

LOUISIANA Agriculture

Vol. 50, No. 3, Summer 2007
Published Since 1957

Assuring Our Future Through Scientific Research and Education



4-H Marsh *Velocity*

Magazine's 50th Birthday
Russian Honey Bee Impact
Did Surge Salt Kill Fields?
Battling Food Pathogens





ON THE COVER: Marsh Maneuvers students Erron Holland of Plaquemines Parish and Megan Albert of St. Martin Parish ride through the marsh at Rockefeller Wildlife Refuge in an airboat piloted by Jeb Linscombe of the Louisiana Department of Wildlife and Fisheries. (Photo by Bruce Schultz)

Camp immerses 4-H'ers in marine environment

After an exhilarating airboat ride through the marsh, Keith Espadron of Port Sulphur ambled up to the beach, shell fragments crunching under his feet, and gazed out at the muddy shoreline that once was grass-covered marsh.

The outing was one of several for 4-H'ers participating in the LSU AgCenter's Marsh Maneuvers camp at the state's Rockefeller Wildlife Refuge.

It was apparent to Espadron that the shoreline of mud and sand along the Louisiana coast is changing.

"How far has this beach eroded?" Espadron asked.

"The shells have been pushed back quite a ways. Several feet in just the past year," said Mark Shirley, LSU AgCenter coastal specialist and organizer of the camps, which have been held annually since 1989.

Tom Hess, biologist for the Louisiana Department of Wildlife and Fisheries, explained to the students that the coastline along Rockefeller Wildlife Refuge recedes 40 feet a year in some places.



Photo by Bruce Schultz

Marsh Maneuvers students David Templet, at right, and Trett Bourgeois, center, both of Ascension Parish, get a look at juvenile white trout caught in a shrimp trawl as Mark Shirley, LSU AgCenter coastal specialist, at left, explains the role the fish play in the marsh ecosystem.

"It's part of my daily life," the 4-H'er said.

Espadron's family lived in Venice before Hurricane Katrina. Since the storm, they moved to Port Sulphur.

Attending Marsh Maneuvers gave Espadron a better understanding of why Louisiana's coastline is washing away.

Marsh Maneuvers is a four-week program each summer that brings 4-H youths from across the state to the Louisiana coast to get immersed in a marine environment. Fourteen 4-H members from Ascension, St. Bernard, St. Martin and Plaquemines parishes attended the weeklong session July 16-20, 2007. ■ **Bruce Schultz**

"You see the marsh grass at the edge of the Gulf? That was land a year ago," Hess said, adding that Hurricane Frances claimed 65 feet in 1998 and that Hurricane Rita caused about the same amount of damage in 2005.

The difficulty of protecting the Southwest Louisiana coastline is complicated by a 40-foot-thick layer of mud and sediment that prevents the use of rock jetties to control erosion, Hess said. "We can't use rocks here because they would just sink into the mud," he explained.

Living in Plaquemines Parish, Espadron is all too familiar with coastal erosion.

LOUISIANA Agriculture

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WEB DESIGN: Kathy Kramer and Megan Smith

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Linda Foster Benedict, Editor
Louisiana Agriculture
P.O. Box 25100
Baton Rouge, LA 70894-5100
phone (225) 578-2263
fax (225) 578-4524
lbenedict@agcenter.lsu.edu



www.lsuagcenter.com

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What's New?

Williams named Simmons Professor of Dairy Science

Cathy Williams was recently designated the Gerald A. Simmons Professor of Dairy Science in the School of Animal Sciences.

This professorship was funded by contributions from friends of Gerald Simmons in recognition of his many contributions to the dairy industry in the state and region. The donation was matched by the Louisiana Board of Regents to establish a \$100,000 endowment.

Williams received her B.S. degree in dairy science from LSU, her M.S. degree in dairy science from the University of Georgia and her Ph.D. degree in animal science from Auburn University.

She joined the faculty at LSU in dairy science in 1998. Other honors include the Tiger Athletic Foundation Outstanding Assistant Professor in the College of Agriculture, the North American Colleges and Teachers of Agriculture Excellence in Teaching Award, the Gamma Sigma Delta Teaching Award, and the American Dairy Science Association Outstanding National Advisor Award.

Williams is a member of the *Louisiana Agriculture* editorial board.

Simmons, a native of Simmesport, earned a bachelor's degree from LSU in 1957. In 1958-59, he was a county agent in

Cameron Parish and in 1959, became legislative and membership director of the Louisiana Farm Bureau Federation. In 1966-67, he served as an assistant legislative director of the American Farm Bureau Federation in Washington, D.C.

He returned to Baton Rouge in 1967 as membership director of the Chamber of Commerce and in 1973, became executive manager of the Louisiana Dairy Products Association, a position he holds today.

■ **Linda Foster Benedict**

Widespread crawfish virus does little damage

More than half of 135 Louisiana crawfish ponds tested for White Spot Syndrome Virus so far have shown positive, according to an LSU AgCenter aquaculture expert.

"This means it's much more widespread than anyone thought," said Ray McClain, crawfish researcher at the LSU AgCenter Rice Research Station.

The virus has been detected in more than 88 samples. But McClain said fewer than 10 ponds reported dying crawfish.

It also has been found in three of nine samples from Atchafalaya Basin crawfish.

In addition, McClain said, crawfish tissue samples at the LSU School of Veterinary Medicine from two years ago tested positive, he said.

"It looks as if it's been around awhile," McClain said. "It does not appear to be as devastating in crawfish farms as it was in shrimp farms."

A crawfish pond where the virus was found earlier this year appears to have recovered somewhat, he said.

The virus was first found in the United States among Texas shrimp farms in 1995, and the affected shrimp died rapidly.

Several crawfish ponds

were quarantined this spring after the virus was found in St. Martin and Vermilion Parish ponds, and crawfish from the affected ponds have to be tagged and sold only to a processor. McClain said the quarantine is still in effect, but that could change, depending on future decisions by state and federal agencies.

Symptoms of the virus include lethargic and sluggish crawfish that eventually die. Affected shrimp usually have a white spot, but not crawfish.

The virus is not a threat to humans, McClain said. ■ **Bruce Schultz**

LSU AgCenter dairy farm sets new record

The LSU AgCenter's dairy farm in Baton Rouge recently reached a milestone in Louisiana agriculture when it recorded the highest rolling herd average milk production ever in the state.

The rolling herd average reached 24,002 pounds of milk at the July measurement, according to Charles Hutchison, dairy specialist, who manages the farm. That's nearly 2,800 gallons of milk per cow over a year's time.

The rolling herd average is calculated as the average production per cow in the herd for the previous 12 months, the dairy specialist said. It's "rolling," because as each month's results are added to the average, the same month from the previous year is dropped.

"This gives us the opportunity to measure our performance compared to the same month last year," Hutchison said. "We can track changes over time and evaluate our management practices."

This record-keeping is part of the LSU AgCenter's participating in the Dairy Herd Improvement Association (DHIA), which is a national dairy-producer cooperative that maintains a national dairy records program for participating dairy producers. Approximately 33 percent of the Louisiana dairy farms, which account for about 40 percent of the state's dairy cows, are enrolled in the program, Hutchison said.

Hutchison said the LSU AgCenter's 85-cow herd in Baton Rouge is maintained in what the dairy industry calls "confinement." The animals are not put on pasture, but they are in open lots with access to large barns with individual stalls.

"Some people call it a cow motel," Hutchison said with a smile.

Photo by Mark Claesgens



Cathy Williams and one of the cows at the LSU AgCenter dairy farm in Baton Rouge.

Photo by Bruce Schultz

The confinement operation is dictated by the limited space available in Baton Rouge. The other LSU AgCenter dairy farm is at the Southeast Research Station at Franklinton, which has more space, and cows are often put on pastures there.

"The confinement operation allows us to closely monitor nutrition and feed management," Hutchison said. "And the free-stall system allows us to group cows based on production and body condition."

Data and research results gained from operating the LSU AgCenter dairy farms provide AgCenter experts with important information that is shared with Louisiana dairy producers to help them improve their productivity. ■ **Rick Bogren**

Regents give AgCenter \$915,000 for hurricane recovery

The Louisiana Board of Regents recently approved \$28 million for university research to spur hurricane recovery and economic development, including a \$915,000 grant to the LSU AgCenter for wetland restoration.

"The LSU AgCenter has been involved in wetland restoration research for nearly 10 years," said David Boethel, vice chancellor for research and director of the Louisiana Agricultural Experiment Station. "This money will be used primarily for infrastructure to support the research."

The main emphasis of the AgCenter research is to use plant breeding expertise, gained from decades of research on agricultural crops, to develop plants and improve coastal habitats with the goals of restoration and reclamation.

The lead scientists for wetland restoration research are Michael D. Materne and Stephen A. Harrison, both in the School of Plant, Environmental & Soil Sciences.

The LSU AgCenter was one of eight institutions of higher education in the state to receive money through this program.

■ **Linda Foster Benedict**

Rutherford named new director for Renewable Natural Resources

Longtime faculty member Allen Rutherford has been named the new director of the School of Renewable Natural Resources.

He took over July 1, 2007, from William Kelso, who had served as interim director after the retirement of Bob Blackmon in 2005.

"Dr. Rutherford understands the state and has developed excellent relationships with key stakeholders," said David Boethel, LSU AgCenter vice chancellor for research and director of the Louisiana Agricultural Experiment Station. "He has conducted an outstanding research program and has been the mentor and guide for many graduate students."

A native of Beesville, Texas, Rutherford has been at LSU since 1985, when he joined the faculty of the School of Forestry, Wildlife and Fisheries – the former name for the school. He has a Ph.D. in zoology from Oklahoma State University in Stillwater and B.S. and M.S. degrees in biology from Baylor University in Waco, Texas.

Rutherford has served as professor of fisheries and coordinator for graduate studies. He has authored numerous publications and secured more than \$8 million in grants and contracts.

The School of Renewable Natural Resources includes a research and extension program, housed in the LSU AgCenter, and a teaching program, offering the B.S., M.S. and Ph.D. degrees, through the LSU College of Agriculture. ■ **Linda Foster Benedict**

4-H'er breaks stereotype, wins state show with mule

Don't bother telling Bethany Edler of Iberia Parish that mules are ornery, stubborn and kick hard. She's heard it all before – and she can prove you wrong.

The 18-year-old convinced judges at the state 4-H and FFA Horse Show in West Monroe in July that she knows what she's talking about, winning first place in the Premier Exhibitor competition with her mule, Alabama.



Bethany Edler and her mule, Alabama. Edler won the Gerry Lane Premier Exhibitor event at the state 4-H Horse Show in West Monroe this year.

The Gerry Lane Premier Exhibitor category is not based solely on a student's skill in the saddle. In addition to demonstrating their abilities with their animals, competitors are judged in interviews, tests of their knowledge and public speaking.

"This year I thought I hadn't done well. I couldn't even bring myself to go to the banquet," said Edler, who had placed third in the competition last year.

Dressed in a grubby T-shirt and jeans, she was working with Alabama in the show ring while the banquet was being held next door. When she heard her name announced as a finalist, she hurried over to the banquet room.

"As soon as I came around the corner I heard that I had won," Edler said.

In addition to a whopper of a belt buckle, she won a \$1,000 savings bond.

But Edler's abilities go far beyond her equestrian skills. She graduated this year from New Iberia Senior High School with a 3.9 average and will start LSU this fall as a pre-veterinary major. Bethany said as a vet, she would like to return to the area to treat large and small animals.

Alabama was the hybrid offspring of a male donkey and a thoroughbred mare.

More than 600 young people competed in the 38th annual state horse show.

■ **Bruce Schultz**

50 Years Serving Louisiana

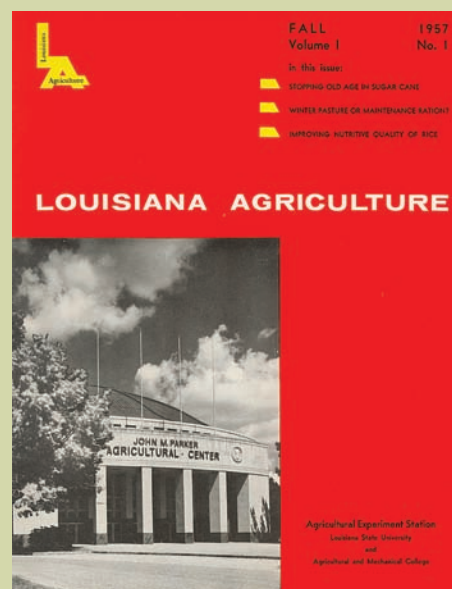
Magazine has birthday

The year was 1957. The New York Yankees beat the Brooklyn Dodgers in the World Series. Actress Grace Kelly married Monaco's Prince Rainier. And a wildly popular singer named Elvis Presley was causing a sensation with his gyrating hips.

Not quite as exciting but certainly significant for Louisiana agriculture that same year was the establishment of a quarterly magazine from the LSU Agricultural Experiment Station. Charles W. Upp was the director, and J.N. Efferson, whom the LSU AgCenter's administration building is named after, was dean of the College of Agriculture.

Other land-grant university experiment stations also began publishing magazines about this same time. Most of them, however, have long since faded away, although many have re-emerged with different names and broader content.

But 50 years later, which is old for a magazine, *Louisiana Agriculture* still has the same name, still is produced quarterly and still showcases research accomplishments and impact.



Louisiana Agriculture premiered in the fall of 1957. The magazine's format has undergone many changes since then, including a new nameplate with this issue, Volume 50, No. 3.

Volume 1, No. 1

Other than the citation numbers – Volume 1, No. 1 – a reader cannot tell by the content of the magazine – declared “FREE” on the back cover – that this was the premier issue. There is no introductory article, or even paragraph, ballyhooing this new venture.

Yet the articles provide a thoughtful look at topics relevant today:

■ Chemical defoliation of cotton was new. The authors give pros and cons and provide guidelines on how to do it right. An advantage, they say, is less dew so the length of day for picking – both mechanically and by hand – is extended.

■ Ratoon stunting disease was being controlled with an oven developed at the Experiment Station in cooperation with the U.S. Department of Agriculture Sugar Station at Houma and the American Sugar Cane League at Thibodaux. This strong partnership among these three entities continues.

■ Rice researchers were looking to improve the protein content of rice, which they are still doing today. The “motivating force” behind their research was better health for rice consumers and more money for Louisiana’s rice growers – words that have stood the test of time.

■ The nursery industry was big – \$3.5 million in the 1955-56 season – and expanding. Commercial production took place in 22 parishes with St. Tammany in the lead. Most sales were to out-of-state buyers (54 percent). This expansion continues with a farm-gate value in 2006 of \$108 million.

Agriculture awareness, value

In the second issue of Volume 1, Fred H. Wiegmann, who would become head of the agricultural economics department, wrote an insightful piece about the value of agriculture to Louisiana and lack of awareness of that value. With numbers and facts updated, the article could run today.

Wiegmann explained that the decreasing numbers of people engaged in farming per se belies the increasing contribution agriculture makes as a whole to the economy. He pointed out that agriculture is so much broader than farming. Other industries depend on agriculture as major customers, including the chemical industry, which produces

the fertilizer and pesticides essential to production. Then there’s farm equipment from the manufacturing plant to the retail outlet. Cotton gins, food processing plants, the feed and seed trade and the complex marketing system are all part of agriculture. The oil industry, the railroad, trucking, communications and power systems also are integrally aligned with agriculture.

“While fewer people work directly on farms, more are employed in industries that are allied with or service the needs of agriculture,” he wrote.

Wiegmann said the sale of agricultural products in Louisiana had reached nearly \$372 million in 1956. The backyard flocks of chicken of yore, for example, had given way to a \$20 million poultry industry.

Compare those numbers to a nearly \$5 billion farm-gate value in 2006. With value-added, that number jumps to more than \$10 billion. The poultry industry alone contributed \$1.15 billion with value-added.

Technology fuels progress

Early issues of *Louisiana Agriculture* highlighted problems then that have found solutions today because of an effective research program. For example, in an article about anaplasmosis in Issue 3, the author describes this deadly cattle disease and the devastation it wreaks in the Louisiana cattle industry. At that time, according to Lon E. Foote from the Department of Veterinary Science, researchers were working to find the exact cause of the disease and hoped to develop a vaccine to prevent it.

Louisiana Agricultural Experiment Station researchers through a concerted, team effort were able to pinpoint the cause and develop a vaccine in the early 1990s. This technology was later patented and licensed to a start-up company, University Products LLC of Baton Rouge.

The patenting and licensing of technologies to businesses was something not done by agricultural researchers in the late 1950s. But the LSU AgCenter was among the first to do this in the decades following. Intellectual property endeavors have greatly expanded the reach and effectiveness of agricultural science.

In Issue 4 of Volume 1, the boll wee-

vil reared its ugly head in the cover photo. The accompanying article explains that this cotton pest developed resistance to insecticides with chlorinated hydrocarbons, which was documented in 1955. Louisiana scientists were in the midst of testing the efficacy of other insecticides and studying the biology of the boll weevil to help develop control measures.

Since then, the boll weevil has been eradicated in Louisiana through a consistent, concerted effort by many agencies in agriculture – including the LSU AgCenter.

New product development was a research focus then as it is now. For example, an article in Issue 3 describes the research to develop a package-able, palatable sweet potato chip. One of the authors was Julian C. Miller, whom the LSU horticulture building is named after. Sweet potato chips are today available in most grocery stores and on restaurant menus.

Social sciences included

The research program in the late 1950s did not neglect home and family. The first issue included an article about studies on successfully freezing cake batter and baked cakes.

An article entitled “Vitamin A studies with Louisiana children” began with this statement: “At L.S.U. not only the requirements for good crops and sturdy farm animals are investigated, but also the nutrients needed to make boys and girls grow normally.”

A sample of 1,500 elementary school children from 12 parishes was included in the study. The average serum levels of vitamin A and carotene were “highly satisfactory,” and the children were encouraged to eat more sweet potatoes, the article said.

In Issue 4, an article on the effects of more industry in rural Louisiana is more intriguing because of what’s asked than what’s found. With what appears to be federal funding in addition to experiment station backing, the author asks rural residents employed by a “plant” about their standard of living. The measures are: electric lights, hot and cold running water, mechanical refrigerator, power washing machine, radio, television and telephone.

What Paul H. Price in the Department of Rural Sociology finds is that by 1957, the percentage of households with all seven items had risen from 2 percent in 1950 to nearly 20 percent.

Readability, visuals

The articles in the first volumes were written in a reader-friendly style, including what the research meant to Louisiana citizens. This changed over the years with articles becoming more technical in nature with details about methodology and statistical analysis.

Under leadership from Kenneth Koonce, dean of the College of Agriculture and editorial board chairman from 1989-1997, while he was the assistant director of the experiment station, the magazine went back to its original emphasis on readability and results.

The look of the magazine also changed during those years with the introduction of more color photos.

“A big improvement was the addition of color,” Koonce said. “There’s no doubt it’s more appealing to flip through the magazine and see colorful photos.”

The magazine went full color on every page – like a commercial magazine – in 2000. This was one of the changes initiated by David Boethel, who has been chairman of the editorial board since 1998, when he was named LAES assistant director. Boethel continues as board chairman in his role as the LSU AgCenter vice chancellor for research and LAES director, the title he has held since 2004.

“Why be penny-wise and pound-foolish” is how R. Larry Rogers, LAES director from 1996-2001, described the reason he approved increasing the cost of the magazine to add color throughout. Though budgets are always tight, his philosophy was that the magazine shows accountability for taxpayer support of the LSU AgCenter and needs to be attractive to help people read it.

Focus on issues

While Koonce was editorial board chair, focus issues were introduced.

“This added a lot to the sense of community,” Koonce said. “Scientists who didn’t normally publish together came together to address a current issue.”

The production schedule calls for two focus issues per year – fall and spring – to emphasize one topic with input from many different units.

The focus issue in the fall of 1994, for example, was on biotechnology, which was a new concept in agricultural research circles and a topic few among the general public understood.

That topic was re-addressed, showing the vast amount of progress, as the focus for the fall 2003 issue, which has been among the most popular issues.

Inclusive of outreach

Under Boethel’s leadership the magazine has gone back to including more about the extension programs that carry the research knowledge to the people of the state. The first volumes of the magazine frequently included articles featuring outreach programs. For example, in the fall of 1958, Wiegmann wrote about the importance of farm business management and how people could get help through the extension service.

The editorial board includes scientists representing both research and extension.

“We owe much of the magazine’s success to the editorial board,” Boethel said. “They are a dedicated group.”

Board members serve three-year terms and play a significant role in directing the magazine’s content.

Published since 1957

Reading through back issues of *Louisiana Agriculture* provides a fascinating look at not only the history of the magazine but of the LSU AgCenter’s research and extension programs and the history of agriculture in the state.

Much of the agricultural research conducted today had its beginnings 50 years ago. This sustained examination of problems is how they get solved. Research breakthroughs don’t happen overnight. Progress comes only through persistence and commitment.

The biggest change for the magazine has come about in the past few years with its publication on the Internet. Although its print circulation is about 4,000 – including all the libraries, high schools and public officials in the state and a voluntary list of more than 3,000 – its electronic circulation reaches the world. Foreign subscribers were eliminated from the list a few years ago because of cost. But now anyone anywhere can easily go to the magazine’s Web site and read what they want. A subscriber – the magazine is still free – has a choice of print or electronic versions or both. We’re in the process of uploading back issues and hope to eventually get to Volume 1, No. 1.

This is the 50th year of the magazine and my 10th year as editor. I consider it a privilege and an honor to be associated with this venerable publication. Although I probably won’t be around for another 10 years, I hope the magazine continues to survive for another 50. I suspect it will. ■ **Linda Foster Benedict**

Economic Impact ***of Russian*** ***Honey Bees***

John V. Westra



Most people don't give honey bees much thought, but the honey they produce is an economically important agricultural crop, generating \$2.5-\$5 million annual sales in Louisiana and \$150-\$250 million annual sales in the United States. Additionally, pollination by honey bees is an essential part of the production of many vegetable, fruit and nut crops in the United States. Unfortunately, the recent infestation of honey bee colonies by a parasitic mite called Varroa destructor has contributed to a significant decline in beekeeping. Varroa mite infestations weaken or destroy bee colonies. As a result, producers and their bees spend much of their effort rebuilding or replacing colonies instead of growing them and producing honey. As this persists, beekeepers who sustain economic losses leave the industry. U.S. Department of Agriculture (USDA) data from 1987 through 2002 indicate 55 percent of the farms with bee colonies quit keeping bees during that period. This decline in beekeepers has led to a 17 percent reduction in the number of bee colonies and a 29 percent reduction in honey production.

Until recently, options for controlling Varroa mites were limited to a few miticides. The continued effectiveness of these products is uncertain because Varroa mites appear to be developing resistance to them. Because infestation of Varroa mites can cause substantial damage, producers have been seeking any economical means for controlling them. To assist beekeepers, the USDA Agricultural Research Service Honey Bee Breeding, Genetics and Physiology

Photo provided by USDA-ARS



Close up of an adult Varroa mite.

Tony Stelzer of the USDA/ARS Honey Bee Breeding, Genetics and Physiology Research Unit assists in Russian bee research, evaluation and development of Russian queen lines resistant to varroa mites and mechanisms of varroa resistance. Photo by John Wozniak

Photo provided by USDA-ARS



Adult parasitic Varroa mite on the back of a honey bee.

Research Unit in Baton Rouge developed and released commercial queens from a line of Russian honey bees resistant to Varroa mites.

A few years after these Russian queens with Varroa resistance were released commercially in 2000, the USDA/ARS contacted the Department of Agricultural Economics & Agribusiness to determine how many beekeepers were using these queens and to calculate the economic impact of this line of bees. To help answer these questions, we mailed surveys to approximately 1,000 beekeepers nationwide who belonged to the major U.S. beekeeping associations – the American Beekeeping Federation and the American Honey Producers Association. Usable information was obtained from 55 percent of beekeepers surveyed.

Varroa Mites

Two-thirds of beekeepers indicated Varroa mites were a "very serious" or "extremely serious" problem in their operation. Beekeepers reported that losses from Varroa mites nearly doubled from 174,000 colonies in 2001 to 342,000 colonies by 2004. To control Varroa mites, beekeepers have used a variety of methods, with miticides being the most common practice. Unfortunately, one-third of beekeepers indicated Varroa mites in their areas have developed resistance to one or more miticides. As a result, 25 percent of beekeepers surveyed had used lines of bees – including Russian queens – developed to control Varroa mites.

Russian Queens

To determine the number of colonies with Russian queens, we expanded the survey data using a factor derived from the most recent data available on the number of colonies in the United States. Using this factor, we estimated that 113,000 colonies with Russian queens were kept in the United States in 2004 (3 percent of colonies nationwide). By 2007, this is estimated to have increased

Get bees out of walls

It's not unusual for homeowners to have problems with honey bees, said LSU AgCenter entomologist Dale Pollet. Hives often split, and new swarms go looking for new homes.

Sometimes those homes may be in peoples' walls. If that happens, Pollet suggests contacting a Louisiana beekeeper who can open the wall, collect the bees, clean the wall and put it back into place.

Pollet maintains a list of Louisiana beekeepers on the Internet. You can find it at www.lsuagcenter.com. Enter "honey bee removal" in the search box.

■ Rick Bogen

Photo provided by USDA-ARS



Beekeeper holding a Russian queen with an identification sticker (#29) on her back.

to 5 percent of the U.S. production (117,000 to 143,000 colonies).

Estimated Economic Impact

To determine the potential direct economic impact of Russian queens being used by U.S. beekeepers, we considered marginal changes in revenues and production costs associated with Russian

John V. Westra, Assistant Professor, Department of Agricultural Economics & Agribusiness, LSU AgCenter, Baton Rouge La.

Photo provided by USDA-ARS



USDA-ARS research scientists isolating a Russian queen from her colony.

queens. Potential changes in revenues include pollination fees and honey sales. Because pollination fees for colonies of Russian and non-Russian queens were essentially the same in 2004, they were excluded from this analysis.

Beekeepers indicated that honey production was 64 pounds per colony with Russian queens in 2004 while non-Russian colonies averaged 78 pounds per colony. This difference of 14 pounds of honey per year, when multiplied by the \$1.23 per pound responding beekeepers indicated they received for bulk honey, yielded \$17 per colony revenue shortfall for Russian queens.

Scenario 1

Because most production practices were similar for Russian and non-Rus-

sian lines of bees, we examined changes in the amount of miticides used to control Varroa mites (2 percent of estimated total production costs). Though beekeepers used less miticide on Russian colonies than non-Russian colonies, the difference was not statistically significant. One possible explanation is that 75 percent of beekeepers who purchased Russian queens apparently did not purchase pure Russian queens (Russian queens mated to Russian drones). These queens like-

ly had lower genetic resistance to Varroa mites; therefore, beekeepers might have resorted to miticide treatments for these hives similar to those for non-Russian hives. Other possible reasons could be risk aversion to potential loss of colony from mites, even with resistant queens, or habit – treating miticides, though at slightly reduced rates, even when bees in the colonies are from resistant queens. Assuming beekeepers were risk-neutral and had pure Russian queens, the need for miticide treatments would be greatly diminished or eliminated. The cost savings in miticides in this situation would be \$18 to \$20 per colony per year – more than offsetting any reduction in revenues from lower honey production. In this situation, the direct economic impact from

Russian queens, with estimated honey revenue reductions of -\$17 and cost savings from reduced miticide treatments of \$19, would be about \$2 per colony per year. The estimated annual total direct economic effect ranged from \$227,000 to \$286,000 nationwide.

Scenario 2

As beekeepers become more familiar with managing Russian queens, it is likely that the difference in honey production between colonies with Russian queens and those of non-Russian queens, will be eliminated. Research shows average honey production of hives with Russian queens was equal to or greater than those of non-Russian hives. In that situation, gross revenue would show no dif-

So far, no Louisiana bee colonies 'collapse'

Bee colonies in more than 20 states are collapsing. And honeybees are disappearing because of a mysterious ailment. So far, Louisiana colonies don't seem to be affected by what is being called "colony collapse disease," according to LSU AgCenter entomologist Dale Pollet.

Experts across the country attribute the bee malaise to stress related to genetics, Pollet said. It's most common among bees transported across the country by commercial beekeepers who rent their bees to various growers for pollination. These hives are transported from Florida to California, then to Washington State, Oregon and eventually to the Midwest, following the bees' food sources.

"Stress on the system can create natural occurrences of decline magnified by changes in diet," Pollet said. "As an individual you get the physical effects of stress. Bee colonies can react similarly to seemingly minor things in their environment."

Pollet said colony collapse happens occasionally, going back to the late 1960s, mid 1970s and early 1980s.

"No one knows the reason," he said. "It may be linked to travel and food sources."

Louisiana has about 200 commercial and hobby beekeepers, and none has reported anything unusual.

■ Rick Bogen

Photo provided by USDA-ARS



USDA-ARS research scientists examining colonies of Russian bees.

ference. As in Scenario 1, with negligible miticide use, the direct economic impact of Russian queens would be \$18 to \$20 in cost savings per colony per year. With net positive benefits of \$19 per colony the direct economic impact nationwide, would range from \$2.2 to \$2.7 million annually.

We looked at how these two scenarios would affect the direct economic impact of Russian queens in the U.S. beekeeping industry. Under the first scenario, with lower honey production but lower production costs for the Russian queens, net revenues increased by \$2 per colony and resulted in approximately \$250,000 of direct economic benefits annually. Under the second scenario, with honey production equal for hives with Russian and non-Russian queens and lower production costs for Russian hives, direct economic impacts were approximately \$2.5 million annually. In the long run, results from the second scenario are more likely as beekeepers adapt management practices for the Russian queens and honey yields increase. Because many of the early adopters of this technology are located in the South, the release of Russian queens may have larger economic benefits to beekeepers in this region of the country. In the Delta states of Louisiana, Mississippi and Arkansas alone, the economic benefits may exceed \$1 million annually.

These findings highlight the positive and large economic impact that Russian queens potentially have on the beekeeping industry, particularly in the Delta. This potential has not been realized yet, primarily due to the recent commercial release of Russian queens. Unfortunately, this potential may be severely diminished if the vendors of Russian queens do not maintain the integrity of the genetic material and the associated benefits of Varroa mite resistance. The industry must maintain genetic integrity of Russian queens and the associated benefits in controlling Varroa mites. Efforts by extension educators at field days, demonstrations and producer-to-producer information exchanges will help inform beekeepers of the benefits of Russian queens in addressing mite problems and of the importance of maintaining the genetic and behavioral benefits of this line of bees. ■

Acknowledgement

Jeffrey Harris, research entomologist, and Thomas Rinderer, research leader, the USDA-ARS Honey Bee Breeding, Genetics and Physiology Research Unit in Baton Rouge, La.

Red River Station helps Louisiana tomato industry

Sales of greenhouse tomatoes from the LSU AgCenter's Red River Research Station's spring crop topped 65,000 pounds in 2007 – making this the best year ever.

"Our tomatoes look nice, taste good and have a long shelf life," said H.Y. Hanna, the scientist at the station who has been conducting research on how to grow better greenhouse tomatoes for the past 11 years. "The tomatoes have superior quality and flavor because they are grown under controlled environmental conditions that protect them from damaging rain, hot days and cold nights."

The station sells excess tomatoes from the research project and uses the money to help support the research, Hanna said.

The 2,400 tomato plants in the greenhouses are fed properly, kept at a temperature between 60 and 70 degrees F and protected from insects and disease, Hanna said.

Last year, Hanna put in a raised gutter system under the plants to keep excess moisture off the greenhouse floor.

"This lowered humidity, which means there is less chance for disease," Hanna said. "The new gutter system is part of the reason our yields were so high this year."

The other reason is extending the sale through July.

"We had been concluding that sale by the end of June," Hanna said.

In 2006, the year the new gutter system was installed, more than 56,000 pounds were sold. The year before, more than 54,000 pounds were sold.

Hanna uses the information gathered from his research to teach people in the greenhouse tomato business how to do better. The station hosts a greenhouse tomato field day every February.

In 2006, 17 Louisiana parishes had 35 farms commercially growing greenhouse vegetables in 4.9 acres of greenhouse space. All production was devoted to tomatoes except for 4,000 square feet of hydroponic lettuce.

"Tomato plants need water, carbon dioxide and sun energy. We supply them with water and other minerals 12 times a day, from sunrise to sunset, to assist the plant to make sugars and proteins," Hanna said.

The fruit begins as a flower, and the flower has to be pollinated by electric vibrators or bumblebees in the greenhouse. It takes approximately 50 days from pollination to produce a mature fruit. Each plant grows to be 20 to 25 feet tall in the spring and produces around 50 fruit that weigh approximately half a pound each.

"We leave only the nice looking fruit on the plant and remove the bad ones to save plant energy for better quality fruit," Hanna said.

The tomatoes are sold to the public in 5-pound boxes for \$10. In a recent informal survey, two-fifths of the tomato buyers were from outside of Shreveport-Bossier City.

"The tomato program is the only one of its kind in the mid-South and supports greenhouse producers in the surrounding states of Texas, Arkansas and Mississippi," said Jere McBride, LSU AgCenter regional director.

Hanna said the tomato shelf life is three weeks, and he recommends that the tomatoes not be refrigerated.

Hanna also sells a fall crop of greenhouse tomatoes – but the spring tomatoes produce three and four times the yields of the fall tomatoes.

■ **Mary Ann Van Osdell**

Salt Damage to Agricultural Fields in South Louisiana

Gary Breitenbeck, Johnny Saichuk, Howard Cormier and Sonny Viator

When hurricanes Katrina and Rita came ashore in Louisiana in 2005, they were accompanied by storm surges that inundated vast areas in the southern parishes with salt water. Flooding of agricultural land was especially severe in the southwest where the surge from Rita flooded rice and sugarcane fields more than 50 miles inland. In many areas north of the east-west state Highway 14, flood waters receded within a few days. Farther south, water remained for weeks. In some cases, the flood water persisted for several months where the surge was trapped by protective levees. This was sufficient time for much of the water to evaporate and deposit its load of salt in the fields.

LSU AgCenter scientists conducted a preliminary study to assess the extent of salt effects. Of the six sugarcane and nine rice soil types examined within the flooded zone, salinity levels in saturated soil extracts ranged from negligible to more than 5,000 parts per million (ppm). In the surface 6 inches of soil, salinities averaged 3,100 ppm, a level far in excess of established tolerances for optimal yields of rice and sugarcane. Both sugarcane and rice, the predominant crops in the flooded areas, are moderately sensitive to salt. Understandably, farmers with affected fields were deeply concerned that these fields could not be profitably planted in the 2006 growing season.

In the case of sugarcane, this concern seemed to be largely unfounded. Sugar is a perennial crop planted once in a typical four-year production cycle in Louisiana. Many flooded sugarcane fields were in first or second “stubble,” so planting was not required. Selective monitoring and anecdotal evidence

suggested that 2006 sugarcane yields from these fields were not substantially reduced as a result of saltwater flooding. Sugarcane is usually grown on raised rows, which may have improved this crop’s ability to withstand elevated soil salt levels. During dry periods, salt tends to wick upward to the tops of rows. Rains can then wash surface salts down into adjacent fur-



Vast acreages of agricultural land were flooded with saltwater during the 2005 hurricane season. A key question for many was whether the land was too salty to plant in 2006. Many were asking this question in 2007.

Gary Breitenbeck, Professor, School of Plant, Environmental & Soil Sciences, LSU AgCenter, Baton Rouge, La.; Johnny Saichuk, Professor, Rice Research Station, Crowley, La.; Howard Cormier, County Agent, Vermilion Parish, Abbeville, La.; Sonny Viator, Professor and Coordinator, Iberia Research Station, Jeanerette, La.

Table 1. Impact of storm surge flooding on rice fields in southwestern Louisiana. Assessments based on salts contained in the surface (0-6") of soil and the underlying 6-12".

Impact	0-6"	6-12"
None	35%	47%
Mild	19%	19%
Moderate	10%	16%
Severe	30%	15%
Very severe	6%	3%

rows. Following heavy rains, the salts accumulating in furrows are subsequently flushed from the field into ditches, canals and bayous.

Rice Fields Hold Salt Water

In contrast, rice is grown on level fields surrounded by levees that control runoff. Most prime rice soils in southwestern Louisiana are shallow because of a well-developed hardpan that inhibits downward flow of water. Elevated salt levels can substantially reduce rice germination, growth and grain filling. To assess the effects of Rita's storm surge on rice fields, a survey was organized. With the help of parish agents and others, more than 150 fields were systematically sampled. This survey showed that the impact on surface soil was negligible in about

Photo by Gary Breitenbeck



Table 2. Criteria used for assessing salt impacts following coastal flooding. Salts (ppm) were determined by measuring the electrical conductivity of saturated paste extracts and multiplying by a factor to convert to 'ppm', a term more familiar to Louisiana farmers. The sodium adsorption ratio (SAR) in saturated extracts reflects the degree of sodium saturation.

Salt impact	Salts (ppm)	SAR	Effects
None	<500 and	<4	Effects unlikely
Mild	500-1000 and	<5	Some yield reduction possible
Moderate	1000-2000 or	<6	Some yield reduction likely
Severe	2000-5000 or	<13	Substantial yield reductions likely
Very severe	>5000 or	>13	Catastrophic crop failure

35 percent of the fields (Table 1) located primarily along the northern reaches of the flooded area. Another third showed mild to moderate impact where minor reductions in rice yields were possible. About a third of the fields had been severely affected to the degree that substantial yield reductions were likely to occur. Salt levels in some of the most severely impacted fields suggested that not only catastrophic crop failure was likely, but also that these fields were at risk of becoming permanently unproductive.

The criteria for classifying salt impact (Table 2) are based primarily on measures of salinity and the sodium absorption ratio (SAR). The SAR is a reliable indicator of the impact of sodium on the soil. High sodium not only reduces plant growth, it causes soils to lose structure as well as their ability to absorb and retain water. When the amounts of sodium in the soil solution increase relative to those of calcium and magnesium, sodium can become toxic to even the most tolerant plants. As salts leach from the soil, salinity decreases while the SAR can remain high. Soil pH then rises above pH 8 and micronutrient deficiencies occur. An exceptionally high ratio of sodium causes soil to become impermeable to water. Crops cannot grow even with irrigation because water will not penetrate the soil. Reclaiming soils containing salt is costly because it not only requires large quantities of calcium but also the installation of a drainage system to promote leaching.

At-Risk Fields

It is important that we identify fields at risk of permanent damage from salt. Applying calcium as lime to acid soils or as gypsum or slag to neutral soils can prevent salt damage. To determine the status of a salt-affected soil, soil samples can be submitted to the LSU AgCenter's Soil and Plant Testing laboratory on the LSU campus in Baton Rouge and request the "Storm Surge" analysis. Results will include both a measure of salinity, the SAR and other data. As a rule, we should be seriously concerned if the SAR is greater than 13. We have sampled a few fields flooded by Rita that now have SAR values greater than 25. A SAR of less than 4 is ideal.

Most flooded fields are not at risk of permanent damage even though salinity values remain high enough to threaten yields. Resampling rice fields that tested high for salts in the initial survey more than a year after the initial flooding showed



Photo by Gary Breitenbeck

The behavior of salt varies greatly among soil types.

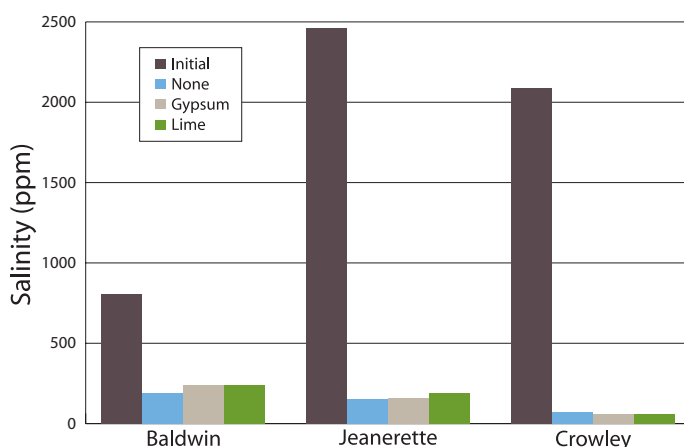
that salinity values remain substantially greater than 1,000 ppm. Monitoring the change in salt concentrations over time is complicated by vertical movement of the salts. In general, as soils dry, the salts accumulate near the soil surface. After a rain, they rapidly move down into the soil profile. Extensive monitoring of one field showed that salts also move laterally, accumulating near levees and in depressions where water evaporates. Even so, the finding that high salts remained for more than a year despite near normal rainfall suggests that natural processes cannot be relied upon for remediation of rice fields

with heavy salt loads. The most common methods for removing salts include either leaching them deep into the soil or flushing them from the field in runoff. Several laboratory studies were conducted to better understand the behavior of salts in the silt loam soils typical of rice fields in southwestern Louisiana. We tested the efficacy of adding gypsum or lime to accelerate leaching salts from three soil types collected from fields that had been flooded with several feet of saltwater (Figure 1).

These studies showed that passing one "pore volume" of water removed most of the free salts. Pore volume is the air space between soil particles in a given volume of soil. The rate of water infiltration varied greatly, and none of the soil columns in the laboratory contained a thick hardpan that slows leaching in most rice fields.

After passing three pore volumes through the soils, the salinities of all three were low. With each leaching, however, the soils became less permeable. After the second leaching, the Commerce soil became extremely compacted, and infiltration stopped entirely because of the high ratio of sodium that remained in that soil. Adding lime or gypsum did not significantly improve either the rate of salt leaching or the rate of infiltration. Because it contains sulfate, too much gypsum could cause sulfide toxicity problems once a field returns to rice production. The benefits do not seem to justify the costs and risks unless excessive sodium threatens to destroy the soil structure.

Figure 1. The effects of amending soils with gypsum and lime on the amount of salt remaining in 6" columns of three flooded soils (Baldwin, Jeanerette and Crowley) after leaching with 3 pore volumes of water. 'Initial' refers to soil salinities prior to leaching. Three pore volumes is equivalent to about 8" of rain.



Flushing Fields

An alternative approach lies in flushing the fields to remove excess salts. Laboratory studies using columns of three soils showed that salt concentrations of water in a simulated irrigation flood continue to increase for about two weeks and then stabilize (Figure 2). This suggests that closing levees before a heavy rain and opening the levees after two weeks may be a practical means of reducing salts. We found, however, that the rate that salts diffuse into this floodwater varies greatly



Photo by Gary Breitenbeck

Deep sampling 18 months after flooding showed that in this field most salts had accumulated in the hardpan at a depth 12-18" below the surface. As the soil dries, some of these salts will move upward; after a rain they move down again.

among soil types. Crowley silt loam, a common soil in the affected area, gave up only a small portion of its salt to the floodwater (Figure 3). Most of the salt moved downward following flooding and remained in the soil.

Additional studies suggested mechanically mixing the soil after flooding and then retaining the floodwater for 3-5 days, offered a practical means of rapidly removing salts. This technique was field-tested in Vermilion Parish. This field consisted of a sequence of three levee cuts, each draining into the next until water was discharged from the lower cut into an adjacent

bayou. Each field was worked dry, flooded by about 5 inches of rain over a two-week period, then worked again with standing water and allowed to settle for five days.

Comparison of the dissolved salts before and after working the flooded soil indicated that working the soil increased salts dissolved in floodwater by 60 percent to 190 percent before discharge. The levees were then opened and the field drained. The soil retains about an inch of water in each 2 inches after draining, so it is not possible to remove all of the soluble salts in a single flushing. Nevertheless, we calculated that this process

Figure 2. Salinity of floodwater at various times after establishing a 4" flood on 12" columns of three soils. All soils were flooded for several weeks by Hurricane Rita (initial saturate paste salinities shown in legend).

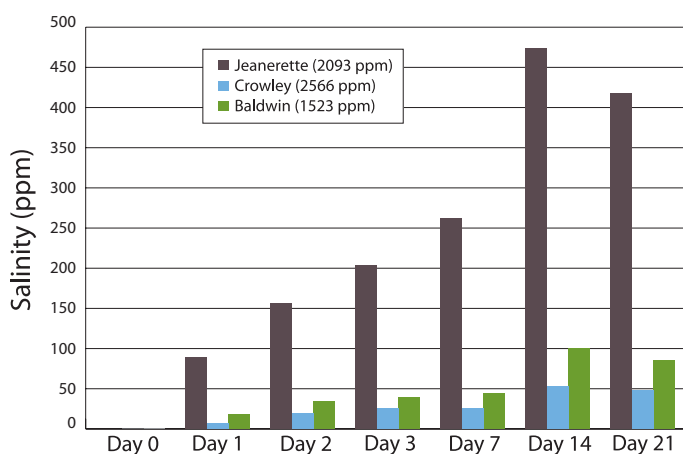
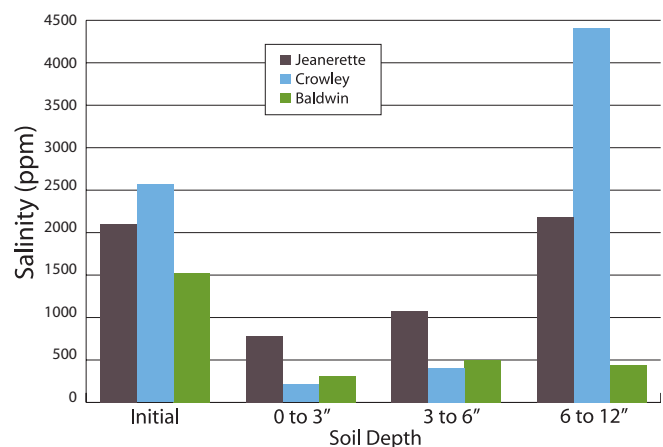


Figure 3. Distribution of salts in 12" columns of three soils 21 days after establishing a 4" flood. Soils were dry before flooding.





Working a salt-impacted field to increase the dissolved salts in floodwater prior to discharge.

Photo by Gary Breitenbeck

ture resulted in the removal of between 480 to 993 pounds of salt per acre. After flushing, the SAR and pH were sufficiently low so that the soil was not at risk of collapsing, though the addition of lime or slag would provide added insurance.

Some farmers with highly saline soils have temporarily converted their rice fields to hay production. Both common and coastal Bermudagrass are highly salt-tolerant and can accumulate substantial amounts of salt in their tissue. Harvesting

the hay will eventually reduce salts to a level where those fields can return to rice production. Fertilization, especially with nitrogen, will accelerate plant growth and salt removal rates. Potash is a high-salt fertilizer and should be applied only where soil tests show that it is absolutely essential.

The results of these studies can ultimately be used to remediate highly saline soils should storm surge happen again in South Louisiana. ■

New varieties featured at annual sugarcane field day

One new sugarcane variety released earlier this year and two sugarcane varieties released in 2006 were featured along with three new releases of energy cane at the annual field day July 18 at the LSU AgCenter's Sugar Research Station.

The new variety – HoCP 00-950 – was developed by the U.S. Department of Agriculture's Sugarcane Research Unit in Houma in cooperation with the LSU AgCenter and the American Sugar Cane League in Thibodaux, said Kenneth Gravois, sugarcane breeder and resident coordinator of the Sugar Research Station.

Gravois also said two new varieties released last year – L 99-226 and L 99-233

– are being increased for planting this year.

The field day is a way to discuss information and learn from what the researchers are doing in actual sugarcane production fields, said Warren Harang III of Donaldsonville.

"Without research, production wouldn't happen," said Harang, who raises 2,700 acres of sugarcane.

In 2005, the variety LCP 85-384 was planted on 91 percent of the state's acreage, but rust disease and declining yields have led to increasing interest in new varieties, Gravois said. Since 2003, the LSU AgCenter and its USDA and American Sugar Cane League partners have released six new varieties they expect will provide improved alternatives to the old standby variety of sugarcane.

This year's new variety, HoCP 00-950, performed well over the past three years of tests, the experts said.

The cooperating agencies released three high-fiber cane plants for biofuel applications, Gravois said.

"High-fiber canes have the potential for biofuel applications," he said. "They're a good start for an emerging industry."

The sugarcane breeder said major energy companies have visited the LSU AgCenter during the past few months looking for information on manufacturing ethanol from cellulose – the fibrous parts of plants – rather than from only the sugars and starches. ■ **Rick Bogren**

Developing Rapid and Sensitive Pathogen Detection Systems for Food Safety and Biosecurity

Beilei Ge, Marlene E. Janes, Feifei Han, Reshani Senevirathne and Janet Simonson

America boasts one of the safest and most plentiful food supplies in the world. Unfortunately, food by nature or by accident is vulnerable to contamination by harmful microbes at any point from the farm to the table.

According to the U.S. Centers for Disease Control and Prevention in Atlanta, each year 76 million Americans get sick from something they eat. Of these, 325,000 are hospitalized and 5,000 die. In the fall of 2006, *E. coli*-tainted spinach led to one of the largest and deadliest foodborne outbreaks in recent years. Shortly after, peanut butter contaminated with *Salmonella* sickened more than 600 people in 47 states, heightening growing public concerns over food safety. Along with food safety concerns, the intentional contamination of our food supply – referred to as agro-bioterrorism – can cause graver social and ecological damage, underscoring the urgency and significance of research to minimize such risks.

The ability to quickly and accurately detect the presence of even low levels of harmful microbes is essential for food safety and biosecurity. An ideal detection method is above all rapid, sensitive, specific and cost-effective. Currently, foodborne pathogen detection relies heavily on conventional microbiological culturing techniques, which are labor-intensive and time-consuming. Although newly developed molecular techniques have improved performance, they still lack sensitivity, take a long time for analysis or require expensive equipment.

LSU AgCenter researchers are improving methods to detect these foodborne pathogens. In particular, they are focusing on detecting and counting a deadly foodborne pathogen that has been the foremost concern to the Louisiana oyster industry for the past few decades – *Vibrio vulnificus*.

This particularly troublesome microorganism is salt-loving and favors warm coastal and estuarine waters. The Gulf of



Photo by John Wozniak

A dry heating block that maintains a constant temperature for performing the isothermal detection assay.

Beilei Ge, Assistant Professor, Marlene E. Janes, Assistant Professor, Feifei Han, Graduate Student, and Reshani Senevirathne, Graduate Student, Department of Food Science, LSU AgCenter, Baton Rouge, La.; and Janet Simonson, Instructor, Department of Agricultural Chemistry, LSU AgCenter, Baton Rouge, La.

Figure 1. Positive samples (green to greenish-yellow color) and negative samples (orange color) under normal air.

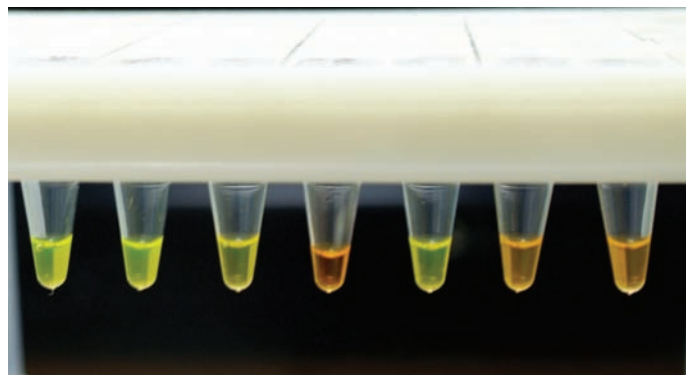


Photo by John Wozniak

Mexico is an ideal natural habitat for *V. vulnificus*. In summer months, the prevalence rate can be as high as 100 percent, and 95 percent of seafood-related deaths – about 40 annually – are due to eating raw oysters containing this pathogen. Fortunately, *V. vulnificus* is a pathogen that causes illness only in certain at-risk groups, which include people who have weakened immune systems, liver disease or alcoholism.

V. vulnificus detection is primarily based on culturing the bacteria followed by confirmation using biological and chemical reactions. Few rapid tests – including convenience-based (like a pregnancy test) or immunological-based (antigen-antibody recognition) methods – are available. Molecular-based methods, such as polymerase chain reaction (PCR), which amplify certain genes of the bacteria, are just starting to gain some momentum. The problems with PCR include expensive instrumentation and difficulty in field testing.

LSU AgCenter researchers are developing and evaluating a novel isothermal (one constant temperature) method to amplify – or extensively duplicate – certain genes in *V. vulnificus*. Similar to PCR, this technique starts with efficiently amplifying the target bacterial genes, duplicating the initial gene millions of times in about an hour. This assay is actually more sensitive and rapid than PCR. The accuracy of detection is ensured by targeting genes unique in *V. vulnificus*. When the assay gives a positive testing result, it will indicate the presence of *V. vulnificus*, not something else.

Figure 2. Positive samples (bright fluorescent green) and negative samples (dark, non-fluorescent) under UV.

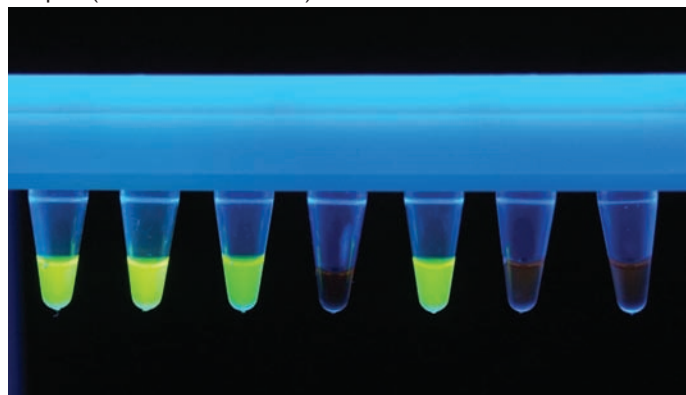


Photo by John Wozniak

Another attractive feature of this technique is how the amplified genes are detected. After adding a few drops of a DNA dye, positive samples turn the tube green to greenish-yellow while negative samples remain orange (Figure 1). The signals are even stronger under ultraviolet light (Figure 2). Such color changes can be easily identified by the naked eye, so it is easy to tell the positives from negatives. This technique can also be used to quantify the number of *V. vulnificus* cells in an oyster sample. The researchers are enhancing this detection system and will evaluate it for field applications.

LSU AgCenter researchers have also developed a *V. vulnificus* antibody-based detection method that is more user-friendly than U.S. Food and Drug Administration recommended methods. The LSU AgCenter method involves growing bacterial colonies on agar plates, transferring the colonies to membranes, treating the membranes with antibodies for 1 hour and washing the membranes three times. The membranes are then incubated with another chemical for 1 hour and washed three times. Finally, a color-development mixture is added for five

Figure 3. Different clinical and environmental strains of *Vibrio vulnificus*.

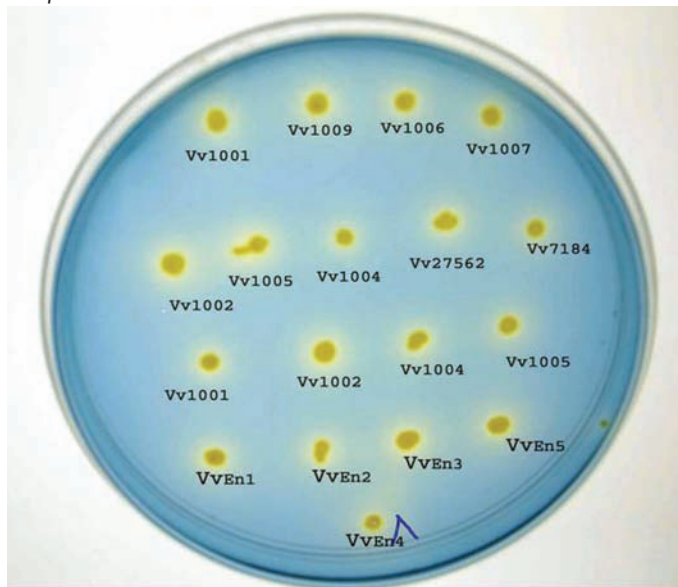


Photo by Reshani Senevirathne

minutes. Positive colonies produce a purple color. The test was positive for all *V. vulnificus* strains tested (Figure 3) and did not react with other *Vibrio* species.

This newly developed *V. vulnificus* test can consistently detect 100 *V. vulnificus* cells mixed with 10,000 cells of a related pathogen. The method was compared with two FDA recommended methods for counting naturally occurring *V. vulnificus* in oysters, and all three methods are comparable. The LSU AgCenter method exhibited better color development and was less time-consuming than the FDA methods. It can be completed in 3.5 hours while one FDA method takes 24 hours and the other method takes 50 hours to perform. The LSU AgCenter process for detecting *V. vulnificus* could be used as a rapid counting method by regulatory agencies or the seafood industry.

Both detection systems developed by LSU AgCenter researchers can be modified and applied in detecting other harmful microbes of food safety and bioterrorism concerns. Taken together, these research efforts will greatly advance the ability to fight against pathogens associated with foodborne illnesses and bioterrorism threats. ■

COTTONSEED MEAL

Improves Beef Cow Performance

David W. Sanson

Beef cattle feed goes through a microbial fermentation process in the rumen before being digested by the animal. Since the majority of the cow's diet is forage, efficient fermentation of this fiber is critical. Diet supplements provide additional nutrients to improve utilization of the fiber.

Mature forages – generally hay and pastures that provide less than 7 percent crude protein and are below 50 percent digestibility – are low in both energy and protein. Because of these deficiencies, it is often impossible for beef cattle to consume enough of these forages to meet requirements above maintenance. Although mature forages are low in both protein and energy, protein is generally considered the limiting nutrient for improving utilization by the rumen microbes.

Supplemental protein provides the rumen microbes with nitrogen needed to increase fiber utilization. This increases the nutrients the cow absorbs from the forage. In addition, increasing the rate of digestion allows the animal to consume more low-quality forage, giving the animal additional energy.

Supplemental protein improves the digestion of low-quality forages by 5 percent to 10 percent and improves intake by 10 percent to 20 percent. The combination of intake and digestion improvements can increase the value of low-quality forage and meet the maintenance and gestation requirements of a mature beef cow.

Experimental Procedures

Ninety-six mature cows at the Rosepine Research Station near Rosepine, La., were studied in 2004, and 104 similar cows were studied in 2005 to compare the effect of supplementing cottonseed meal during the last trimester



Cows were supplemented with different levels of cottonseed meal during the last one-third of gestation.

on weight change of cows consuming a mature, low-quality hay. Treatments were: no supplement, 1 pound of cottonseed meal, 2 pounds of cottonseed meal or 3 pounds of cottonseed meal. The cows were randomized into eight groups of 12 cows in 2004 and eight groups of 13 cows in 2005. Then the groups were randomly assigned to receive one of the four supplemental treatments, resulting in two replications of each treatment in each of two years.

Cow groups were maintained in 100-foot by 200-foot pens at the Rosepine Station during the supplementation period. Supplements were fed each morning, and all groups had unlimited

access to a low-quality bermudagrass/bahiagrass hay.

Cows were weighed on two consecutive days before the start of the supplemental treatments in mid-October and approximately one week before the start of the calving season in mid-January. Each cow was assigned a body condition

David W. Sanson, Associate Professor, Dean Lee Research Station, Alexandria, La.

score, using a 1 to 9 scale, on each of these days. Supplementation was continued for each cow until she had calved, at which time the cow and calf were put on ryegrass pasture. Cows were also weighed and assigned body condition scores in April before the next breeding season, in June at the end of the breeding season before the study began as well as in mid-September when the calves were weaned.

Calves were born from mid-February to mid-April. At birth, calves were identified with a numbered ear tag and weighed, and male calves were castrated. Calves were also weighed each time the cows were weighed.

Cows and their calves were moved to an annual ryegrass pasture within 24 hours of calving. After the ryegrass grazing season, the pairs were maintained on bermudagrass and bahiagrass pastures until weaning.

Results

Cottonseed meal supplementation increased weight gain during the last third of gestation with mature beef cows. Each additional pound of cottonseed meal improved weight gain during the supplementation period. Beef cows should gain approximately 0.9 pound of weight per day during the last one-third of gestation to account for fetal development. Weight gain for fetal development

does not add any true weight to the cow and at calving this weight is lost.

Cows fed only hay lost about 90 pounds during the supplementation period; this roughly equals the amount of weight that a cow should gain to account for the increase in weight due to fetal development. Since the forage did not meet the requirement of these cows, the cows used energy stores (body condition) to provide the nutrients for fetal development. This observation is supported by condition score change during the supplementation period. Cows fed only mature hay had a decrease in body condition of 1.8 units.

Cows supplemented with 1 pound of cottonseed meal essentially maintained their weight; however, they lost more than 1 unit of body condition score. The diet of these cows was not adequate to provide the nutrients for fetal development, thus the cows used body stores to provide nutrients deficient in the diet.

Supplementing 2 pounds of cottonseed meal resulted in a weight gain during the last third of gestation of about 35 pounds. Although these cows were in a positive weight gain, the nutrient level of this diet was not adequate to provide all of the nutrients required for fetal development. These cows lost half a unit of body condition score. Cows supplemented with 3 pounds of cottonseed meal gained close to 80 pounds during

the supplementation period. Thus the diet essentially met the nutrient requirements for fetal development. These cows maintained body condition during the supplementation period.

The effect of weigh loss due to calving is demonstrated in the weight change from the weight before calving to the weight taken before the breeding season. There was no difference in weight between cows supplemented with 2 or 3 pounds of cottonseed meal before the start of the breeding season; however, cows that received only 1 pound of cottonseed meal weighed less than those receiving the higher level of supplements. This difference in weight was also present at the end of the breeding season. Cows that received only hay were lighter than the other treatments at the start and at the end of the breeding season.

The level of supplementation had an effect on fall pregnancy. There was no difference between cows fed only hay and cows supplemented with 1 pound of cottonseed meal; however, both of these groups had lower fall pregnancy rates than cows supplemented with either 2 or 3 pounds of cottonseed meal. There was no difference in fall pregnancy rates between cows that received 2 or 3 pounds of cottonseed meal.

Although not significant, cows receiving no supplement had calves that were three pounds lighter at birth. At weaning, these calves were 35 pounds lighter than cows that received cottonseed meal supplementation. There was no difference in birth weight or weaning weights of calves among cows that received cottonseed meal supplementation.

Producers feeding low-quality or mature hay during the last third of gestation should provide a protein supplement. Each level of cottonseed meal supplementation improved forage utilization. Three pounds of cottonseed meal, however, improved nutrient intake enough to provide the nutrients for cow maintenance as well as for fetal development.

In the end, producers have to consider the relative condition of their cows during pregnancy, the cost of supplemental feeding and the quality of the forage the cows will receive following calving. The value of supplemental feeding is most reflected in the success of breeding the cows for the next season, and the data show that cows that lost the most weight during this study had a much lower pregnancy rate the following season. ■



After calving, cows and their calves were moved to ryegrass pastures.

Blast in Rice

Researchers Detect Resistance to Fungicides

Control Percentages Continue To Decrease

Donald Groth, Milton C. Rush and Don Lindberg

Close-up of severe leaf blast lesions on rice.

Photo by Bruce Schultz

Pesticides are used in agriculture to control many different insects, weeds and pathogens that cannot be controlled by other practices, such as planting resistant cultivars, cultural management and biological control. Most pests have the ability to overcome pesticides by becoming resistant over time. This often leaves a gap in the farmer's ability to control important pests. Monitoring programs are in place to detect these situations and allow time to develop new control practices.

Blast, often called rotten neck blast because the disease attacks the plant at the joint just below the seed head, is caused by the fungus *Pyricularia grisea*. This is one of the most significant rice diseases in Louisiana and the Mid-South. Some varieties offer resistance, but most do not. Control is enhanced by establishing and maintaining a flood as soon as possible, planting early to avoid late-season blast pressure, using recommended nitrogen fertilizer rates and not planting in sandy soils or in tree-lined fields. Losses due to blast are increasing because of current production practices that require draining fields for controlling insects, correcting herbicide damage or

preventing straighthead disease. Farmers often have to depend on fungicides to protect their rice crop from severe blast damage, and the development of resistance to fungicides by the blast fungus poses a major risk.

Blast fungicide trials have been conducted at the LSU AgCenter's Rice Research Station at Crowley since the 1970s. Small plots were usually 4 feet by 16 feet, consisting of seven strips with 7-inch row spacing. Seeding rates, fertility and pest control followed current recommended practices. Experiments were randomized with at least four replications. Varieties selected were susceptible to blast. The plots were fertilized with

Donald Groth, Professor, Rice Research Station, Crowley, La.; Milton C. Rush, Professor; and Don Lindberg, Retired Professor, Department of Plant Pathology & Crop Physiology, LSU AgCenter, Baton Rouge, La.

Figure 1. Percent control of rice rotten neck blast with Benlate fungicide as compared to the unsprayed control under light and heavy disease pressure. 1976-2005. Rice Research Station, Crowley, La.

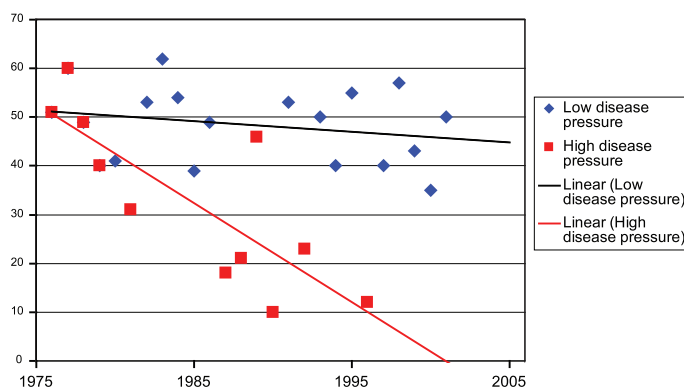
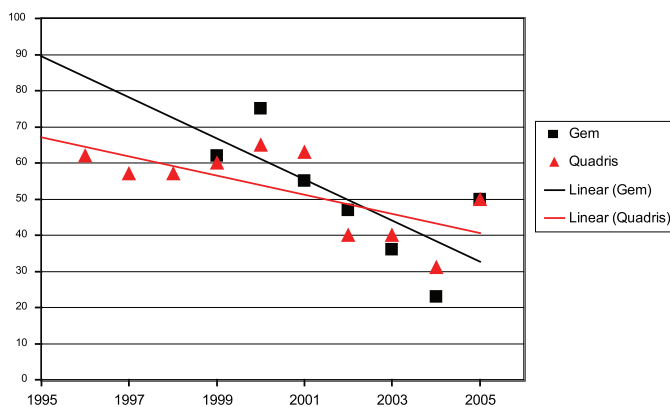


Figure 2. Percent control of rice rotten neck blast with Quadris and Gem fungicides as compared to the unsprayed control. Rice Research Station, Crowley, La.



high nitrogen rates, planted late, drained at midtillering until the soil cracked and then reflooded and located where disease pressure was high to favor the incidence and severity of the disease.

Typically, fungicides were applied to the small plots using pressurized sprayers at the 2-inch boot stage and at 50 percent heading. Benlate (withdrawn from the market in 1997), Quadris and Gem were applied to plots, and an unsprayed control was included. Blast incidence was determined by counting the number of heads infected. Plots were combine-harvested and yields expressed in pounds per acre at 12 percent moisture. Milling samples were collected, and total and head rice percentages determined.

Historical data from 30 years of testing showed that from 1976 to 2001, control of blast by Benlate decreased from 60-70 percent to below 50 percent when light disease pressure was present and from 50-60 percent to 10-20 percent when heavy disease pressure was present (Figure 1). Decreases observed in Quadris and Gem over time indicated the blast fungus may be developing resistance to these fungicides (Figure 2).

At this time, fungicides that control blast appear to be performing well in commercial rice fields in Louisiana except for about three failures reported in the past four years. Before Benlate was removed from the market, blast control failures had been reported. The current practice of applying fungicide only once per year and not using a fungicide every year has limited pressure on the fungal pathogen population to develop resistance in commercial fields. If blast becomes more of a problem and rice needs multiple fungicide applications every year, fungicide resistance in the blast pathogen population could easily become a problem. Loss of currently registered fungicides to resistance would be a major blow to rice production. It is essential that testing of fungicide efficacy in Louisiana rice fields be continued and that management practices that reduce the speed of pesticide-resistance in major pathogens be studied. ■

Controlling Narrow Brown Leaf Spot Disease

In 2006, the fungus *Cercospora janseana*, which causes narrow brown leaf spot, did significant damage to the rice crop in south Louisiana. This disease involves linear, red-dish-brown spots that usually appear near heading. These spots are slow to develop, taking up to 30 days from infection. Both young and old leaves are susceptible. Seed heads can become infected, causing premature ripening and unfilled grain.

The symptoms of narrow brown leaf spot can be confused with rotten neck and panicle blast lesions. *Cercospora* symptoms on panicle necks are usually darker brown and develop in the internodal area of the neck. Sheaths and glumes can be infected, causing significant discoloration and necrosis. On sheaths, the disease is referred to as "net blotch" because of the brown sheath cell walls and the

tan-to-yellow intracellular areas that form a net-like pattern. Grain infection appears as a diffuse brown discoloration. The disease can also be severe on the second crop.

Rice breeders have found resistance to narrow brown leaf spot, but new races of the pathogen develop rapidly. Low nitrogen appears to favor disease development. Fungicides used to reduce other diseases may reduce narrow brown leaf spot. Propiconazole (Tilt, PropiMax, Bumper, Stratego and Quilt) has the best activity of the labeled fungicides. A limited number of studies suggest the best time to apply fungicides is at boot growth stage (a 4-inch panicle in the boot).

The rate of propiconazole needed to control the disease is approximately equivalent to 6 ounces of Tilt, PropiMax, Bumper, 19 ounces of Stratego or 21 ounces of Quilt.

This rate for Tilt, PropiMax and Bumper is very weak against sheath blight and the 21 ounces of Quilt only has 6 ounces of Quadris in it, which would also be weak against sheath blight. These fungicides will need added sheath blight fungicides to control sheath blight. The 19 ounces of Stratego has 6 ounces of propiconazole and a full rate of Gem and should work well against sheath blight.

There is no recommended scouting method for *Cercospora*, except to look at the lower leaves for the narrow brown leaf spot lesions. If the disease is present, there is no treatment threshold for spraying. Fungicides will have to be applied as a preventative. In 2006, it was unusually wet, and the pathogen had extensively over-wintered on rice in crawfish fields, giving it a head start.

■ Donald Groth

Partial Resistance to Bacterial Panicle Blight in Jupiter Rice

Milton C. Rush, Rangaraj Nandakumar, Xueyan Sha, Donald Groth and Steven D. Linscombe

Jupiter is a high-yielding, early-maturing, short-stature, medium-grain rice variety developed at the LSU AgCenter's Rice Research Station at Crowley and released for commercial production in 2004. Results from field evaluations conducted in Louisiana from 2002-2006 indicate that Jupiter has good field resistance to bacterial panicle blight, rotten neck blast and sheath blight. Jupiter also appears to be resistant to the physiological disorder straighthead.

Bacterial panicle blight of rice, caused by the pathogen *Burkholderia glumae*, has been a serious problem causing seed rot and grain rot on rice in Japan since 1955. It has recently been reported in other rice-producing countries around the world. Research at the Rice Station showed it was the cause of an epidemic of panicle blight and grain abortion on rice in the southern United States in 1995. In Louisiana, the disease causes abortion of florets on affected rice plants, resulting in greatly reduced grain filling and the potential for yield losses as high as 40 percent.

Most commercial rice varieties grown in Louisiana are susceptible to bacterial panicle blight. Years with temperatures exceeding 90 degrees F through 9 p.m. have the potential for epidemic development of the disease in

Photos by Milton C. Rush



Typical symptoms of bacterial panicle blight on a susceptible long-grain rice variety inoculated with *Burkholderia glumae*.



Jupiter rice inoculated with *Burkholderia glumae* showing a highly resistant reaction.

Milton C. Rush, Professor; Rangaraj Nandakumar, Postdoctoral Researcher, Department of Plant Pathology & Crop Physiology, LSU AgCenter, Baton Rouge, La.; Xueyan Sha, Assistant Professor; Donald Groth, Professor; and Steven D. Linscombe, Professor and Southwest Region Director, Rice Research Station, Crowley, La.



Non-inoculated panicles (left) and inoculated panicles (right) of Trenasse rice, susceptible to bacterial panicle blight, 7 days after inoculation.



Non-inoculated panicles (left) and inoculated panicles (right) of Jupiter rice, resistant to bacterial panicle blight, 7 days after inoculation.

Louisiana and the rice-growing areas in the southern United States. The pathogen is carried on the seed and is widely present in commercial rice seeds. No complete resistance has been identified for this disease anywhere in the world. Recent tests indicate that Jupiter exhibits improved resistance to the disease with yield losses much lower than those of

other commercial long-grain varieties and the medium-grain variety Bengal.

Bacterial panicle blight and blast caused devastating yield losses in Bengal in the late 1990s, which helped trigger a rapid reduction of acreage in medium-grain rice. Jupiter overtook Bengal in 2006 as the most planted medium-grain rice variety in Louisiana.

A research program was conducted to confirm this variety's resistance and assess its yield loss to bacterial panicle blight compared to losses among four susceptible varieties – Bengal, Francis, Trenasse and Cocodrie. Field experiments with yield plots inoculated with *B. glumae* were conducted at the Rice Station during 2005 and 2006. Jupiter exhibited significant partial resistance with average disease ratings of 3 on a 9-point scale (zero = no disease and 9 = grain mostly destroyed by the disease). See Table 1.

Susceptible varieties had ratings ranging from 7 to 9. Mean yield loss in Jupiter across three tests was 551 pounds per acre compared to mean losses from 1,424 pounds per acre to 2,345 pounds per acre among the susceptible varieties. The variety Trenasse had the maximum disease rating of 9 and yield loss of 7,308 pounds per acre (46 percent). A negative correlation between disease development and yield indicated the yield loss could be attributed to the disease with a high degree of probability. Because effective chemical controls are not yet available for this disease, the high level of partial resistance in Jupiter rice is immediately useful. Jupiter will serve as a source of resistance for use in developing new resistant varieties.

Experiments are being used at the Rice Station to identify pathogen-responsive genes and the molecular basis of partial resistance in Jupiter. Early results show the resistance is due to the expression of certain genes during plant-pathogen interactions. Identifying these genes and their products will explain the basis for the high level of partial resistance. This study will identify the molecular basis of resistance in Jupiter and assist in transferring this resistance to new varieties through conventional breeding or marker-assisted selection. ■

Table 1. Bacterial panicle blight and other disease ratings on Jupiter and other commercial rice varieties in tests conducted in 2005 and 2006 at the Rice Research Station.

Variety	2005 BPB rating (0-9)*	2006 BPB rating (0-9)*	2005 SB rating (0-9)*	2006 SB rating (0-9)*	2005 leaf blast rating (0-9)*	2006 RN blast rating (0-9)*
Jupiter	3.3	3.0	5.0	5.3	3.8	2.0
Bengal	8.7	7.3	5.5	5.3	5.8	5.3
Cocodrie	7.3	7.5	7.5	7.5	3.8	5.0
Trenasse	8.3	9.0	7.5	8.0	5.0	4.5

*Rating where 0 = no disease and 9 = maximum disease for bacterial panicle blight (BPB), sheath blight (SB), and leaf or rotten-neck blast.

New rice lines in the works

At the LSU AgCenter's Rice Research Station's annual field day, June 28, 2007, rice breeder Xueyan Sha discussed and displayed a demonstration plot of LA2028. This is a promising semi-dwarf medium grain experimental line that may be released as foundation seed in 2008. This line is characterized by excellent yield potential – comparable to Jupiter, the most recent Rice Station medium grain variety release – excellent grain quality and large grain size, which is preferred by most medium grain customers.

In addition, Sha spoke of LA2125, a promising semi-dwarf long grain with Jasmine characteristics. Jasmine has a unique cooking type with a distinctive aroma and a soft texture after cooking. There

is great interest in the development and release of a Jasmine type adapted to production in Louisiana. The United States imports a substantial amount of this type of rice from Thailand.

Ida Wenefrida, another researcher at the station, discussed her efforts to develop rice varieties with higher levels of protein, especially lines with higher levels of essential amino acids. She has developed several lines with significant improvements in protein level. She also evaluates these lines for yield, quality and agronomic characteristics. If successful, this research will certainly open up new markets for future rice produced by Louisiana growers.

■ **Steven D. Linscombe**

Researchers use GPS technology to fight nematodes

Louisiana cotton farmers are facing increasing threats from high populations of nematodes – microscopic, parasitic worms that feed on plant roots. Of the two types most common, reniform nematodes are relatively new to the Louisiana delta cotton fields.

“The current population densities of nematodes Louisiana farmers must deal with are basically isolated to and seriously limiting production on the silt loam and fine-sand soils in the Louisiana delta as well as in other parts of the state,” said Gene Burris, an entomologist at the LSU AgCenter’s Northeast Research Station at St. Joseph.

Burris attributes the growing problems to continuous cotton planting. Cotton is such a good host for these worms that they continue to increase in population as cotton is planted in the same fields over several years. In time, he said, reniform populations can grow to exceed 100,000 per pint of soil and root knot populations can be found in excess of 5,000-6,000 per pint.

The consequences of nematode damage include not only reduced harvest but also lost efficiency of applied fertilizer, particularly nitrogen, which has become particularly expensive the past few years. Within fields, variations in soil texture and elevation can result in varying populations of nematodes and varying response rates to applied nitrogen. To address field variability, producers can use new technology that incorporates geographic positioning systems – GPS – to vary the application rate of fertilizer, applying different amounts based on the yield potential of the soil.

Burris and a team of researchers have been conducting studies to determine the causes of variation in cotton yield, define the correct nitrogen rates based on these variations and optimize yields. Other team members include Dennis Burns and Ernie Clawson at the Northeast Research Station; Keith Morris, an engineer in the Department of Biological & Agricultural Engineering; Kevin McCarter in the Department of Experimental Statistics; and Charles Overstreet and Maurice Wolcott in the Department of Plant Pathology & Crop Physiology. The researchers have used soil maps and measuring devices in conjunction with GPS to map fields based on soil type by measuring electrical conductivity in the soil, which can be used as a surrogate for soil type. Different soil types respond differently to nitrogen applications, and soils with the lowest electrical conductivity have the potential for the highest nematode populations.

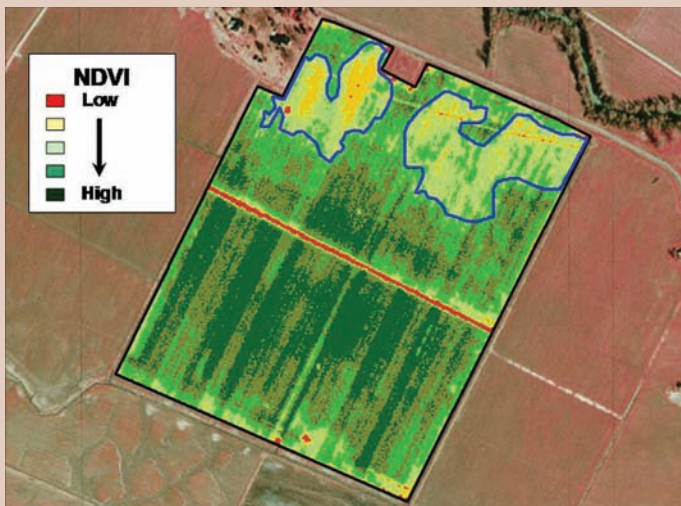
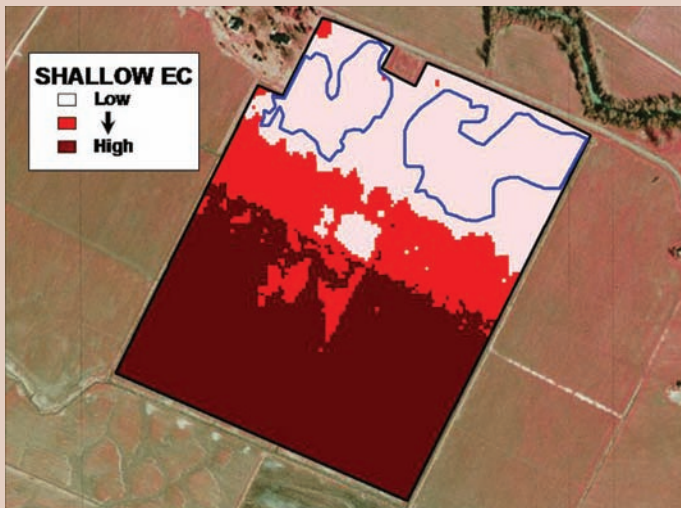
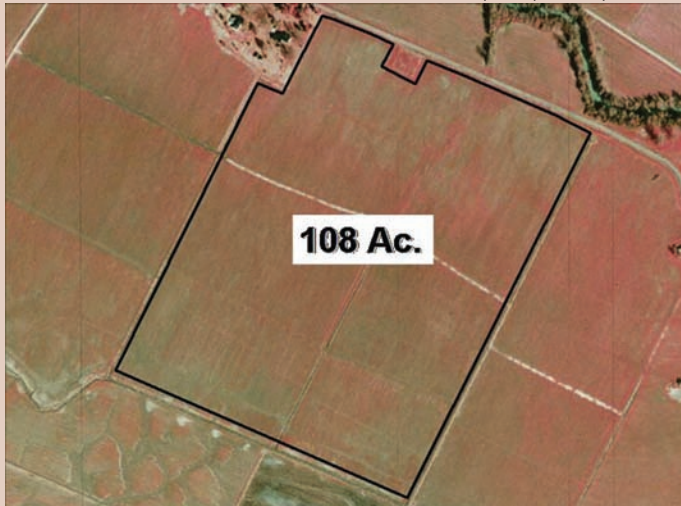
Photos by Rick Bogren



Gene Burris uses a GPS monitor on a four-wheeler to determine where to plant a flag to identify a portion of a field that’s being used in a research trial.



Researchers use this GPS device to pinpoint field locations to match maps developed using electrical conductivity, which can be used to differentiate soil types.



LSU AgCenter researchers applied nitrogen fertilizer to a field (top) that had been mapped using electrical conductivity to identify different soil types (middle). Then, with satellite imagery that uses Normalized Difference Vegetation Index (NDVI) (bottom), they measured the apparent differences in vegetation on the same field later in the growing season to determine if areas of low electrical conductivity produced lower amounts of vegetation and how much difference fertilizer rates made.

Burris and his team conducted a nitrogen fertility experiment in a 108-acre field on the Helena Plantation near Waterproof, La. in 2005. The field was divided into strips that included a number of different soil types, and the researchers applied different rates of nitrogen to the strips. Some strips were given constant rates of nitrogen throughout. For other strips, however, the researchers used GPS technology to vary the nitrogen rate based on soil electrical conductivity. A similar test was done in 2006 in a 90-acre field with various soil types on a farm near Newellton, La.

In both tests, the researchers observed that dividing the fields into zones based on electrical conductivity was useful in identifying regions of the fields that responded to nitrogen treatments, Burris said. In addition, the same data showed which areas of the fields were affected by nematodes.

"Severe nematode damage and lack of nitrogen response were found to be associated with the low electrical conductivity portions of the Helena test field," Burris said. And data from the nitrogen tests at the Newellton farm in 2006 suggested that high population densities of multiple nematode species resulted in excessive nutrient consumption and water use.

"In the test field, reniform and root-knot nematodes were found to be above the economic threshold," Burris said of the Newellton farm.

Farmers have historically controlled nematodes through crop rotations and by using seed treatments and in-furrow and foliar applications of nematicides. These approaches haven't been as successful as producers would like as nematode populations increased, Burris said. In addition, the nematicides are usually applied uniformly across a field, resulting in over-application and increased cost.

An alternative to these practices is to use a soil fumigant. These products, however, require specialized equipment and are expensive to use. One way to cut down on the expense, however, is to use GPS technology to identify the areas where nematodes are most likely to be present and selectively apply the fumigant in those areas.

"We want farmers to learn how to use fumigants to optimize yield," Burris said. "They need to understand the seriousness of the yield losses nematodes can cause."

He explained that fumigants, because they're applied as liquids that form gasses, must be handled carefully. In addition, they must be applied at least three weeks before planting. Waiting time after fumigation is more critical when the weather and soils are cool and wet in early spring. This is more critical when the products are used on corn, which is planted earlier in the year than cotton.

One other advantage cotton has over corn is a later planting date. Because of this, the window for applying fumigants can include both late fall and early spring.

Burris and his research team are currently evaluating cotton yields with no nematode treatment, a seed treatment for nematodes and a soil fumigant. They're also comparing these treatments with a variety of nitrogen fertilizer application rates.

"There's a relationship between nematode activity and nitrogen," Burris said. "Nematodes destroy roots, limiting the uptake of nitrogen. Farmers apply more nitrogen to compensate for lost roots and end up applying too much fertilizer and costing themselves money." ■ **Rick Bogen**

SUGARCANE BEETLE

A Potential Threat to Louisiana Crops

Tara P. Smith, Abner M. Hammond, Craig A. Abel, Michael J. Stout, and B. Rogers Leonard

The first reported damage by the sugarcane beetle, *Euethola humilis*, to crops in the United States was in Louisiana sugarcane plantations during 1880. Since that time, this beetle has been documented as an occasional pest of field corn, rice and more recently sweet potato. Historical crop damage reports related to this pest have varied through the decades, and reports of damage to seedling corn plants have been more common in recent years. Sugarcane beetle damage to sweet potato was reported for the first time in 2001, and several Louisiana sweet potato growers have suffered significant losses from this insect in recent years.

The adult beetle appears to be the most common stage that causes crop injury as it feeds beneath the soil surface on root tissue. Damage to sugarcane, field corn and rice often results in death of the plants. Sugarcane beetles gouge holes in sweet potato roots, and damage is often confused with that of a more familiar pest, the white grub. Feeding damage from the beetles (Figure 1) compromises the aesthetic quality of the roots, rendering them unmarketable.

Sugarcane beetles have one complete generation each year. They overwinter as adults and become active in the spring as soil and air temperatures increase. These beetles can injure corn seedlings in early spring but will continue feeding on corn plants up to 4 feet tall. Sugarcane beetles emerge in the spring and early summer, mate and lay eggs in the soil. Larvae develop in June and July, and a new generation emerges from August through September. Recent research suggests that this newly emerged generation damages sweet potatoes prior to harvest.

Granular soil insecticides and some insecticide seed treatments have been shown to reduce sugarcane beetle infestations in corn; however, no insecticides are currently labeled to control this beetle in sweet potato. Researchers have limited information on the ecology and biology of the sugarcane beetle, probably as a result of its sporadic occurrence. The recent increase in reports of damage to Louisiana corn and sweet potatoes suggests that additional research is warranted.

A series of experiments were conducted in LSU AgCenter greenhouses in Baton Rouge in 2003 and 2005 to investigate sugarcane beetle feeding on known host plants. Seven different plant species – sweet potato, sugarcane, corn, Bt corn (corn with a gene from *Bacillus thuringiensis*, a bacterium toxic to some insects), strawberry and Bermuda grass – were evaluated as host plants. Plants of each species were maintained in the greenhouse and transferred to plastic tubs for a selective feeding choice test. The tubs were divided into seven sections with plexiglass partitions. Fresh potting soil was placed in each tub level with the tops of the plexiglass, and plants were assigned randomly to each section. Two plants each of sweet potato, sugarcane and strawberry were placed in a section. Two groups of six seedlings each (12 seedlings per section) of corn, Bt corn and rice were planted in a section. Corn and rice used in the

experiments were 6 to 12 inches tall. Bermuda grass was transplanted to totally cover a section. After transplanting the plants, the soil was leveled across all sections and the plants were watered. Five replications (one per tub) were conducted each year.

Sugarcane beetles were collected using black light traps and were starved 48 hours before each test. Six beetles were placed in each section of a tub; three grouped around each plant or clump of plants. After all beetles had burrowed into the soil, hardware cloth was secured across the top of the tub to prevent

Figure 1. Sugarcane beetle damage to sweet potato.



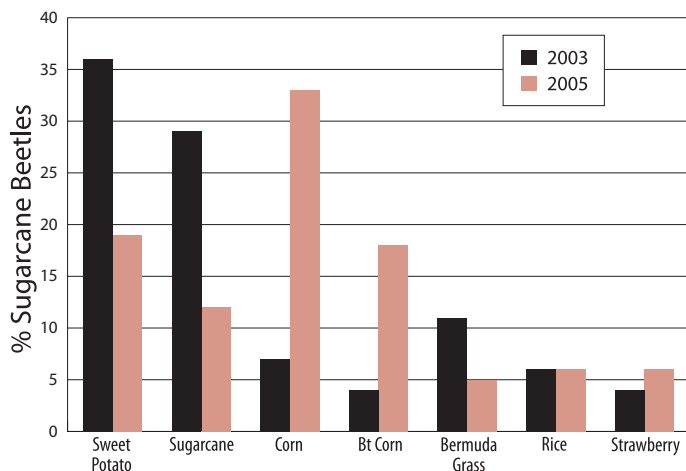
Photo by Tara P. Smith

their escape. The insects were allowed to feed and move freely for 96 hours. To make a choice, beetles had to leave one host plant and then search and find an alternative host plant by moving across plant sections and burrowing into another section; however, they could not move underground between sections because of the plexiglass dividers. At the end of 96 hours, the hardware cloth was removed, the soil from each section of each grow tub was sifted, and the number of beetles per section was recorded.

Sugarcane beetles fed on all plants evaluated; however, the majority of beetles were recovered from sections containing

Tara P. Smith, Assistant Professor, Sweet Potato Research Station, Chase, La.; Abner M. Hammond, Professor, Department of Entomology, LSU AgCenter, Baton Rouge, La.; Craig A. Abel, Research Leader, USDA-ARS Southern Insect Management Research Unit, Stoneville, Miss.; Michael J. Stout, Associate Professor, Department of Entomology, B. Rogers Leonard, Professor, Macon Ridge Research Station, Winnsboro, La.

Figure 2. Percent sugarcane beetles recovered from various plants tested in 2003, 2005.



sweet potato, corn or sugarcane plants. In 2003, 36 percent of the beetles were recovered from sweet potato sections and 29 percent were recovered from sugarcane sections (Figure 2). In 2005, more beetles were recovered from corn, 33 percent, than any other plant evaluated. However, 18 percent of the beetles were also recovered from Bt corn and 19 percent were recovered from sweet potatoes. These data are consistent with recent field observations of sugarcane beetle damage. Most damage reports from this insect in the past five years have been in sweet potatoes and corn.

LSU AgCenter scientists are monitoring the pest status of this beetle in both corn and sweet potatoes. New and innovative strategies will be required to manage this pest because of its biology and behavior. Research projects are currently focused on identifying a sampling technique to monitor adult populations and evaluate insecticides that might fit into the overall integrated pest management programs in those crops where it proves to be a pest. ■

Efforts To Improve Stink Bug Management Continue

Michael J. Stout

The rice stink bug is the most important late-season insect pest of rice in Louisiana. This insect feeds on rice grains as they develop. Feeding by this insect reduces both grain yield and grain quality. The rice stink bug is probably present in nearly all rice fields in Louisiana every year, and one or more applications of insecticides are often required to control this insect in fields. Guidelines for managing this insect are well-established, but efforts to improve the current management program continue.

Rice stink bugs have piercing/sucking mouthparts and damage rice by removing the liquid contents of grains as the grains mature. The consequences of rice stink bug feeding depend on the stage at which the grain is attacked. The entire contents of rice grains may be removed at anthesis (flowering stage) and during the early milk stages of grain development, resulting in empty or atrophied grains and in reduced yields. Feeding during later stages of grain development (late milk and dough stages) can also result

in reduced grain size. More importantly, however, attack during the late milk and dough stages often results in chalkiness and discoloration around the feeding site.

Microorganisms (bacteria or fungi) introduced into the grain during feeding are involved in causing this chalkiness and discoloration. Rice grains so affected are referred to as "pecky" and have a lower market value. Pecky rice often breaks during milling, further reducing the market value of the grain. Pecky rice shows reduced viability and does not germinate well when planted.

Before moving into rice fields, the rice stink bug can be found feeding on grassy weeds in or around rice fields. Keeping fields and field margins free of weeds may reduce the severity of stink bug infestations.

Scientists are investigating the factors that attract rice stink bugs to rice fields. Recent research in Texas suggests that rice at the milk and soft dough stages of development is more attractive to rice stink bugs than rice at anthesis. Current research in Louisiana is focused on identifying volatile compounds involved in attracting bugs to heading rice. This research may lead to improved methods for monitoring this insect.

These insects are called "stink bugs" because they emit an odor when disturbed. We have characterized the chemical components of this odor, again

as part of an effort to develop ways of more effectively monitoring this insect in rice fields.

Management guidelines call for monitoring this insect using a standard insect sweep net. Sweep sampling should begin at or before 50 percent heading. Applications of insecticides are recommended when stink bug densities exceed three bugs per 10 sweeps during the first two weeks of heading or 10 bugs per 10 sweeps during later stages of grain development. The action threshold increases during later stages of grain development because rice in the dough stage of development is more tolerant of stink bug feeding.

A number of insecticides are labeled for use against the rice stink bug: methyl parathion, malathion, lambda-cyhalothrin (Karate), gamma-cyhalothrin (Prolex) and zeta-cypermethrin (Mustang Max). The major problem with these insecticides is that they have short residual activities, although the pyrethroid insecticides (Prolex, Mustang Max and Karate) probably have longer residual activities than the other two insecticides. Malathion has shown lower efficacy than the other insecticides in small-plot studies conducted at the LSU AgCenter's Rice Research Station in Crowley. Alternative insecticides are currently being evaluated. ■

Michael J. Stout, Associate Professor, Department of Entomology, LSU AgCenter, Baton Rouge, La.

Yellow Nutsedge Control IN LANDSCAPE FLOWER BEDS

Yan Chen, Ron Strahan and Regina P. Bracy

Yellow nutsedge is one of the most troublesome and widespread perennial weeds in landscapes and gardens across the coastal plains. This fast-growing weed can be found in nearly all soil types but thrives in irrigated landscape plantings. Its upright growth habit and pale green color make it a prominent distraction in the aesthetics of high quality landscapes. Although grass-like and often referred to as nutgrass, nutsedges are not grasses but true sedges. Sedges can be identified by their triangular stems, whereas grass stems are flat or oval. Distinguishing between grasses and sedges is important to landscape managers because selective grass-killing herbicides such as fluazifop and sethoxydim will not work on sedges.

It is also important to differentiate within sedge species because the species differ in their herbicide susceptibility. The two most common sedge species found in landscape beds are yellow nutsedge and purple nutsedge. As their names imply, flower color is an easy way to identify the two species. Yellow nutsedge flowers are yellowish while those of purple nutsedge are burgundy to purple. Both species produce rhizomes and tubers, but purple nutsedge produces tubers connected by rhizomes or “chains.” Yellow nutsedge produces tubers at the end of rhizomes. When flowers are not available, leaf tip is the easiest way to differentiate the two species. Yellow nutsedge leaf tips have long and tapered points; purple nutsedge leaf tips are blunt or dagger-like in appearance.

Yellow nutsedge is difficult to manage because of its carbohydrate-storing tubers that produce numerous aerial shoots. One tuber is capable of producing as many as 1,900 shoots and up to 7,000 additional tubers each year. Tubers are viable for years and are distributed from 2 to 14 inches below the soil surface. These characteristics contribute to a long germination period that requires

Photo by Yan Chen



Grass-like yellow nutsedge growing in this garden bed makes the garden look unsightly.

Yan Chen, Assistant Professor, Hammond Research Station, Hammond, La.; Ron Strahan, Assistant Professor, School of Plant, Environmental & Soil Sciences, LSU AgCenter, Baton Rouge, La.; Regina P. Bracy, Professor, Hammond Research Station, Hammond, La.

Table 1. Nonselective and selective herbicides for nutsedge control in landscapes.

Brand Name	Active Ingredient	Selective or Non-selective	Pre or Post Emergence Nutsedge	Yellow or Purple Control	Available to Home Gardener
Casoron	dichlobenil	Yes	Pre	Both	Yes
Eptam	EPTC	Yes	Pre	Both	Yes
Pennant	metolachlor	Yes	Pre	Yellow	No
Basagran T/O	bentazon	Yes	Post	Yellow	Yes
Roundup	glyphosate	Non	Post	Both	Yes
Image	imazaquin	Yes	Post	Both	Yes
Sedgehammer	halosulfuron	Yes	Post	Both	Yes
Finale	glufosinate	Non	Post	Both	Yes

repeated treatment for effective control.

Although tilling and hand-pulling are common weed control methods, they are time-consuming and expensive and often contribute to the spread of the sedge in the field. Few nonselective herbicides are available that control yellow nutsedge (Table 1). Selective herbicides, including pre-emergence and post-emergence products, are available, but choosing the correct product depends on proper sedge identification. For example, the herbicide Pennant provides good pre-emergence yellow nutsedge control but no control of purple nutsedge.

Mulching is a common practice in landscape maintenance to protect trees and shrubs from soil temperature fluctuation and to provide some weed control by suppressing seed or tuber germination. Research suggests that nutsedge tubers will emerge through bark or rock mulches in landscape plantings; however, a thick layer of mulch combined with herbicide treatment may control nutsedge at emergence or at an early growth stage.

During the past two years, LSU AgCenter scientists have been testing herbicides at the Hammond Research Station for effective nutsedge control and their safe use around ornamental plants. A study conducted in 2006 investigated the interactions between landscape mulch types, herbicide rates and herbicide placement (above or under the mulch) and the control effects of the herbicides Sedgehammer and Eptam 5G on yellow nutsedge.

A total of 72 research plots were manually infested with yellow nutsedge tubers, and each was planted with Stella de Ore daylilies, Big Blue lirioppe, and Mystery gardenia. Plots were covered with one of the three organic mulches

often used in our area – 4 inches of pine straw, 4 inches of pine bark nuggets and 6 inches of cypress mulch – either before or after herbicide sprays. Herbicide treatments were Eptam 5G or Sedgehammer at the label rate or twice the label rate. Sedgehammer was applied as post-emergence treatment when yellow nutsedge was at 3-to-5-leaf stage. Eptam 5G was applied as pre-emergence treatment. The numbers of yellow nutsedge plants in treated plots were compared with untreated plots. Control efficacy was based



Leaf tips of yellow (left) and purple (right) nutsedges.



The flowers of yellow and purple nutsedge are an easy way to differentiate the two species.

on weed density and vigor and evaluated on a scale of zero percent (no control) to 100 percent (complete control) at 4, 8, 12 and 16 weeks after treatments. Overall landscape plot quality was assessed by visual ratings on a scale of 1 to 10, where 10 represented the best quality. Visual ratings lower than 8 represented unacceptable quality. Tolerance of ornamental plants to herbicide treatments was also evaluated.

Mulch effects on nutsedge control

Bare-soil plots with no mulch or herbicide averaged 250 yellow nutsedge plants per plot. Mulched plots had fewer nutsedge plants – pine bark nuggets, 75 percent less nutsedge; straw, 60 percent less; and cypress mulch, 45 percent less. These results suggest that mulching is an effective method for reducing yellow nutsedge emergence. None of these plots was aesthetically acceptable based on their overall ratings, indicating that at a high nutsedge infestation level herbicides were needed in combination with mulches to obtain acceptable controls.

When herbicides were applied over top of mulch, only Sedgehammer at the twice-label rate gave acceptable control of fewer than two nutsedge plants per 10 square feet. Eptam at the twice-label rate applied on top of mulch did not provide satisfactory control.



Research plots of the yellow nutsedge control study at the Hammond Research Station.

When herbicides were applied before pine bark nugget or pine straw mulch, Sedgehammer at both rates and Eptam 5G at the twice-label rate provided acceptable control of nutsedge. Results suggest that for heavy yellow nutsedge infestations when the herbicide is applied after mulch installation, satisfactory control of this weed is only provided by Eptam and Sedgehammer at the higher rate. These results indicate that the amount of herbicide (and associ-

ated cost) can be significantly reduced if landscapers can apply herbicides before they mulch the area.

Herbicide effects on plant growth

Ornamentals planted in herbicide-treated plots showed no acute injury to overhead application of Eptam or Sedgehammer. By the end of the 12-week growing period, Eptam had little adverse effect on ornamental plant growth. However, plants exhibited different degrees of growth reduction in response to Sedgehammer. Generally, plant growth reduction was less pronounced when the herbicide was applied above the mulch than when applied under mulch.

In some instances, landscape plant response was also influenced by mulch type. Daylilies in plots covered with pine straw and treated with Sedgehammer at high rate had very short flower stalks and were aesthetically unacceptable. Daylilies in plots covered with other types of mulches with the same herbicide treatment were shorter but still acceptable. Liriope fresh weight was reduced by Sedgehammer treatments, but plants were aesthetically acceptable in terms of plant size and leaf greenness. Gardenia plants treated with Sedgehammer had similar number of flowers compared with untreated control, but plant size was smaller. Because of these potential growth reduction effects, Sedgehammer should only be applied as a directed spray around newly planted woody ornamentals or on established landscape beds. ■

Photos by Yan Chen



Strengthening Rural Louisiana

James N. Barnes

Rural Louisiana continues to face significant challenges to improve local economies. For example, one out of every four people in rural Louisiana lives in poverty, and roughly three quarters of all rural parishes have been defined as persistent poverty areas.

Despite persistent poverty, we have limited stakeholder input from rural residents regarding rural development research and extension strategies to improve community rural development. If we are going to make progress, we must listen to rural residents, institutions and other economic development organizations.

The LSU AgCenter has taken steps to gather input from rural residents about the most pressing issues in rural areas and is responding to these research and extension needs to strengthen rural Louisiana.

Listen to the people

On September 6, 2006, the LSU AgCenter's Delta Rural Development Center (DRDC), a satellite center for the Louisiana Center for Rural Initiatives (LCRI), took an important step to gather rural stakeholder input to better develop and deliver rural development research and extension programming. With

Table 1. Northern Louisiana Rural Development Roundtable Results

Education/Workforce Development		Economic Development	
Strategies ● Re-brand education and workforce development as lifelong learning ● Redesign incentives for pay in K-12 ● Improve access to technical training; provide bus service from high schools to technical colleges ● Establish technical skill clubs in high school to promote post-secondary education ● Implement alternative learning approaches for high school mathematics, such as asking business leaders to teach for a day.		Strategies ● Review/study transportation projects that would result in economic prosperity for rural areas ● Support organizational development of value-added co-ops and product development for ethanol/biofuel possibilities ● Train members serving on school boards, police juries and other leaders in governance positions ● Promote regional planning and development of rural tourism ● Create a business incubator program in rural areas ● Reform zoning ordinances in rural areas to promote clean-up and growth	
Research Needs ● Successful high school redesign strategies for rural communities ● Analysis of present and future business trends ● Assess K-12 entrepreneurship coursework ● Conduct high school-technical college transportation feasibility study to reduce high school dropout rate ● Provide continuing education to improve production/profit for self-employed individuals in agriculture/agribusiness industry (timber production, beef cattle, poultry, truck crop farming), construction - carpenters, welders, air conditioning/refrigeration		Research Needs ● Case studies: zoning versus non-zoning communities and economic performance ● Value-added agriculture opportunities (biofuels, ethanol) ● Improve access to rural health care and rural health care delivery systems ● Labor market migration ● Factors affecting new business start-ups (regulation, tax incentives) ● Assess the skill needs of large employers ● Alternative strategies to promote entrepreneur development for adults and youth ● How to improve access to Internet in rural areas	
Extension Needs ● Volunteer development programs ● More computer based learning opportunities for students and parents ● Technical assistance to rural business owners ● Assistance with estimating demand for products in rural areas (trends, analysis) ● Consider using Small Business Incubator approach for rural entrepreneurship ● Grant writing ● Community strategic planning ● Provide access to community information from USDA and Census		Extension Needs ● Assistance to communities with community planning ● Governance/leadership training program should target local problem solving and use of best practices in governance ● Assist rural tourism groups partnerships access to geographical and political boundaries ● Other than 4-H, have after-school technical skills program (carpentry, mechanics and technology) ● Character building programs ● Assist with value-added agriculture development and conservation workshops	

funding support from the Kellogg Foundation and the Southern Rural Development Center, DRDC and LCRI faculty held roundtable discussions in Calhoun and Winnsboro.

Approximately 50 participants came from groups such as police jury and school board associations, economic development organizations, mayors and other elected officials, residents, agricultural producers, rural business owners and chamber of commerce executives. Using a focus group discussion approach provided by the Southern Rural Development Center, participants were asked to identify rural development needs and list some initiatives that would strengthen rural Louisiana.

Suggested Rural Development Priorities

Participants identified and prioritized three core areas of rural development research and extension needs. (Table 1)

The highest priority was to address issues related to improving education and workforce development. The general consensus was rural communities struggle to assess workforce skills and do not understand the role of economic incentives needed to improve business recruitment. In addition, participants cited the need for more emphasis on providing existing rural business owners with technical assistance in order to spur

business growth, such as how to gain access to high-speed Internet to sell their products on-line.

The second priority was for more research and extension programming aimed at spurring economic development of both agricultural- and non-agricultural-based businesses. Participants cited lack of an entrepreneurial environment, limited access to high-speed Internet, drug usage and insufficient information about bio-fuels and other value-added agricultural opportunities as significant barriers to development.

The third priority was research and extension programming in natural resource and environmental management to strengthen rural Louisiana by identifying new solid-waste management strategies, including water distribution infrastructure and water quality, adopting more conservation land uses to preserve natural resources and reducing air and water pollution.

Moving Forward

LCRI and DRDC faculty and community rural development agents are developing new and adjusting existing extension programming to focus more on rural entrepreneurship, value-added agricultural enterprise development and other programs aimed at providing community leaders with tools to manage resources. Suggested initiatives include:

- Start a business incubator program that provides access to high-speed Internet to give rural business owners the necessary technological infrastructure to create new companies and expand into on-line markets. Access to dial-up Internet is insufficient to spur the creation and sustainability of new rural businesses and job growth.
- Teach adult entrepreneurs how to start and manage e-businesses, such as establishing Storefront businesses on eBay, as well as develop Web sites. Educational programs can be provided using distance education technology and regional partnerships with economic development institutions and organizations.
- Teach youth in rural areas business management skills (marketing, sales, finance, economics, etc.) necessary to start and grow businesses, including how to buy and sell items on the Internet. Rural youth could work with local retailers to expand their businesses into global markets. This approach has been piloted in West Carroll Parish.
- Develop alternative supply-chain business model arrangements for energy crops to learn about bio-fuel opportunities in Northeast Louisiana.
- Provide strategic planning educational presentations for producers and others who are interested in exploring bio-fuel businesses, such as successful case studies in Louisiana. Non-traditional markets for crops may yield opportunities for long-term sustainable economic stability and growth for agriculture in Louisiana.
- Organize and host a regional workshop to assess renewable energy options for producers and others in the business community. This will include bio-fuels and non-traditional

Natural Resources and Environmental Management

Strategies

- Collaborative between government and LSU AgCenter to explore alternative land uses for farmers
- Increase awareness of solid waste management issues
- Access funding to improve rural water infrastructure and solid waste systems
- Promote environmental clean-up of land
- LSU AgCenter teach new land use techniques/crops/new uses for food/fuel

Research Needs

- Alternative methods of solid waste management
- New water delivery systems
- Support rural tourism
- Alternative land use practices for farmers to boost income and sustain rural communities

Extension Needs

- Entrepreneurial training for rural tourism ventures
- Demand analysis for small businesses (market research)
- Public service announcements indicating LSU AgCenter services available in your region/state
- Public education on diversity and value of different areas of natural resources in rural areas
- State unification of programs or knowledge of what is done elsewhere in natural resource development
- Education for youth (lifelong): urban gardens, computer uses, recycling, other land uses, water conservation

James N. Barnes, Director and Assistant Professor, Delta Rural Development Center (DRDC), and program leader for community rural development, Oak Grove, La., and Department of Agricultural Economics and Agribusiness, LSU AgCenter, Baton Rouge, La.

sources of energy. Conducted by LSU AgCenter, this conference could include partners from neighboring states.

Innovation and Collaboration

Gathering information from public and private organizations in rural Louisiana as well as understanding perspectives from residents provides new information which is presently being used to develop new ways to organize resources within the LSU AgCenter.

This organizational innovation provides at least two fundamental effects aimed at strengthening community development in rural Louisiana. First, stakeholder input provides a set of suggested priorities for research and extension programming. This means the LCRI and the DRDC must become increasingly more relevant, timely and focused on the most important community development needs in rural Louisiana.

The LCRI and the DRDC will be able to leverage resources more effectively when collaborating with other Louisiana institutions, such as the Southern University Agricultural Center, as well as other institutions of higher education in the South. Similar roundtable discussions conducted throughout the South during 2006 identified top priorities for rural development research and extension programming in other states. These results can be used in a systemic way to identify other states with similar priorities and cooperatively develop projects which address common community rural development problems.

Much of the work ahead will require significant institutional collaborations with organizations such as police jury and school board associations, economic development organizations and private foundations. Resources are simply too limited to recreate the proverbial wheels of rural economic development. Bringing innovation in various forms to rural areas and working with collaborative partners is a better approach. And that's exactly what it's going to take to strengthen rural Louisiana. ■

About the LSU AgCenter's Rural Development Efforts

The Louisiana Center for Rural Initiatives was created to understand more about the socioeconomic conditions and trends in rural areas of Louisiana as well as gather rural stakeholder input. LCRI is an interdisciplinary team of social scientists and policy professionals engaged in research and extension programs that contribute to sustainable community and rural development in Louisiana. LCRI, as created by Act 796 of the Louisiana Legislature, is a consortium between the LSU AgCenter and the Southern University Agricultural Center. LCRI is housed in the Department of Agricultural Economics & Agribusiness at LSU and operates the Delta Rural Development Center in Oak Grove, La. ■

Physician

and

J. Matthew Fannin and James N. Barnes

While Louisiana faces a short-term healthcare crisis brought about by hurricanes Katrina and Rita, an often-understated long-term healthcare crisis exists in rural Louisiana. According to the Louisiana Department of Health and Hospitals, 49 of Louisiana's 64 parishes are classified as geographic shortage areas for primary care physicians. These parishes, disproportionately in rural areas, typically have only one family practice, general practice, internal medicine, pediatric or OB-GYN physician for each 3,000 or more residents (Figure 1).

One way to improve healthcare access for rural residents is to increase the number of primary care physicians in local communities. A major challenge, however, is recruiting physicians to rural areas, which typically offer lower pay, fewer local amenities, few consulting local physicians and less-equipped hospitals and clinics.

LSU AgCenter researchers have been investigating how to strengthen recruitment of physicians in rural Louisiana. Their first step has been to look at the economic incentives hospitals use to recruit physicians. One way of examining these incentives is to observe the various types of contractual arrangements used between hospitals and physicians.

According to a 2004 survey by the American Hospital Association, contractual arrangements between hospitals and physicians in Louisiana closely mirror the Southern average. Table 1 shows 58 percent of these arrangements have no formal structure; only that the physician is given the right to admit patients and provide follow-up care management in the hospital. About 14 percent of Louisiana hospitals only have physicians who are fully employed by that hospital. Another 27 percent of hospitals have a mix of arrangements, which may include combination employment, admittance rights only and mixed arrangements where physicians may contract portions of their time with a hospital for managed care or for operating hospital-owned clinics.

Each arrangement type has a different set of incentives that attract physicians, including length of contract, revenue-sharing options, liability insurance coverage and salary, among others.

Table 1. Hospital-Physician Contractual Arrangements by Region.

Region	No Structured Arrangement	Mixed Arrangements	Employment Arrangements
Louisiana	58.02%	27.48%	14.50%
Southern Average	54.06%	31.61%	14.33%
U.S. Average	45.22%	34.28%	20.50%

Recruitment

Health Care Access in Rural Louisiana

- Employment arrangements guarantee the physician a specific salary while the hospital typically gains exclusive admittance of the physician's patients and at the same time can more closely monitor physician performance.

- Admittance-rights arrangements typically work well for physicians who over the long term enjoy the financial rewards that accrue from building a practice from the ground up.

- Mixed arrangements are typically preferred by physicians who want to maintain some autonomy in their medical practice but minimize some of the up-front financial risk. This risk is often minimized by a hospital providing clinical space and equipment for the physician to use in starting his or her practice as well as assisting the physician in being added to local and regional health care insurance plans in order to secure an initial group of patients.

No one arrangement type is best for a specific hospital. In some cases, the community must be flexible in negotiating these

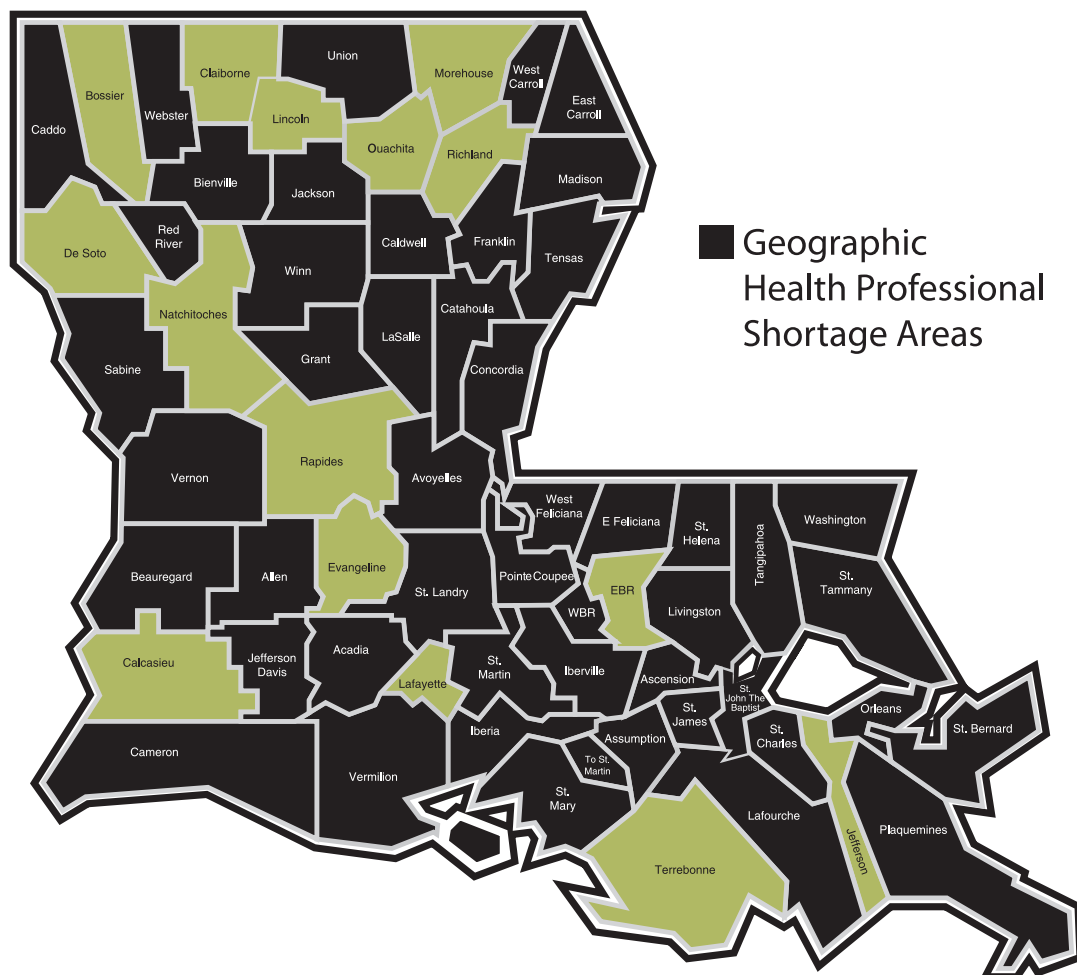
contracts based on the risk tolerance of the prospective physician. In other cases, the hospital must evaluate its own risks in developing contractual terms with a physician. A rural hospital with a high debt load from investments in buildings and equipment can't afford to have a downturn in the number of hospital beds that are filled over the long term. Without the proper contractual arrangements with physicians, rural hospitals may lose patients to local physicians who admit a larger proportion of patients to regional hospitals in urban areas.

Rural physician recruitment is a national healthcare problem and has been for many years. While several factors are well understood that affect successful recruitment of physicians to rural areas, we know little about the economic incentives hospitals use to recruit physicians in the United States and certainly in Louisiana. In the past decade, a number of federal programs have provided rural hospitals financial support, which often

has been used to strengthen recruitment incentives. These include the Critical Access Hospital and the Federally Qualified Health Center programs.

Future research by Ag-Center faculty will focus on how changing federal policies such as these will affect the contractual arrangements used by hospitals when recruiting physicians to rural areas and the type of contractual arrangements hospitals use in persistent poverty areas of rural Louisiana. Perhaps hospitals in these areas could use an alternative contractual arrangement to improve recruitment. Such a step bodes well for providing access to health care services in rural areas of Louisiana. ■

Figure 1. Geographic Health Professional Shortage Areas



J. Matthew Fannin, Assistant Professor, Department of Agricultural Economics & Agribusiness, LSU AgCenter, Baton Rouge, La.; James N. Barnes, Director and Assistant Professor, Delta Rural Development Center, Oak Grove, La., and Department of Agricultural Economics & Agribusiness, LSU AgCenter, Baton Rouge, La.

2008

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