include diversifying the way her team recruits to draw more students to some of the majors with lower numbers.

"We will focus on engaging high school students through interactive presentations at their schools in classes like biology and chemistry to showcase how science provides the foundation to everything we do in the agriculture industry," she said.

College offers living, learning community for first-year students

The College of Agriculture's Agriculture Residential College (ARC) in Blake Hall, a dormitory on the LSU campus, is a living-learning community for first-year students. Students must apply, and the occupancy is around 100. ARC offers students the opportunity to live and take classes with the same group of peers, thus creating a smaller network within the larger LSU campus. ARC students go on field trips and attend special interest lectures that focus on agricultural issues in a changing world. They learn about the many career choices in agriculture. There are social events, too, as well as chances for community service.



Haley Rupp, an animal sciences major, holds a baby alligator while visiting the LSU AgCenter Aquaculture Research Station as part of the many activities planned for students who live in the Agriculture Residential College (ARC) on the LSU campus. Photo by Tobie Blanchard

Managing Insects for Peace and Prosperity

Michael J. Stout

Insects are the largest and most diverse group of organisms on earth. Almost a million species of insects have been described by scientists, with many more yet to be discovered. The overwhelming majority of these insect species enrich our lives with their beauty or provide us with tangible benefits by acting as vital components of ecosystems. For example, insects are responsible for pollinating many of our crops and for consuming other insects that would otherwise damage our crops. A relatively small number of insects, however, create serious problems for humankind. The mission of the Department of Entomology is to develop solutions for these insect-related problems.

Insects negatively impact humans by consuming crops both before and after harvest. Historically, one of the primary reasons for the establishment of separate departments of entomology in land-grant universities, like LSU, was to better help farmers control the pests that threatened their crops. Many entomology faculty members are leaders in the discipline of integrated pest management (IPM), an approach that seeks to develop ecologically based, cost-effective and sustainable solutions to pest problems in crops. An IPM approach does not completely eschew the use of insecticides, but rather seeks to use insecticides rationally and integrate the use of insecticides with alternative tactics such as biological control (the use of a pest's natural enemies against it), host plant resistance (the development and deployment of crop varieties with inherent resistance to pests) and cultural controls (alteration of the crop environment in ways that reduce the impact of pests). LSU AgCenter field crop entomologists are developing IPM tactics in crops important to Louisiana's economy, including corn, soybeans, sugarcane and rice. Similar principles are being applied to the management of pests of forests. The research and extension programs directed by the department's field crop and forest ento-

mologists save Louisiana's producers millions of dollars annually.

The voracious appetites of some insects for plants can in some cases be used to our advantage. Giant salvinia is an extremely damaging weed present in many Louisiana waterways. The aptly named salvinia weevil feeds only on this plant, and releasing this weevil in areas affected by giant salvinia can greatly reduce the salvinia problem. A large effort is underway in the department to rear large numbers of this weevil for release in salvinia-infested areas in Louisiana.

Insects are also important pests in urban environments, whether by acting as nuisances (bedbugs, cockroaches, fire ants) or by attacking structures (termites, carpenter ants). The Formosan subterranean termite alone causes hundreds of millions of dollars in damage annually in Louisiana. Like their field crop counterparts, urban entomologists in the department are investigating novel strategies for monitoring and controlling urban pests. For example, they were instrumental in developing bait systems for controlling Formosan subterranean termites, and experiments are now being conducted to develop termite control strategies that target the symbiotic protozoans in termite guts essential to the ability of termites to feed on wood.

Another major impact of insects on humans is the ability of some insects, notably mosquitoes and biting flies, to transmit (vector) diseases to humans, livestock and companion animals. There are a number of insect-vectored diseases that are already problems in Louisiana, such as West Nile virus in humans and heartworm in dogs, while other diseases such as Zika virus are not yet present in Louisiana but are potential threats. Research and extension personnel in the department are at the forefront of efforts to develop and implement improved programs for managing the vectors of diseases and thereby prevent disease. One collaborative project in this area involves two of the most familiar

insects in south Louisiana, honeybees and mosquitoes. Department personnel are developing strategies to effectively use insecticides against mosquitoes without negatively affecting honeybees, the hives of which are often found in areas targeted by sprays for mosquitoes. Another related effort seeks to monitor mosquitoes statewide for the development of resistance to insecticides. The development of insecticide resistance in mosquito populations would severely curtail our ability to control the spread of mosquito-vectored diseases.

Other research in the department is directed toward a better understanding of the key role of insects in natural ecosystems. In coastal marshes, for example, larvae of horse flies (tabanids) function as top predators, and populations of tabanids are therefore sensitive to ecological perturbations. Research initiated after the Deepwater Horizon oil spill in 2010 is using surveys of tabanid populations in coastal areas of the Gulf of Mexico as indicators of ecosystem health and recovery in oiled regions.

The Louisiana State Arthropod Museum is vital to all the activities of the Department of Entomology. The museum houses more than a million specimens of insects, and museum personnel have collectively described hundreds of new species of insects over the past 20 years. More importantly, the taxonomic expertise possessed by museum staff is essential to the proper functioning of all the other research, extension and outreach programs in entomology.

Also central to all activities in the department are our students. There are currently about 35 master's and doctoral students from eight countries. It is their hard work that fuels most of the research, and they are active in outreach efforts by the department. Graduates from the department go on to jobs in academia, the agrochemical industry and government agencies like the Environmental Protection Agency and the U.S. Department of Agriculture.

The Department of Entomology also teaches and mentors undergraduate students, both formally in classes and informally by providing undergraduate opportunities for independent research.

The diversity of research and outreach activities conducted by the faculty, staff and students of the LSU Department of Entomology is a reflection of the diversity of insects themselves. Unifying these disparate activities is not only a commitment to solving insect-related problems for the people of Louisiana but also a desire to increase public appreciation for this fascinating group of organisms.

Michael J. Stout is head of the Department of Entomology and has the L.D. Newsom Professorship in Integrated Pest Management.



Photos by Claudia Husseneder

RESEARCH BRIEF

Research at the Arthropod Museum Reveals Earth's Natural History

Brittany Owens

The Louisiana State Arthropod Museum is one of the LSU AgCenter's hidden gems. Containing more than a million pinned, curated insect specimens and many more preserved in ethanol, it is an incredible resource and a gold mine of insect specimens from Louisiana, the Southeastern United States and many countries around the world.

Researchers working in the museum have the opportunity to build unique research programs focused on insects from Louisiana to New Zealand, gain experience as insect diagnosticians, and form collaborations with researchers in the state and around the world.

Within the museum's long history of supporting insect taxonomists and systematists, current scientific efforts focus on a group of beetles found in forest litter, flood debris, soil and caves. These beetles — members of the family Staphylinidae, the “rove beetles” — are the most diverse family of animals on the planet, with more than 60,000 described and many undescribed species. Studying these beetles offers insight into the processes of evolution responsible for current patterns of biogeography and biodiversity. The quest for these little coleopterans has led museum scientists on road trips from Baton Rouge to Mt. Rainier and on plane flights from LSU to Auckland, New Zealand. Such studies have resulted in the description of new species and the incorporation of molecular phylogenetics from specimens around the world. But a strong focus on the Southeastern U.S. fauna remains a driver behind ongoing research efforts. Museum taxonomists spend hours “collecting” in the museum, sorting through specimens collected locally and abroad. In a recent publication, 10 new species of beetles from the Arthropod Museum, including one known from a single specimen collected in Louisiana, were identified. Discoveries like this highlight biodiversity in Louisiana and the importance of research based on natural history collections with a local focus.

As taxonomic consultants, museum scientists also aid other scientists in the state by providing identifications for their research

projects. Over the past two years, museum researchers have contributed to several projects focusing not on beetles, but on native bee faunas. Data from these surveys have been combined with the Louisiana bee species in the museum to create the most comprehensive checklist of native bee species in the state, including more than 20

new species records for Louisiana. Again, by “collecting” in the museum, taxonomists uncovered several undescribed species of bees from Louisiana. Together with collaborators they have prepared critical collections and data, allowing researchers to catalog an essential element of the native pollinator fauna. These results highlight the importance of maintaining active insect collection-based research with a strong regional focus.

Current research in insect taxonomy, phylogenetics, diagnostic work and taxonomic consulting at LSU is profoundly shaped by the Louisiana State Arthropod Museum. From molecular phylogenetic work on beetles in Oceania to studies of pollinator faunas within endangered habitats in Louisiana, the resources available at the museum facilitate both far-reaching opportunities for discovery abroad and commitment to the research community in Louisiana.

Brittany Owens is a doctoral student in the Department of Entomology.



Brittany Owens, a doctoral student in the Department of Entomology, conducts research projects at the Louisiana Arthropod Museum, which is part of the department. Photo by Tobie Blanchard

Meeting the Business Needs of Agriculture in the Global Economy

Michael E. Salassi

The mission of the Department of Agricultural Economics and Agribusiness is to generate, apply and disseminate knowledge on a wide range of issues important to agribusiness, agricultural production, food marketing, farm policy, natural resource use and rural development in Louisiana, the nation and the global community. Departmental faculty employ the highest scholarly standards in their teaching, research, and outreach and extension programs, which are integral to the purpose of the land-grant university system.

Undergraduate students have the opportunity to pursue a B.S. degree in agribusiness, with concentrations in agribusiness finance, food industry management, international business and rural development. Graduate students have the opportunity to pursue M.S. and Ph.D. degrees in agricultural economics, with specialization in a variety of subject matter areas. Through the LSU AgCenter, our faculty conduct research and extension activities in a wide range of areas, including agricultural production economics, agribusiness, agricultural finance, commodity and food marketing, forestry economics, international trade, farm policy, rural development, rural sociology, and natural resource economics and conservation.

An important area of research and extension effort in the department focuses on the economics of major row crop production in Louisiana. The general objective of the various research projects in this area is to conduct economic evaluations of physical, technological, economic and farm policy factors affecting the production of major row crops, as single enterprises, and the management of commercial row crop farming operations, within a whole-farm context, in Louisiana. Researchers in this area investigate alternative crop production practices that maximize net farm economic returns as well as analyze the effects of alternative federal farm income support and conservation programs on alternative commercial farming operations in the state. These research activities focus on major crops produced in the state, including rice, sugarcane, corn, cotton, soybeans and sweet potatoes.

Other areas of departmental research concentrate on issues in agribusiness sectors integral to the economic viability of agricultural and food production in Louisiana. One research project analyzes financial markets and how they are linked with debt decisions, providing information to stakeholders, representatives of financial institutions, researchers, farmers and citizens interested in starting an agricultural operation. Researchers in the department also analyze the importance of U.S. food and agricultural trade in a global market environment,

including the impacts of exchange rates, trade agreements and domestic policies on Louisiana agriculture. Research projects on consumer demand identify food attributes and analyze factors that affect overall food demand as well as the food preferences of consumers.

The department also conducts economic research and extension activities in many natural resource sectors that are important to the Louisiana economy. One research area involves the economic effects of the Louisiana forestry sector and projects the near-term and long-run outlooks for the state's wood products industry. Other research in the area of rural economic development measures the economic contribution of Louisiana agriculture to the state's overall economy and analyzes the effects of parish-level rural prosperity and financial resiliency to withstand natural and economic adverse conditions. Further, the department also conducts wide-ranging research and extension efforts related to Louisiana's coastal and fishery natural resources and their interrelationships with a healthy natural ecosystem and a vibrant state economy.

Research and extension activities in the department are focused on strengthening the economic viability of the agricultural sector in Louisiana while enhancing the wise use of natural resources. With faculty expertise covering a wide range of production, consumption, trade and policy areas, and with research projects investigating important economic issues in the areas of agriculture, food, natural resources and the environment, the Department of Agricultural Economics and Agribusiness plays an important role in the mission of the LSU AgCenter.

Michael E. Salassi has the J. Nelson Fairbanks Endowed Professorship in Agricultural Economics and Agribusiness and is the department head.

Matt Fannin, at right, is the William H. Alexander Professor in the Department of Agricultural Economics and Agribusiness. Photo by Tobie Blanchard



Optimal Disaster Debris Management in a Changing Policy Environment

Alejandra Brevé Ferrari

Coastal communities, businesses, farmers, fisheries and local governments across Louisiana have struggled to recover financially from recent hurricanes and other natural disasters. The Public Assistance Grant Program administered by the Federal Emergency Management Agency (FEMA) is available for states and communities that have received a major or emergency disaster declaration. This is only approved after FEMA evaluates the request and recommends action to the White House based on the disaster, the local community and the state's ability to recover. In some instances, the costs taken may exceed the minimum federal threshold of damages required for federal financial assistance, but the opposite could also be the case. After the most recent devastating tornadoes in 2017, the state of Louisiana didn't meet with the state threshold and, therefore, couldn't receive public assistance.

Two of the initial and most important aspects of disaster response and recovery operations are the removal and disposal of debris from the disaster-affected area. This study assesses local governments' debris removal management decisions and how they impact their net wealth in the long run by using local government financial data from audited financial statements and post-disaster data gathered from the Louisiana Public Assistance database.

Preliminary statistical results suggest that the storm and parish characteristics significantly affect the local government's debris management decision after federally declared disasters. Parishes are more likely to hire a third party to process and dispose of debris after more severe storms. It can be possible that the debris accumulated is beyond the capacity of the parish for some disaster events. In more extreme cases, the storms could also take a toll on the local government's labor and equipment assets, limiting their ability to clean up themselves. Parishes with a higher index of community involvement, referred to as social capital (number of associations, voter turnout, census response rate and number of nonprofit organizations), were shown to reduce the use of debris removal contracts. These results were then incorporated in a computer program model, System Dynamics, in the context of assumptions about future storm characteristics (such as frequency and severity), price of outsourcing and self-procurement of debris removal opera-



Alejandra Brevé Ferrari, doctoral student in the Department of Agricultural Economics and Agribusiness, studies statistical models to help predict the consequences of natural disasters to rural communities. Photo by Tobie Blanchard

tions as well as the current capital and debt financial accounts of a rural parish government in Louisiana. System Dynamics models all relationships that take place in a system and how specific relationships affect the system over time. Once the model is constructed and all relationships are established, the simulation can be applied over a specific length of time. After running the model scenarios over 10-year windows, it was easy to see how present interactions affect overall net wealth in the future. The public wealth of the local government can be shocked with various debris management policy scenarios. Understanding the implications of recovery and response policy, specifically when facing constraints such as a lack of federal assistance funding, should help local governments become more resilient as they face a future of uncertainty. System Dynamics modeling visualizes all of the tentative effects of different activities that take place in a complex financial system as it is shocked by a disaster.

Alejandra Brevé Ferrari is a doctoral student in the Department Agricultural Economics and Agribusiness.

Agricultural Education Grows in Scope and Numbers

Kristin Stair and Joey Blackburn

The Department of Agricultural and Extension Education and Evaluation is one of the newest “old programs” in the College of Agriculture. Moved back to the College of Agriculture in 2013 after three years in the LSU School of Human Resources and Education, it has been rapidly growing. The program has more than doubled in undergraduate enrollment in the past two years, and with the addition of graduate coursework, continued growth is expected.

The undergraduate program consists of two concentrations, formal education and nonformal education. Formal education prepares students to become high school agriculture teachers, and they leave the program with a teaching license. The other concentration is primarily designed to work with informal audiences, such as 4-H programs, community programs, agricultural businesses and even international agriculture programs.

One of the central purposes of the program is to prepare students for work with agriculture and work with people. We focus on both sides of this spectrum, and our courses and degree plans reflect the importance of understanding both. The connection with people is what makes the department unique. While many departments focus on specific aspects of technical agriculture, this program allows students to explore agriculture broadly and provides them the skills to share that knowledge of agriculture with others.

The department is not only growing in numbers, but also in scope. Recently approved master’s and doctoral programs will allow for professional advancement for agriculture teachers, extension agents, agriculture professionals and those with an interest in international agriculture education. The international option allows for study abroad and international internship opportunities.

In addition to new graduate program options, the department is expanding its curriculum to better prepare agricultural education students. Most recently added are courses in agricultural mechanics, in which students learn hands-on skills in small engines, electricity and carpentry. Well over half of high school agriculture programs across the U.S. teach some components of agricultural mechanics.

Currently, the department is actively pursuing the development of its Agricultural Technology Welding Laboratory, which also will provide metal fabrication coursework for the students. This lab will allow students to learn various types of welding along with plasma cut usage and other metal work. The welding lab and the agricultural mechanics lab will provide hands-on instruction to students for a variety of skills that they will need when working with middle school and high school students. Students in horticulture, renewable natural resources and animal science are taking these classes as well to improve

their skills, especially in the small engines area. Courses like these have not been offered at LSU in a long time, and faculty in the department believe that the skills are useful for a wide variety of students.

The department has seen an increase in student numbers as well as quality of young teachers and agents leaving the department. With a shortage of teachers and agents across the country, the work that this department does is important to Louisiana and the U.S. to ensure that there are qualified professionals who can educate the world about agriculture.

Kristin Stair and Joey Blackburn are both assistant professors in the Department of Agricultural and Extension Education and Evaluation. Stair also is Rector of the Agriculture Residential College.

Emily LeBlanc, a student in agricultural and extension education, builds an electrical board in Joey Blackburn’s class. Photo by Tobie Blanchard



RESEARCH BRIEF

Why Won't They Go? Increasing Agriculture Student Participation in Study Abroad

Shelli E. Danjean

Globalization is not a passing phenomenon but rather the definitive world system in which a new dynamic of global interconnectedness exists. Advancements in technologies, communication and transport systems have bridged the gap between nations and increased the awareness of the global world within local communities. The evolution of this worldwide system has introduced new challenges and opportunities for those in the agriculture sector. Today, future agricultural professionals must have an awareness of pressing global issues as well as the ability to work in a diverse work environment and address the needs of a variety of clientele. As much of the responsibility for developing these professionals has been placed on institutions of higher education, many universities have increased efforts to promote international experiences, or study abroad opportunities, that may help students gain the skills and knowledge they need to succeed.

As part of the effort to internationalize the undergraduate and graduate experience at LSU, faculty and graduate students in the Department of Agricultural and Extension Education and Evaluation began a series of research studies aimed at increasing study abroad participation programs in which College of Agriculture students would be most interested as well as identifying factors that may motivate or hinder them. Several key findings have emerged from this research.

The findings revealed that most agriculture students at LSU are interested in studying abroad during their college career. They believed studying abroad would help them gain valuable life experiences as well as look good on their résumé and increase their employability. Most students identified a short-term study abroad program held during the spring or summer semester as most ideal. Additionally, students identified gaining hands-on experience, taking courses related to their career and learning about another culture as very important activities to include in a study abroad program.

Despite student interest and motivation to participate in a study abroad opportunity, several factors were identified as obstacles that may keep them from doing so. Most students believed they could not afford to study abroad and were too busy with school. Additionally, many were unaware of study abroad opportunities available. Those who were aware reported having acquired the information from friends and the LSU Academic Programs Abroad website. While time and financial concerns can be difficult barriers to address directly, the research

findings support the notion that increasing student interest in and motivation to study abroad can reduce their concern over the obstacles. Essentially, students who really want to study abroad will find a way to do so.

So, what now? As College of Agriculture students indicated that friends and word-of-mouth were their preferred means of gathering information on study abroad opportunities, it may be beneficial for college faculty to invite students who have studied abroad to provide presentations to other students. These can be informal in nature to allow for peer-to-peer discussion on the life experiences gained. Advisers and faculty can also influence students by communicating support and encouragement to study abroad. If possible, it also would be beneficial for advisers to discuss with students early on the possibility of studying abroad in order to help students plan their course schedule accordingly. Incorporating an international perspective into the high school agriculture classroom may help initiate student interest in gaining international experience, thus increasing the likelihood they will pursue such an opportunity in their college years.

Shelli E. Danjean is a Ph.D. candidate in the Department of Agricultural and Extension Education and Evaluation.



LSU College of Agriculture students on a dive off the coast of Tofo, Mozambique. Photo provided by Reagan Errera



Students in the School of Renewable Natural Resources visit the Shewula Conservancy in Swaziland as part of an African wildlife ecology study abroad course. Photo provided by Bret Collier



College of Agriculture students can study sustainable agriculture in Thailand, where they visit the ancient city of Ayutthaya. Photo provided by Carl Motsenbocker

The World Is the Classroom

Tobie Blanchard

Typical classrooms can't contain students in the LSU College of Agriculture. In the college, the world is a lecture hall. Horticulture classes can be found working in the landscapes around campus or at the LSU AgCenter Botanic Gardens at Burden. Animal science students get experience with livestock at AgCenter farms. Nutrition and food sciences students meet regularly in kitchens and labs, and students studying wildlife and fisheries make their way into the woods and onto the water.

Student experiences go beyond even the nontraditional classrooms. Opportunities include participating in undergraduate research, gaining global awareness through study abroad programs and acquiring professional development skills with internships.

Greer Darden, a senior majoring in natural resource ecology and management, spent last semester studying the effects of environmental factors on oyster larvae after the BP oil spill in the Gulf of Mexico.

"Being able to conduct my own research makes me think like a scientist, and I have the freedom to make the project

what I want it to be," Darden said.

The College of Agriculture gives undergraduate research grants to encourage students to participate in research. Twelve students received grants for the 2016-2017 school year.

"Whether they go into research or not, having that experience helps them understand research, and that can help them navigate problems they may face in their careers," said Allen Rutherford, associate dean of the college.

Ryan Ardoin spent two years working on a research project in food sciences. Ardoin graduated in December and is now a master's student in the School of Nutrition and Food Sciences. His study focused on consumer perception and purchase intent of a low-sodium mayonnaise-type spread.

"This study could give consumers alternatives for reducing their daily sodium intake," Ardoin said. "It is an important step in figuring out how to reduce sodium in the American diet."

Ardoin is working with Witoon Prinyawiwatkul, a professor who oversees the school's food sensory lab.

"Ryan's research is part of my ongoing research on sodium

reduction in foods,” Prinyawiwatkul said. “In addition to gaining research experience in the lab, he has had the opportunity to present his work at the annual meeting of the Institute of Food Technologists, which expands his professional network and is good for his career.”

Across the world in Tofo, Mozambique, College of Agriculture students studying natural resource ecology and management can conduct underwater research. Study abroad programs in the college allow students to live and learn in another culture and gain global awareness that can’t be taught at home.

Reagan Errera, an instructor in the college’s School of Renewable Natural Resources, took her first group to Tofo in 2016, and plans to continue the trip each year.

“Students will set up research projects, conduct diving surveys, analyze data, present it and receive class credit for it,” Errera said.

Students in the same major can also spend two weeks in Swaziland.

“Getting the opportunity to be in Africa not only as a visitor, but as a scientist, was just amazing,” said Jaqueline Satter, who was a senior when she studied in Swaziland.

Students in the School of Plant, Environmental and Soil Sciences trek to Thailand every other year to learn about sustainable agriculture in that country, and students studying nutrition and food sciences study food and culture in Greece every year during LSU’s winter intersession.

Lauren Martin, a junior, received an international scholarship to study in Greece.

“Every minute was phenomenal,” Martin said. She is considering a career as a clinical dietitian and said the experience will help her work with different populations.

“I learned how simple things can affect the way you communicate with people, how close you stand to someone, how you greet them,” Martin said.

Internships can be abroad, in another part of the country or close to home. Jennifer Hartman, who majored in nutrition and food sciences, spent her senior year interning with Associated Grocers in Baton Rouge. She was hired to help the company develop a food safety plan for its new subsidiary, Table Fresh.

“It’s a big company that feels small,” she said. “I’ve learned so much there. Interacting with other people, learning the process, understanding what the day-to-day operations are like.”

She said the internship led to a job offer with Community Coffee.

Alexis Agard traveled to Slovakia for her summer internship. The agricultural business major worked with faculty at the Slovak University of Agriculture Faculty of Economics and Management, where she conducted research on consumption of animal products.

Agard said Slovakia is a growing country, and more LSU students could benefit from studying or living there.

“There is a lot of opportunity in that region for young students like us who want to go abroad and share our agriculture knowledge,” she said.

Tobie Blanchard is the assistant director of LSU AgCenter Communications and communication coordinator for the College of Agriculture.

College of Ag

STUDY ABROAD OPPORTUNITIES

The College of Agriculture offers several international opportunities for students.

Academic Programs Abroad provides a semester or full year of study. Featured programs through the College of Agriculture include La Trobe University in Melbourne, Australia; University of Pretoria in Pretoria, South Africa; Jiangnan University in Wuxi, China; and Mendel University in the Czech Republic.

Additionally, the college offers individual international internships. For example, one undergraduate student will spend three months and another will spend two semesters at Mendel University. Partner universities in Poland, Slovakia and Hungary also provide this option.

Other programs provide short-term international studies.

Food and Culture in Greece is a 16-day program that explores the topics of culinary techniques, cultural and ethnic food consumption, issues and trends, food safety and sanitation, and the role of food in the promotion of a healthy lifestyle. Students learn how socioeconomic, cultural and psychological factors influence food and nutrition behavior. The program is led by Judith Myhand, instructor in the School of Nutrition and Food Sciences.

Coastal Africa Field Study is a four-week program on the coast of southern Mozambique. Students learn skills needed to conduct research in coastal marine environments, develop hypotheses and study designs, collect data, and write and present findings to the local community. Reagan Errera, instructor in the School of Renewable Natural Resources, leads this program.

LSU in Thailand is a three-week program that provides opportunities to learn about issues in sustainable agricultural development as well as provide cultural and intellectual enrichments. Carl Motsenbocker, professor in the School of Plant, Environmental and Soil Sciences, leads this program.

Plant, Environmental and Soil Sciences School Has Broad Mandate

Don La Bonte

The name just about covers it — School of Plant, Environmental and Soil Sciences. With a broad mandate like this, the school is involved in just about every area of crop production and horticulture through weed control, soil science, plant nutrition and development of the latest and greatest varieties of wheat, oats, cotton, rice, sugarcane and sweet potatoes. The common theme that transcends everything is the environment.

Soil is a much-overlooked resource that's key to food production. Protecting that precious few inches of top soil means everything to the producer wanting to maintain high yield and to the environmentalist preventing soil from entering our streams and rivers. Our scientists look at ways to prevent soil from eroding by protecting land in the winter fallow period with cover crops. We also develop strategies to reduce runoff of nutrients, chemicals and animal wastes. Protecting the environment means using inputs more smartly. Precision application of fertilizers allows higher rates in areas of need and lower rates in richer soil. We are examining many strategies to use drones and plant color sensors to assess need. The end result is higher yields with lower inputs — a gain for all.

A weed is any plant that doesn't belong. Controlling weeds is a never-ending struggle. A simple change in rice production has led to a weed (Nealley's sprangletop) finding a new home in rice fields. Understanding its ecology — why it is now a problem in reducing rice yield and how it is controlled — is central to keeping rice production high. Our scientists look to understand and control weeds in cropland, home lawns, sport fields and pastures. A well-maintained sport field is more attractive as well as safer for players. The LSU AgCenter extension program, Field of Excellence, helps K-12 schools across the state develop healthy athletic fields so players have softer falls and fields have fewer ruts. Twenty-three fields across the state have been certified so far.

Plant breeding is a unique mandate. Our scientists are involved in developing plants resistant to disease, drought and salt — and understanding the underlying genetic mechanism. Much of this is done through molecular biology, an area of science brought into the applied breeding programs to target these and other stresses. Producing higher yield with fewer pesticides is a driving ideal behind much of what we do. Producers face increased financial pressure with low commodity prices, and increasing yield definitely helps. Our rice varieties developed at the H. Rouse Caffey Rice Research Station are industry leaders. For years, the Clearfield lines have dominated production acreage, and the new Provisia lines are coming into production. Our sweet potato breeding program also develops some of the leading varieties grown in the U.S. and elsewhere. The Orleans variety has higher yield in comparison to the classic Beauregard variety and is quickly gaining acreage in the Gulf South.

Horticulture is about the home and garden, but we also focus on the environment. Our turfgrass scientist has developed improved means of growing grass on levees, a surprisingly difficult task. A levee with no grass can't hold up against water and quickly erodes. We are also looking at methods to reduce irrigation needs in ornamental production nurseries. Less water means healthier plants and less runoff of nutrients into the environment. The horticulture program gets the word out in many ways, and outreach is a major effort. The Get It Growing program provides the latest horticulture news on radio, television, in newspapers and on the AgCenter's website at www.LSUAgCenter.com. The school gardens program is encouraging K-12 students to grow vegetables and make healthy eating choices.

In addition to research on pressing problems, we are also educators. We pass on what we know to a diverse clientele of extension agents, commercial producers, homeowners and government agencies. It is tremendously rewarding to see what we discover put into practice. We also train the next generation. Our research is often done by graduate students who then fill science positions in companies, universities and government agencies. Our undergraduate program in environmental management systems prepares students for careers in environmental regulation, resource conservation and needs assessments in environmentally challenged land. Our plant and soils systems majors become horticulturists, agronomists and soil scientists.

Don La Bonte is director and Lucien and Peggy Labord Endowed Professor in the School of Plant, Environmental and Soil Sciences.



Glenn Wilson, arborist with the LSU AgCenter Botanic Gardens at Burden, assists a student in an arboriculture class. Students in the class learn to safely use chainsaws and climb trees. Photo by Tobie Blanchard



Students in a landscape management class get hands-on experience working at the LSU AgCenter LaHouse Home and Landscape Resource Center in Baton Rouge. Photo by Tobie Blanchard

Potential of Silicon Fertilization in Reducing Arsenic Accumulation in Rice Grains

Flavia B. Agostinho and Brenda S. Tubaña

Arsenic is a heavy metal found in the environment, and it is common to find traces of it in our food supply. It is known to cause human health problems, either through drinking arsenic-contaminated water or consumption of plants cultivated in arsenic-contaminated soils. The most toxic form to humans is the inorganic arsenic, and it is the predominant form in soils. Trace amounts of inorganic arsenic are naturally found in soils; however, cropping practices such as irrigation of fields using contaminated water, use of arsenic-containing pesticides, and flooding have increased its concentrations and availability for plant uptake.

There are several reasons why rice contains relatively higher levels of arsenic compared to other cereal grains. First, rice is cultivated in flooded soils in which the availability of

soil arsenic increases, resulting in increased uptake by rice. In upland soils, arsenic is bound to organic matter, clay particles and iron, aluminum and manganese hydroxides, making it less available for plant uptake. In flooded conditions, the depletion of oxygen results in release of arsenic into the soil solution, and with further transformation it will become highly soluble and mobile. Arsenic in this form is easily taken up by rice. Second, the transporters in the rice root system, which are responsible for absorption of nutrients, are not all selective. There are some root transporters identified as silicon transporters that also facilitate arsenic uptake in rice. Moreover, among the three silicon transporters recently found on rice nodes was the root transporter that also transports arsenic, which might be the pathway for its translocation inside the rice plant and eventually to grains.

Minimal flooding and farming rice in aerobic or a non-flooded condition are some of the cultural management practices known to reduce the amount of plant-available arsenic in soils. However, not only may rice grain yields decline when grown in these conditions, but the availability of cadmium, another metal toxic to humans, may increase. Because silicon fertilization has been associated with reduced insect and disease damage and high yields in crops even under stressful



Photo 1. Typical symptoms of arsenic toxicity in rice: chlorosis (yellowing of leaves) and unfilled grains (plant sterility). Photo by Flavia Agostinho

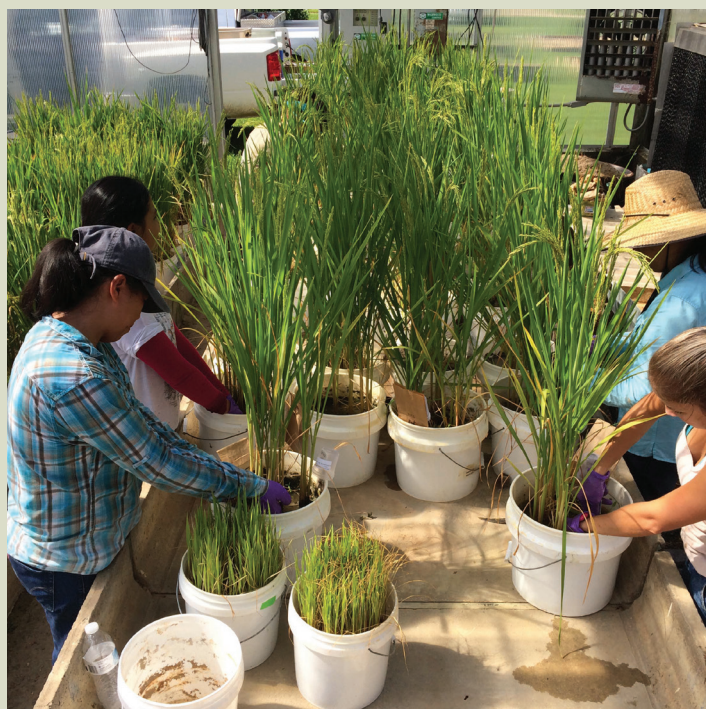


Photo 2. Soil and plant (straw and root) sampling at rice heading stage. Photo by Flavia Agostinho

conditions, it has become an agroeconomic practice in many rice-producing regions in the world. Rice takes up large amounts of silicon from the soil, reaching levels much higher than nitrogen and phosphorus. Studies have shown that silicon can alleviate the toxicity caused by heavy metals including arsenic in rice. It seems that raising plant-available silicon in the soil is a logical approach to reducing intake of arsenic by rice.

A pot experiment was conducted in 2015 and 2016 to document the specific role of high levels of silicon in the soil and within the plant leading to reduced uptake of arsenic in flooded rice production systems in Louisiana. For this study the concentrations of different arsenic species in the soil and arsenic in roots, straw and grains of rice grown with and without silicon fertilization were measured. Bulk soil samples were collected from a rice field in Evangeline Parish and processed before placing them in pots. The soil was treated with increasing arsenic rates (0, 10, 20, 40 and 120 parts per million) with or without application of silicon fertilizer. On average, arsenic worldwide is naturally found in the soil at 10 parts per million. Rice that received the highest rate of arsenic showed typical symptoms of arsenic toxicity: chlorosis (yellowing of leaves) and many unfilled grains (increased sterility) (Photo 1). At the heading stage and at harvest, soil and plant (including root) samples were collected (Photo 2). The concentration of arsenic species in the soil that were significantly reduced by silicon fertilization included the iron-bound and reducible arsenic (Figure 1). These two species are known to impact the form of arsenic that is taken up by rice. There were subsequent reductions in plant arsenic uptake. In 2016, the arsenic content of rice straw was reduced by 51 percent at the heading stage and 38 percent at harvest (Figure 2). In addition, the root arsenic content was reduced by 22 percent at the heading stage in 2016. In effect, the total arsenic content measured in the grain of rice fertilized with silicon was lower by 0.3 parts per million in 2015 and 0.2 parts per million in 2016 compared to rice without silicon fertilization.

The outcome of this research shows that raising plant-available silicon in the soil through silicon fertilization reduces the intake of arsenic by rice. Consuming 0.6 cup of cooked rice per day is comparable to drinking 1 liter per day of water with a total arsenic content of 10 parts per billion, which is the current U.S. maximum contaminant limit for water. Apart from the amount of arsenic intake, its toxicity in humans is influenced by age and body weight as well. One of the parameters used to determine arsenic contamination in humans is the urinary total arsenic concentration. On average, adults, children and 1-year-old infants that regularly consume rice have 2.4, 0.009, and 0.006 parts per million of arsenic in their urine, respectively, which is nearly twice the concentration of

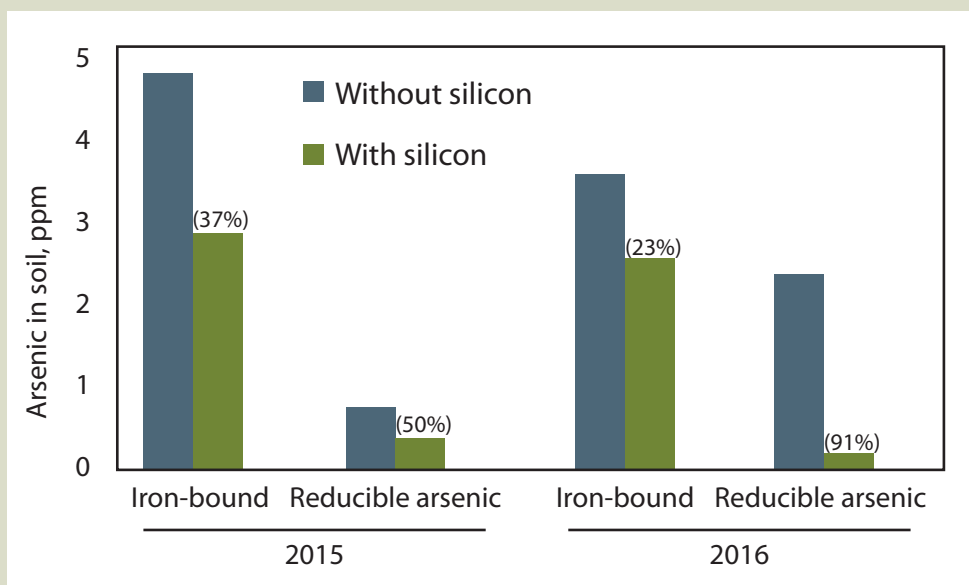


Figure 1. Concentration of iron-bound and reducible arsenic species in the soil with and without silicon fertilization. Values in parentheses are reduction in percentage due to silicon fertilization.

those who do not consume rice-based products. To date, there are still no regulations in the United States for arsenic content limits in foods, except for animals treated with veterinary drugs (0.5 to 2 ppm).

In Louisiana, rice production is considered a core crop industry currently cultivated on about 500,000 acres annually, the third largest in the nation. Production of high-quality rice grains is essential to keep the industry competitive and to maintain food safety. As a staple food, even trace amounts of arsenic in rice grains may pose a health risk to humans, especially for those who consume large amounts of rice in their diet.

Flavia B. Agostinho is a Ph.D. candidate, and Brenda S. Tubaña, an associate professor, holds the Jack E. and Henrietta Jones Professorship in the School of Plant, Environmental and Soil Sciences.

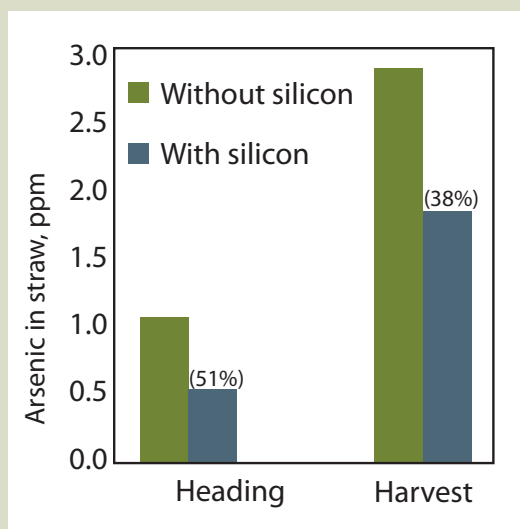


Figure 2. Concentration of arsenic in rice straw with and without silicon fertilization in 2016. Values in parentheses are reduction in percentage due to silicon fertilization.

Nutrition and Food Sciences School Supports Health and Wellness

Louise Wicker

Louisiana ranks 50th in overall health and in the bottom 10 states in diabetes, smoking and obesity. If people make smarter choices together to improve their well-being, the Milken Institute predicts the state could avoid 612,000 cases of chronic conditions in 10 years.

The LSU College of Agriculture School of Nutrition and Food Sciences is responding to the call for improved health and wellness outcomes through research and outreach. Faculty members in the school have expertise in the areas of food innovation, food safety, molecular nutrition, community nutrition and nutrition education.

The school sees the increased interest in local and regional foods as an opportunity to build consumer trust and influence healthier choices. Scientists in the school are involved in food processing innovation, product development and consumer choice research. On many projects, the researchers work directly with industry, collaborate with other institutions such as Pennington Biomedical Research Center and Southern University, and support LSU AgCenter Food Incubator projects.

One area of research is advancing understanding of the gut microbiome and digestive health. This can help product developers create foods that work better in the digestive system. Researchers also are focusing on prebiotics and probiotics, delivery vehicles that survive gastrointestinal transit, omega-3 fatty acids and product development of antioxidant-rich foods.

Food safety is a core tenet of the school's program. Scientists in the school are working to detect, monitor and mitigate pathogen risks in our food supply. The U.S. Food Safety and Modernization Act includes increased regulation and training to ensure safety throughout the food supply chain. The results are a safer food supply and assurance of wholesome food. Since 2013, the school

has supported a program that works with processors and producers to effectively implement this law.

For several years, the school has conducted seafood Hazard Analysis and Critical Control Point (HACCP) classes and has recently expanded beyond the safety of fresh-caught seafood and fisheries to include support for the expanding value-added segment of the seafood and fisheries industries.

Because many breakdowns in food safety occur at the consumer level, the school's program in consumer safety addresses common mistakes in the home. When disaster strikes, rapid information about food safety in the home or in the production field is essential. Within hours of a natural disaster, the school's food safety team can provide information on the safety of food in refrigerators and freezers after power outages, safety of foods in flooded pantries and sources of emergency assistance.

Another research area is innovation to support value-added processing of novel foods. Researchers are looking at increasing value to Louisiana commodities such as dairy, seafood, fisheries and sweet potatoes, as well as co-product recovery for food, pharmaceutical and antimicrobial uses. Whether it is increasing the perception of salty flavor in low-salt snacks or developing a better way to freeze and package shrimp, ingredients and process innovation are at the heart of some of the cutting-edge research in the school.

Students in nutrition and food sciences gain experience through undergraduate research, internships, co-ops and by participating in industry projects. Some of the

research students have conducted has looked at consumer perceptions, worked toward developing detection methods of the human norovirus in marine waters, assessed dietary intake of pregnant women, and studied the foods and physical activity opportunities available in local parishes.

Students also have the opportunity to work in the Sensory Services Lab or with the Food Incubator. The lab is housed in the Animal and Food Sciences Laboratories building — a state-of-the-art facility that includes labs, a demo kitchen, sensory-testing areas, a commercial-grade kitchen and classrooms. These hands-on opportunities give students the advantage they need when applying for dietetics internships, graduate schools or jobs.

As part of the land-grant mission, the school's partnerships aim to lead the effort that results in commercially viable, healthier food products tailored for the lifestyles of the people of Louisiana.

Louise Wicker is director of the School of Nutrition and Food Sciences.

Students in Subramaniam Sathivel's food science class learn to preserve food. Photo by Tobie Blanchard



Cost-saving Consumer Preference Evaluation of Food Products

Kennet Carabante and Witoon Prinyawiwatkul

In the food industry, the study of consumer sensory perception of foods is a key step in new product development. Consumer preference and acceptance evaluation of food products may appear overwhelming because a large number of consumers are often required. However, simplifying some practices may lead to inaccurate results and interpretation when some scientific considerations are avoided. With stiff market competition, measuring preference or difference among food products against the competitors' products becomes important for product success.

Asking consumers to rank a set of food products based on their preference or intensity of a specific characteristic, such as sweetness, is one of the simplest ways to obtain information for product development or improvement. An example of a ranking test would be recruiting 50 consumers and asking each consumer to rank five ice cream samples, assigning a score of "1" to the least sweet and "5" to the sweetest sample. This testing can be done at a supermarket, a farmers market or in the sensory laboratory without complications. The data analysis to investigate significant differences for a ranking test with multiple samples and consumers is carried out with the classic Friedman test, which is a test to determine if statistical differences exist among the rank scores of three or more food samples. It is easy to compute, and its instructions are widely available. The test requires that each consumer rank all samples independently from other consumers.

When it comes to consumer studies, recruiting consumers is always a challenge and may be costly. Replicating a preference or a difference ranking test by making each consumer perform the test more than once can be done to reduce the number of consumers and cut down on cost. However, the data analysis is often more complicated and has not received formal investigation. Unless the ranked scores from the replications are averaged or used individually, the classic Friedman test cannot be used on replicated ranking. LSU AgCenter sensory scientists at the Sensory Analysis Laboratory have carried out multiple studies to determine the best practice to handle a duplicated sensory ranking test along with its data analysis. The studies compared the performance of correctly detecting differences from the Mack Skillings (M-S) test against other analysis alternatives, including the classic Friedman test, on averaged scores. The M-S test is an extension of the Friedman test that includes an adjustment in its analysis to accommodate replications from the same consumers.

In studies at the AgCenter lab, consumers ranked orange juice sample sets, based on personal preference, in duplicates without knowing they were repeating the exact same test. Both a very different sample set (100 percent, 70 percent and 40 per-



Kennet Carabante, left, and Amber Jack, both graduate students in food sciences, participate in a food demonstration. Photo by Tobie Blanchard

cent orange juice) and a sample set containing similar samples (100 percent, 95 percent and 90 percent orange juice) were evaluated to compare performance of the analysis depending on degree of difficulty of the test. The number of consumers used in a single test was also varied from 10 to 125 to evaluate the impact of increased sample size on the analysis.

With very different samples, all statistical analyses found significant differences in all consumer sample sizes; however, with similar samples the M-S test was the most sensitive and consistent analysis to detect significant differences. The M-S test could consistently detect differences in preference using only 20 panelists, whereas the classic Friedman test required at least 50 consumers. Although the reduction of the number of consumers needed could vary depending on the product or degree of difference among samples, the M-S test is capable of rewarding agreement between the responses from the same consumers, thus saving the cost of consumer testing. Researchers at the AgCenter laboratory have used ranking tests to screen various products, including the development of a low-sodium cheddar cheese with up to 70 percent less sodium and preference comparisons among steaks from grass-fed steers.

Kennet Carabante is a doctoral student under the supervision of Witoon Prinyawiwatkul, Horace J. Davis Endowed Professor in Food Science and Technology, in the School of Nutrition and Food Sciences.

Textiles and Apparel Part of Everyone's Daily Life

Jenna Tedrick Kuttruff

Textiles and apparel play an important role in everyone's daily life — from clothing to the textiles that surround us in our homes, cars, businesses, public spaces, and even in the outdoors — and in the global economy. According to Fashion United, the global apparel market in 2016 was valued at \$3 trillion and accounted for 2 percent of the world's gross domestic product.

The Department of Textiles, Apparel Design and Merchandising prepares students to enter this vast and changing world through creativity and an eye to the future. Among the many innovations in the department is the development of a Digital Design Technology Hub to provide students and faculty with the latest technology used in the apparel industry. Starting with the fall semester of 2017, students can digitally design a garment and fit it on a 3-D computer-generated avatar.

The new computer classroom, together with the department's 3-D and 4-D body scanner (4-D adds the capability of recording the dimension of body movement), will also allow students to create their designs, obtain a body scan of their model, print a pattern scaled to the model's figure and then construct their garments. They will even be able to design and print fabrics specifically for their garments on a new textile printer. Student works are shown to the public every spring in the Fashion Association's annual student fashion show.

The acquisition of a 3-D and 4-D body scanner has made possible a number of research projects and collaborations

with other LSU units. Fitting issues are a complaint among consumers of ready-to-wear apparel because the U.S. apparel sizing system does not represent the diversity in ethnicity and body shapes comprising the population. Faculty members are conducting research to create flexible pattern grading and drafting systems for industry use, which will provide a basis for improving the fit of ready-to-wear garments for all sizes and body shapes of both men and women.

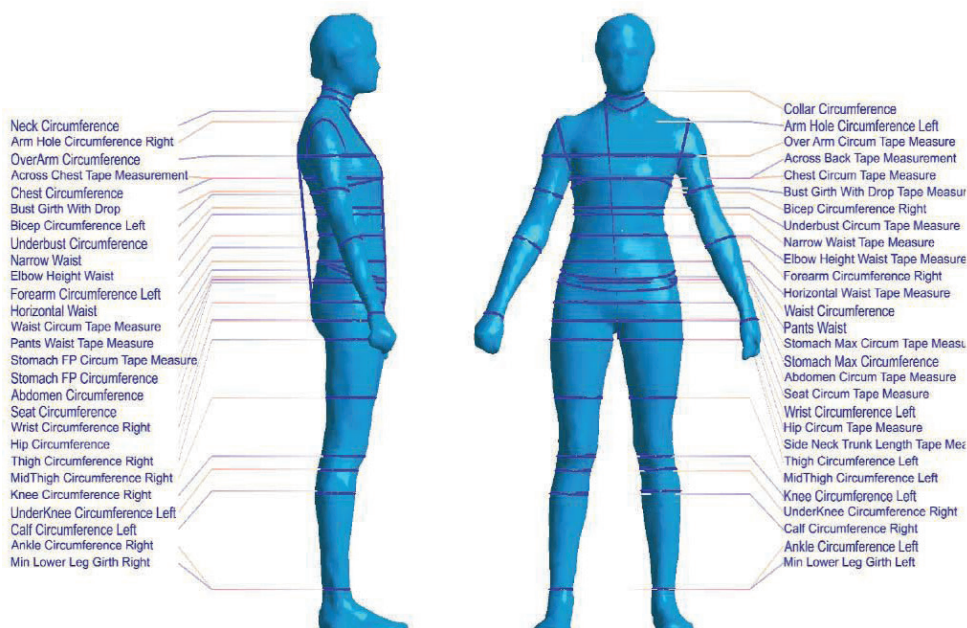
Louisiana and other Southern states have large populations of feral hogs. These hogs damage vegetation, harm other species and carry diseases that can be transmitted to humans, and there is a concerted effort to drastically reduce their numbers. To a limited extent, the meat is being used as food, but a faculty member in the department is also trying to find use for the hides as feral hog leather in apparel. Commercially produced pig skins are currently used in the apparel industry, and the skins of feral pigs could be promoted as a novelty leather for similar uses while reducing the population of these destructive animals.

The fashion industry focuses on culturally creative and diverse products and has potential to cultivate small businesses in Louisiana and across the nation. There has been an increase in the number of fashion entrepreneurs in Louisiana. Faculty members are developing a multidimensional measurement to assess fashion entrepreneurship efficacy. This study will enhance fashion entrepreneurship development. Many graduates of the department have started their own businesses in

apparel design and fashion merchandising, and the success rate of these and other entrepreneurs can be increased.

As part of their research on sustainability, faculty have been working with support of the Louisiana Alligator Council to promote the use of locally produced alligator leathers in the fashion industry. The inventory of slightly flawed, Grade 3, alligator skins has grown because this market has not been fully developed domestically or globally. Faculty and students are exploring ways to expand market demand for these skins. Both of the above research projects provide support for Louisiana fashion entrepreneurs, and many of their products can be marketed as "Made in Louisiana," a state promotional theme.

Textile scientists investigate natural and synthetic organic polymers used in textile materials, together with preparation of sustainable composites made of



Students in the Department of Textiles, Apparel Design and Merchandising get the proper fit for their clothing designs by using a 3-D and 4-D body scanner, which records 400 measurements and gives 1.5 million data points to create a true-to-scale digital model or avatar of a person scanned. Students can then print a pattern scaled to the person's figure and construct a garment with a perfect fit.



Students in the Department of Textiles, Apparel Design and Merchandising evaluate and prepare garments for display in the LSU Textiles and Costume Museum. Photo by Tobie Blanchard



A model walks the runway during a fashion show put on by students in the Department of Textiles, Apparel Design and Merchandising. Photo by Tobie Blanchard

plant-derived polymers and fibers. Adding value to Louisiana byproducts is reflected in efforts to formulate textile composite materials from bagasse and corn-derived bio-polyesters, and the evaluation of physical characteristics of Grade 3 alligator skins. Graduate student research has been initiated on the use of fish scales as a source for dye-absorbing materials to remove dyes from waste waters in the textile industry. Black drum fish was identified as a suitable source of scales, and support of the Louisiana fishing industry has been secured.

Research in the department is conducted on the cultural and historical significance of textiles and apparel. Two such projects focus on Louisiana. One documents handwoven Louisiana Acadian textiles and the tools used in home production of those textiles, and the other is a study of mid-19th century burial dress based on archaeological evidence from Louisiana. The latter study has been expanded to include burial garments from Mississippi and New York. Students are applying what they learn in their survey of world textiles course to complete a technical description and cultural documentation of a large collection of traditional garments from Central America. These garments are part of a more than 200-piece donation to the LSU Textile and Costume Museum.

The LSU Textile and Costume Museum's holdings are global in scope and include prehistoric and ethnic textiles and garments as well as contemporary high fashions and high-

tech textiles. The museum supports the teaching and research efforts of faculty and students. Special collections within the museum preserve a vital part of local, state and regional history. The museum's LSU collection documents innumerable aspects of the university's unique history. Its Louisiana collection includes Native American and Acadian textile artifacts, inaugural garments of previous governors and their families, Red Cross attire used during the Katrina recovery effort, and post-World War II feed sack clothing. The university recently provided new physical space to the museum where it will have a much larger public exhibition gallery with a dedicated entrance.

The Department of Textiles, Apparel Design and Merchandising works to expand its scope and continue to provide students with the knowledge and skills needed in the contemporary job market. Graduates are sought after to fill design and merchandising management positions in the fashion industry. Many students after participating in national and international internships choose to stay in Louisiana to use their skills and increase the recognition of Louisiana as an important player in the fashion world.

Jenna Kuttruff is head of the Department of Textiles, Apparel Design and Merchandising and holds the Beverly Griffin Shea Alumni Association Departmental Professorship.

Battling Disease in Louisiana Crops

Lawrence E. Datnoff

The disease-conducive environment and the frequent new pathogens in Louisiana create an ongoing condition in which plant diseases are one of the most limiting factors in crop production. Prominent current examples are *Cercospora* leaf blight of soybean, sugarcane brown rust, sweet potato viruses, panicle blight of rice and reniform nematode in crops as well as boxwood dieback, daylily rust and rose rosette in home and urban landscapes. The research, teaching and extension programs in the Department of Plant Pathology and Crop Physiology generate basic knowledge and applied solutions to plant diseases. The department has the only program in the state for assessing threats, developing research strategies, generating results and devising solutions.

The soybean pathology program has discovered the new identity of the *Cercospora* leaf blight pathogen. This implies a much broader host range than just soybeans and explains why durable disease resistance has been so elusive. This will be important in efforts to breed for disease resistance. Yield loss studies in soybeans, corn and grain sorghum give producers a history of potential losses if they grow susceptible varieties.

The Plant Diagnostic Center provides services to state residents to diagnose problems by providing mail-in opportunities and on-site analyses at LSU AgCenter field days, garden shows and similar venues.

The scientific disciplines represented in the department are often called “found” professions, meaning most individuals don’t begin their academic careers with the intention of dealing with plant diseases but find their calling through other studies. This creates a passion for learning. The successful research in this department has generated significant outside funding and has attracted outstanding students who found their passion and want to further their careers in research.

The department research and teaching programs are educating the next generation of plant pathologists and crop physiologists. The department offers graduate programs for both the M.S. and Ph.D. degrees, and graduate students work alongside the award-winning faculty conducting investigations into diverse research areas

including plant pathogenic microorganisms, mechanisms of host plant resistance and biology and epidemiology of emerging and re-emerging plant pathogens. Farmers and gardeners benefit from results of research on the impending failure of fungicides and how to deal with it, suppressing plant pathogens with macro- and micronutrients, DNA analysis for diagnostics and plant viral relationships. Students receive training in integrated disease management and techniques related to effective knowledge exchange to help bring the research results into the real world of production agriculture and landscape management.

Departmental graduate students have been recognized for their high-quality research, scholastic achievements and exceptional leadership and communication skills by numerous local and national organizations. Consequently, the graduates are well-prepared for challenging positions in academia, government and industry related to crop protection and plant disease management, ensuring research and extension leadership for Louisiana.

Lawrence E. Datnoff is head of the Department of Plant Pathology and Crop Physiology.

Eduardo Chagas Silva, a graduate student working under LSU AgCenter plant pathologist Ray Schneider holds a soybean leaf in a solution used to expose the plant to cercosporin, the toxin associated with *Cercospora* leaf blight. Photo by Olivia McClure



RESEARCH BRIEF

Xylella fastidiosa in rabbiteye blueberry: A newly studied host of an old foe

Mary Helen Ferguson, Christopher A. Clark and Barbara J. Smith

The bacterial plant pathogen *Xylella fastidiosa* causes a number of plant diseases, including bacterial leaf scorch of Southern highbush blueberry. Most blueberry orchards in Louisiana and Mississippi are planted with rabbiteye blueberry (*Vaccinium ashei* or *V. virgatum*) cultivars, while relatively few Southern highbush blueberries are grown. In Louisiana, *X. fastidiosa* has been detected in rabbiteye blueberry orchards, and it was of interest whether this bacterium affected yield in rabbiteye blueberry plants or perhaps just lived in them without causing harm.

Seventeen blueberry orchards in Louisiana were sampled, and *X. fastidiosa* was detected at only two. Over the course of two seasons, a yield study was conducted at one of these farms, and a strong association between detection of *X. fastidiosa* and yield loss was found. Plants in which *X. fastidiosa* was detected had less than half the yield, on average, as plants in which it was not detected. Because plants were naturally infected, it cannot be stated with certainty that *X. fastidiosa* caused the yield loss; it can only be said that it is associated with it. However, other factors that can affect plant productivity — including Phytophthora root rot, nematodes, soil pH, and soil nutrient levels — were investigated, and none appeared to be directly responsible for the observed reduction in yield.

Even though there was significant yield loss associated with *X. fastidiosa*, when plants were tested for three years in a row, ones that tested negative for the disease in the first year tested negative in the second and third years, too. This suggests that *X. fastidiosa*, which is transmitted by certain insects that feed on plant xylem sap, was not spreading rapidly among plants. However, these plants were approximately 30 to 35 years old, and it is possible that it would spread more quickly among young plants.

Symptoms observed in infected plants included early fall colors (yellowing and reddening of leaves) and a gradual dieback of plants (Figure 1). Approximately one-third of plants in which *X. fastidiosa* was detected appeared dead within three years of when it was first detected. Because other factors may cause symptoms similar to those observed on *X. fastidiosa*-infected plants, testing by a laboratory such as the LSU AgCenter Plant Diagnostic Center is needed to determine if a plant is infected. Leaves should be taken from multiple shoots of each plant tested. Bimonthly testing of infected plants revealed that late summer is the preferred time for taking samples. Even when *X. fastidiosa* is present in plants, it is not readily detected in early spring.

X. fastidiosa from rabbiteye blueberry plants in Louisiana was compared genetically to *X. fastidiosa* strains from other plant hosts to determine what plants are infected by the same or similar strains. There appears to be more than one strain of *X. fastidiosa* in rabbiteye blueberry, but all were within a group that has been found in a limited number of hosts. The predominant strain has been found in Southern highbush blueberry in Georgia and in two wild hosts (giant ragweed and western soapberry) in Texas. Because rabbiteye blueberry plants are infected by a strain that also infects Southern highbush blueberry, it is a potential source of infection for susceptible Southern highbush blueberry cultivars. Growers should take care to only plant clean rabbiteye blueberry plants from a reliable source, as rabbiteye plants may not always show obvious symptoms of infection. Good weed management in the orchard may also help reduce

the chance of getting *X. fastidiosa* in blueberries by reducing the incidence of wild plants that are potential sources of infection.

Mary Helen Ferguson is a research associate and Christopher A. Clark is a professor in the Department of Plant Pathology and Crop Physiology. Barbara J. Smith is a research plant pathologist at the U.S. Department of Agriculture Agricultural Research Service, Poplarville, Mississippi.



Figure 1. This rabbiteye blueberry plant shows dieback and early fall colors, which were symptoms observed in association with *Xylella fastidiosa* infection. Photo by Mary Helen Ferguson



Mary Helen Ferguson, an LSU graduate student in plant pathology, holds a rabbiteye blueberry plant inside a screenhouse on the LSU campus. Photo by Olivia McClure

Alumni Carve Careers in Field, Lab, Fashion, Food

Tobie Blanchard

From courtrooms to classrooms, from Capitol Hill to a castle, LSU College of Agriculture alumni are making marks in many ways. Varied degree programs in the college allow students to find careers in the field, in the lab, in fashion or in food.

Nicole Ward Gauthier, an extension associate professor at the University of Kentucky, is at home in the field, the lab or working with growers and county agents across Kentucky. Gauthier received an undergraduate degree in horticulture

science and a doctorate in plant pathology from the College of Agriculture. When she came to the college as an undergraduate, she owned a landscape business in Pointe Coupee Parish, but a required plant pathology class led her down a different path.

"My professor, Dr. Ray Schneider, really had a sparkle in his eye when it came to plant pathology. His excitement about diagnostics, epidemics and how climate or cultivars influence disease really made me curious about the field," Gauthier said.

Gauthier admits she wasn't interested in the management and administrative side of her business and decided to pursue an advanced degree in plant pathology. Upon completion of her doctorate in 2011, Gauthier moved to the University of Kentucky. There she works with ornamentals, fruit trees, forest trees, Christmas trees and industrial hemp.

"I think my broad training in plant pathology exposed me to a lot of possibilities. My work in the field and the lab at LSU allowed me to transition easily from school to the extension work I do now," Gauthier said.

Just south of Kentucky, in Sevier County, Tennessee, two College of Agriculture alumni started their own biotechnology company. Married couple Angelica Giraldo and Darin Hyman took their background in reproductive biology they received as graduate students and started DeSoto Biosciences. The company collects and sells cow and pig oocytes and embryos to researchers at universities and private companies throughout the United States.

Giraldo began working in reproductive physiology when she was 18 in her native Colombia, but she said the program at LSU gave her and her husband more than just knowledge.

"The program made us tough," Giraldo said. Hyman agreed,



As a plant pathologist, Nicole Ward Gauthier is often in the field examining plants.



Kelly Becnel, at right, is an agriculture teacher at Walker High School. Here she is pictured with her Walker FFA club.



Nicole Ward Gauthier



Kyle McCann



Caroline Coplen, a costume buyer for Disney, received the Walt Disney Legacy Award, an honor bestowed on only one percent of Disney cast members.

adding that the challenges they faced as graduate students prepared them for programs in their career.

"We have to constantly adjust the business for what the animals give us," Hylan said. "Because of what we went through at LSU, we can put out fires with a smile on our faces."

Kyle McCann said the challenge he faced during graduate school was dealing with personal issues. While studying agriculture business in the late 1980s, McCann lost his father who worked in agriculture finance and influenced his career path.

"It was a hard time for me," McCann said. He credited his professor, Harlon Traylor, for helping him through it. "Dr. Traylor put on special gloves to handle me."

McCann, associate commodity director for Louisiana Farm Bureau Federation, still works closely with the faculty in the college's Department of Agriculture Economics and Agribusiness. "I call on them to give independent analysis," he said. The department named him its alumnus of the year in 2016.

"I was very honored to be chosen. I went through a tough time there, and my professors were mentors and became friends," he said.

McCann has been with Farm Bureau for 28 years — starting almost immediately after his graduation. In his role as associate commodity director, he works with growers, state and national elected official and policy advisors.

"My degree and training has helped me research the issues and present that information to our various groups," he said.

While McCann's job often takes him to Capitol Hill, alumna Caroline Coplen's takes her to an iconic castle — Cinderella's. Coplen is a costume buyer for Walt Disney World, where she helps source costumes for individuals working in

operational roles for Disney's domestic parks, resorts and cruises.

"These are considered uniforms, but they are not your typical polos and khakis. It's much more complicated than that," Coplen said. "I am dressing cast members who, for example, work in the Haunted Mansion, so they must look the part."

While studying textiles, apparel and merchandising at LSU, Coplen did a six-month internship with Disney's costume buying team, and she said she couldn't wait to get back after graduation.

Coplen recently received the Disney Legacy Award, an honor bestowed on only 1 percent of Disney cast members. Coplen said recipients are recognized for inspiring others. Guests can distinguish award winners by their blue name tags.

"It is such an honor," Coplen said. "I keep looking down to make sure my name tag hasn't turned white again."

Coplen said she feels very lucky to work for Disney.

"We're creating this immersive experience that you can't do anywhere else. It's a wonderful thing to be a part of," she said.

Kelly Becnel brings the same passion to the classroom that Coplen brings to costuming. Becnel is an agriculture science teacher at Walker High School and received her undergraduate degree in vocational education from LSU in 2006 and is working on a master's degree in agricultural and extension education.

Becnel was an active FFA member while she was in high school. She aspired to become a veterinarian, but realized she could find more fulfillment with people than animals.

"I wanted to give back to FFA and to students and do the job the way my adviser did," Becnel said.

Becnel teaches about plants, animals, agriculture mechanics and wildlife. As FFA members, her students also learn about professionalism, leadership, communication and life skills. Even when she is not teaching, Becnel's classroom is often filled with students who are working on projects, seeking her advice or just finding a place where they can belong.

"Knowing that I am making difference is worth way more than my paycheck," Becnel said.

Katherine Magoun is making a difference for students and faculty at Tulane University. Magoun, a 2006 alumnus who studied environmental management systems at LSU, is the environmental program manager at Tulane's Office of Environmental Health and Safety. Magoun oversees the university's compliance on air quality, hazardous waste management, spill prevention and many other environmental issues that are part of Tulane's research.

"Most of what I do now, I had a lot of experience with in classroom," Magoun said. Magoun worked for several environmental consulting firms in Georgia before returning home to Louisiana. She is also currently working on a master's degree at Tulane.

"It is very rewarding to see the university address these compliance concerns," she said.

Tobie Blanchard is the assistant director of LSU AgCenter Communications and communication coordinator for the College of Agriculture.

Inside:

Submerged aquatic vegetation along the Gulf of Mexico coast is critical to water quality and wildlife. page 10

The most popular major in the College of Agriculture is animal sciences with many job opportunities awaiting graduates. page 12

An animal sciences graduate student is conducting research to move up the date for mares to produce foals as early in the year as possible. page 14

Research at the Louisiana State Arthropod Museum in the Department of Entomology helps reveal Earth's natural history. page 17

An agronomy graduate student is searching for ways to prevent heavy metals in soils, such as arsenic, from getting into crops, such as rice. page 26



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