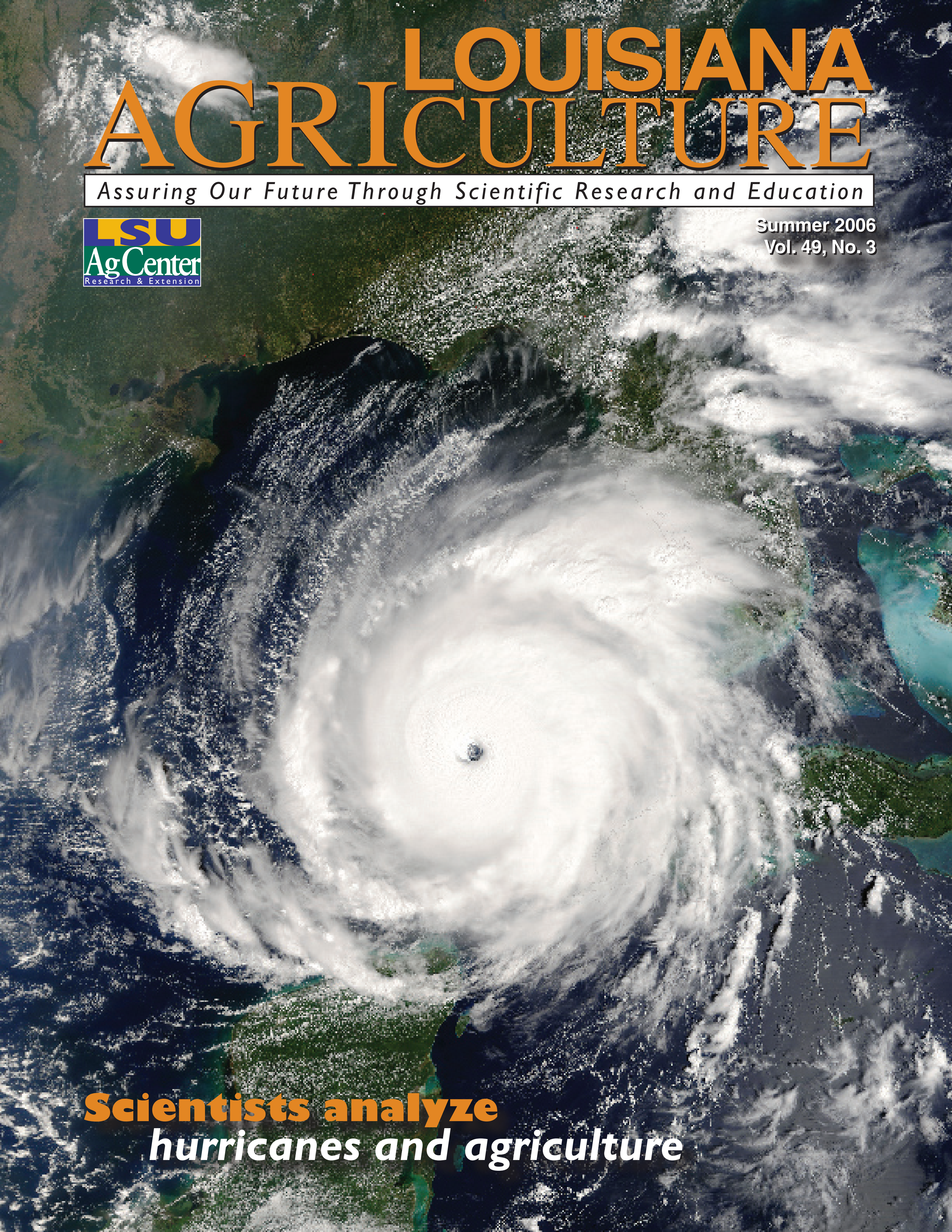
LOUISIANA AGRICULTURE

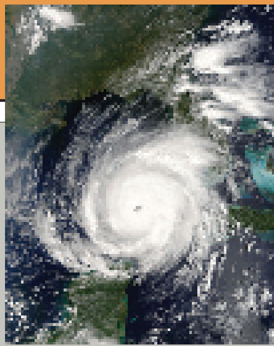
Assuring Our Future Through Scientific Research and Education

Summer 2006
Vol. 49, No. 3

LSU AgCenter Research & Extension



Scientists analyze *hurricanes and agriculture*



ON THE COVER: Rita was building into an extremely dangerous Category 5 hurricane when a NASA satellite captured this image on Sept. 21, 2005. The storm hit Southwest Louisiana, in the upper left-hand corner, on Sept. 24, causing more damage to agriculture in the state than Hurricane Katrina. NASA images are available at http://visibleearth.nasa.gov. Read the article on hurricanes and Louisiana agriculture on page 6.

Leaders Become Informed Voice for Louisiana Agriculture

What is leadership? For many people, it is a difficult concept to understand because it is intangible. Even if most people would find it difficult to define leadership, they are likely to know a good leader when they see one.

Part of the confusion with leadership, whether or not you are involved with agriculture, is its more than 100 definitions. James MacGregor Burns, a noted leadership author and scholar, penned one of the most cited leadership definitions. Burns contended leaders induce followers to act on certain goals that represent the values and motivations of both the leader and the followers.

Burns believed in "transforming" leadership, which occurs when people work together to raise the level of the leader and the followers. The transforming leader should not be confused with a charismatic leader. Often the charismatic leader is the sole individual in charge of a cause. After that leader has moved on, the cause often collapses. Most effective leaders use charisma to some degree, but true leadership is more than charisma. It must be principled and must rise above self-interest and *quid pro quo*, "You scratch my back, and I'll scratch yours."

Agriculture has long needed more leaders. In the 1960s, some agriculture faculty at Michigan State University recognized this and came up with the concept of teaching leadership to people in agriculture. With the help of the W.K. Kellogg Foundation, this was the beginning of many agricultural leadership programs around the country.

The LSU AgCenter created its Agricultural Leadership Development Program in 1988 to address the needs of young Louisiana farmers, ranchers, foresters, nurserymen and others in agriculturally related enterprises. The two-year program involves a series of classroom and trip seminars that introduce program participants to a wide range of individuals, ideas and information that enhance their leadership skills. Since its inception, the Agricultural Leadership Development Program has adhered to Burns' notion of transformational leadership.

The key to the success of the AgCenter's Ag Leadership Program is what it means to the participants and Louisiana agriculture. It has produced more than 275 graduates, many of whom hold or have held important leadership roles and remain active in the program's alumni association called Ag Leaders of Louisiana (ALL).

It takes more than one person to create change. Transforming leaders can achieve significant change not because they have a network of followers, but because they are a network of leaders armed with principles. One of the unintended consequences of this program is the contacts the graduates develop and use in all sectors of agriculture. Alumni network with their fellow graduates to solve issues related to agriculture. This level of engagement is used not only throughout the program but for the remainder of their professional lives.

Transforming leadership has been and should continue to be an underlying philosophy of the Agricultural Leadership Program. The AgCenter faculty involved in the program have seen a transformation in the participants. These leaders have increased their commitment to their professions, the conscientious stewardship of their land, and their unselfish willingness to become involved in community, state and national issues.

These leaders come to understand the critical need for them to be an informed voice for agriculture in Louisiana and their responsibility to support and enhance an industry that competes worldwide but serves the economic, social and cultural needs of Louisiana's local communities. ■ **Bobby Soileau**

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Published quarterly by the Louisiana Agricultural Experiment Station, Louisiana State University Agricultural Center, Baton Rouge, Louisiana.

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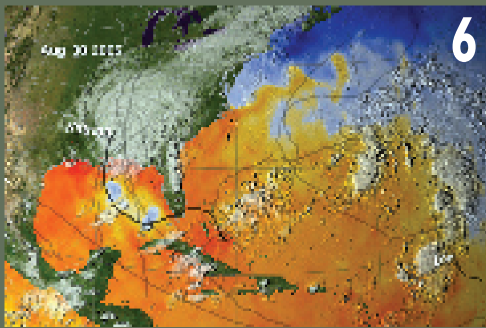

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Volume 49, Number 3, Summer 2006

LOUISIANA AGRICULTURE

Economically Viable Through Effective Research

Michael Salassi

Despite its relatively small size compared to many other states, Louisiana produces a wide and diverse array of agricultural products. Agriculture is big business in Louisiana and is a major contributor to the state and many local economies. Sales of agricultural products provide income to thousands of farm families across the state. However, agricultural producers face considerable price and income risk from year to year, as commodity supply and demand factors interact to change market prices in the face of constantly increasing production costs. The current and future economic viability of production agriculture in Louisiana is dependent, to a large measure, on effective research provided by the LSU AgCenter.

According to the 2002 Census of Agriculture, Louisiana had 27,413 farms, ranging in size from fewer than 10 acres to more than 2,000 acres. Total land in farming operations was 7,830,664 acres, representing 28 percent of the total land area in the state. The market value of Louisiana agricultural products sold in 2002 was an estimated $1.8 billion and included sales of row crops and nursery and greenhouse crops, as well as livestock and poultry products. The bulk of these market sales provides income to farm families throughout the state. Approximately 91 percent of the farming operations in Louisiana are individual or family farms.

Agricultural production is a capital-intensive industry. Investment in machinery and equipment required to produce agricultural commodities is generally higher for row crop farms than for livestock farms. Tractors, harvesters and other equipment used in the production of crops such as cotton, rice, soybeans and sugarcane represent a substantial capital investment for an individual farming operation. The 2002 Census of Agriculture indicates that the total value of machinery and equipment on farms in Louisiana was approximately $1.7 billion.

For a farming operation to be economically viable, income from the sale of agricultural products must cover total production costs. Agricultural producers face two types of production costs: fixed costs and variable costs. Fixed costs generally do not vary with changes in farm size or production level and include such expenses as depreciation and interest charges on equipment, taxes and insurance. Variable costs represent production expenses that do change with the level of acreage or production and include such expenses as seed, fertilizer, herbicides, insecticides, labor, fuel and repairs.

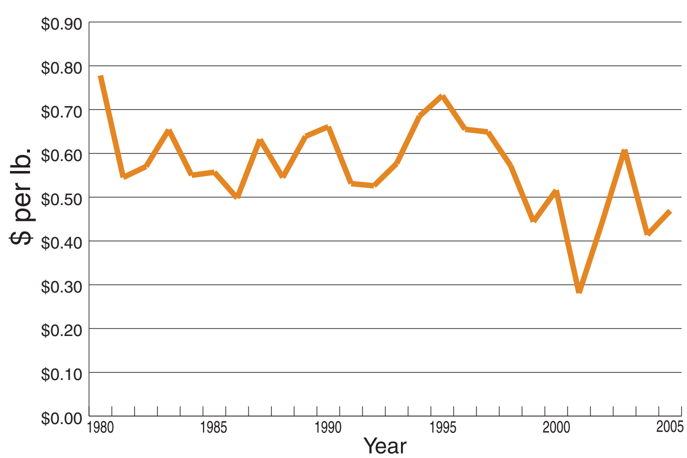
Like many other U.S. products, the cost of producing agricultural commodities has increased over time. This increase in production cost is the result of higher prices paid for inputs such as seed, fertilizer, fuel and labor as well as higher purchase prices of farm machinery and equipment. As an example in 1980, the estimated total cost of producing cotton in Louisiana was approximately $310 per acre, and the total cost of producing rice was approximately $390 per acre. In 2006, the projected total cost of producing an acre of cotton or rice in the state is estimated to be more than $500.

Approximately 91 percent of the farming operations in Louisiana are individual or family farms.

However, unlike many other U.S. products, the selling price of a commodity cannot be set by the producers to ensure income to cover total production costs. Agricultural commodity markets in the United States are what economists often refer to as "purely competitive." Agricultural producers are "price takers," meaning that the market price is not set by the seller but rather by the interaction of demand and supply factors in the market. As a result, given the large capital investment and high production costs required, agricultural producers face enormous price and income risks each year. They are never guaranteed that the market will provide them with a price high enough to cover total production costs.

A look at Louisiana cotton and rice market prices over the past 25 years provides a good illustration of the price risk faced by agricultural producers. From 1980 to 2005, the market price for cotton in Louisiana averaged $0.567 per pound, with a high of $0.778 in 1980 and a low of $0.281 in 2001 (Figure 1). Over the same period, the market price for rice in Louisiana averaged $7.57 per hundredweight and ranged from a high of

Figure 1. Louisiana Cotton Prices, 1980 - 2005



Michael Salassi, Professor, Department of Agricultural Economics & Agribusiness, LSU AgCenter, Baton Rouge, La.

$12.00 in 1980 to a low of $4.03 in 1986 (Figure 2). The challenge that agricultural producers face each and every year is how to remain economically viable over the long term in the face of rising production costs and highly variable market prices.

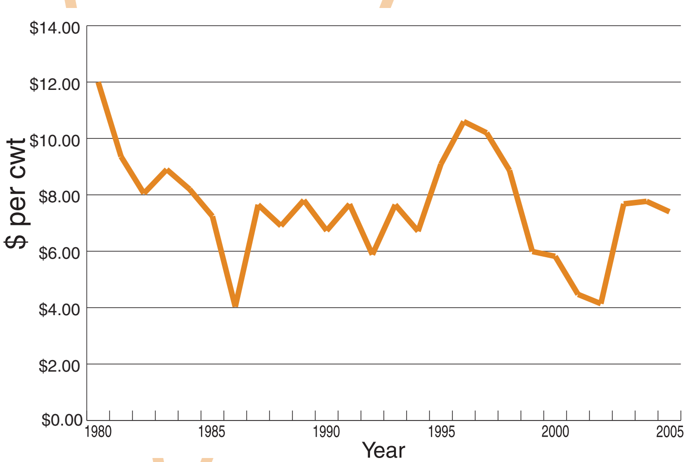
Since agricultural producers cannot influence the price they receive from the sale of commodities, their only means of maximizing returns from production is to make farm management decisions that influence commodity yields and production costs. Much of the agricultural production research conducted by the LSU AgCenter is directed toward the goal of providing agricultural producers in the state with as many production options and as much information as possible to assist them in making production decisions that will ensure that their farming operations will continue to be economically viable.

Photo by Bruce Schultz

Michael Salassi has developed a spreadsheet program that can be used by farmers to help determine how many acres they should consider planting. The program includes such factors as diesel prices, land rent and fertilizer costs.

One of the most significant ways to reduce crop production costs per unit is to plant a higher yielding crop variety. For this reason, the LSU AgCenter devotes considerable resources to crop variety development and evaluation for the major crops produced in the state. The rice varieties Cypress and Cocodrie and the sugarcane variety LCP 85-384 are examples of LSU AgCenter-developed crop varieties that have been widely adopted by growers in the state and have proven to provide substantial benefits to Louisiana agriculture through increased production and higher net returns to the grower.

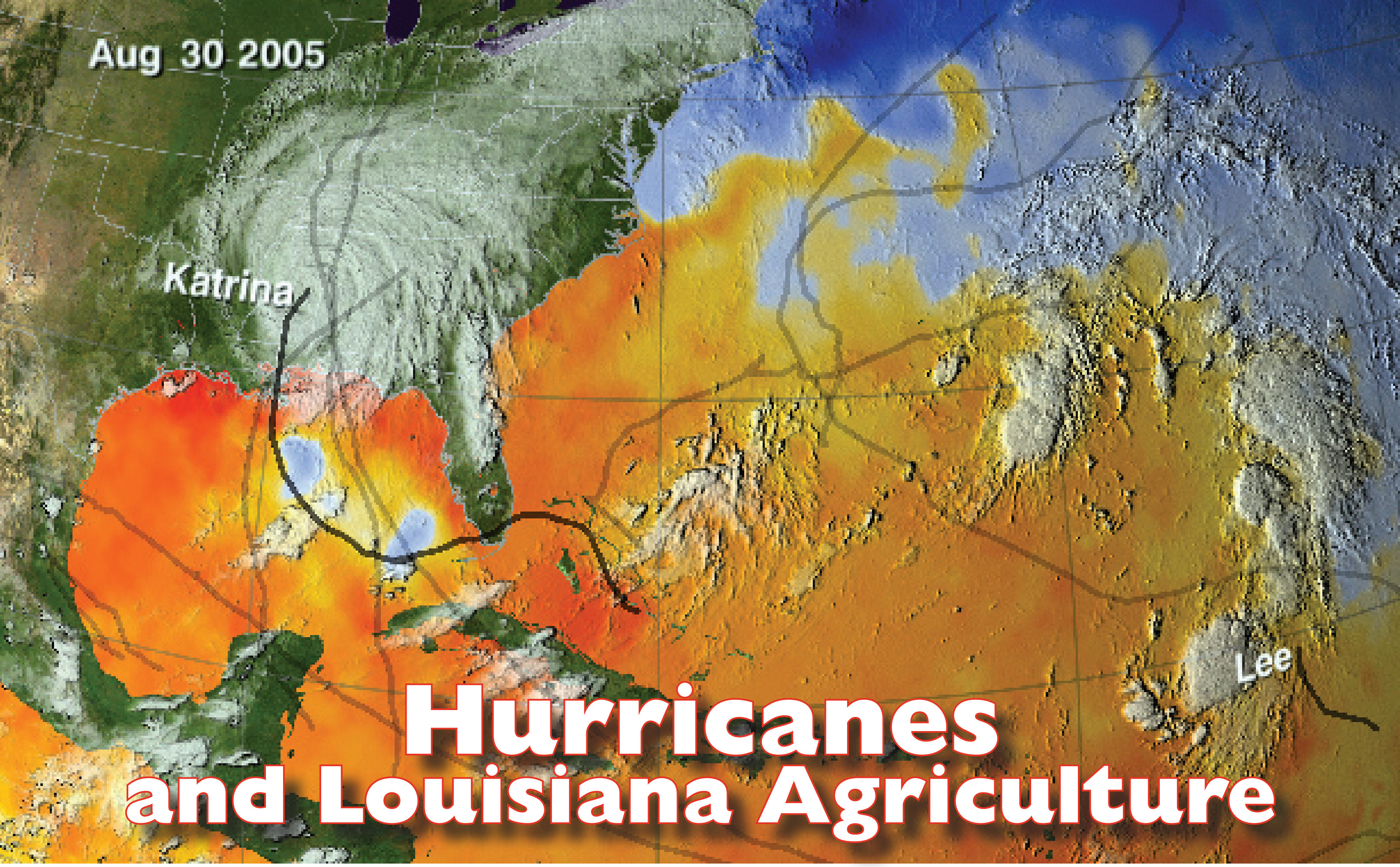
Figure 2. Louisiana Rice Prices, 1980 - 2005



Other ways to improve crop production and reduce production costs per unit include reducing or eliminating the detrimental effects of agricultural pests on crop yields. Crop yields per acre can be reduced through competition for plant nutrients from a variety of weeds as well as by infestation and plant damage by a variety of insects and diseases. Research conducted by the LSU AgCenter seeks to identify optimal control methods for each relevant crop pest by evaluating the value of expected crop loss prevention with the cost of control.

Efficient use of production inputs also reduces crop production costs per unit. The recent dramatic increase in petroleum prices has caused agricultural fertilizer and fuel prices to increase substantially. The optimal use of these inputs – specifically the timing and amount of fertilizer applied, the use of irrigation and the use of minimum tillage – will help ensure that the most cost-effective benefit is received from the use of these inputs. The LSU AgCenter conducts ongoing research in the areas of fertilization, conservation tillage and irrigation to evaluate and identify the optimal use of inputs to maximize returns from crop production.

Farming today is an extremely demanding and challenging business. Uncertainty about input prices, equipment costs, weather, yields, market prices and government programs causes agricultural producers to make farm management and production decisions without perfect information. Research to develop new crop varieties, improved weed and insect control measures, optimal timing and application of inputs are examples of research that helps producers substantially reduce production and income risks. This research is an ongoing effort by the LSU AgCenter to strengthen the productivity and profitability of Louisiana farms. ■



Hurricanes and Louisiana Agriculture

This visualization shows sea surface temperatures. Overlaid are infrared cloud data, storm track data and storm name labels. Ocean temperatures are the fuel that drives hurricanes. Hurricane Katrina hit the coast on Aug. 29, 2005.

Photo by NASA/Goddard Space Flight Center Scientific Visualization Studio

Jay Grymes and David Greenland

Katrina and Rita – names that will live forever – remain a part of the South Louisiana dialog and a pair of storms that will undoubtedly reshape the way Louisiana residents think about tropical weather. Virtually every aspect of community and business life across the Bayou State continues to display a direct effect from these catastrophes, and their signatures of destruction remain plainly evident in the agriculture and forestry sectors as well. Agricultural losses attributed to the 2005 tropical season are still being assessed, and LSU AgCenter estimates put the figure at well over $1.5 billion. And those losses have been compounded further by a year-long drought across much of the state.

Katrina and Rita highlight an active run of hurricane seasons for Louisiana, with 11 tropical cyclones impacting the state in just the last five years. Among these, a sometimes-forgotten Hurricane Cindy preceded Katrina and Rita in the 2005 season. The 2002 hurricane season saw a record four storms strike the Louisiana coast. And 2001's Allison proved to be among the greatest flood-makers in recorded history for some southern parishes. With this recent flurry of tropical activity, the question on the minds of many is: Are these kinds of extreme weather events becoming the new norm for Louisiana? If so, is there anything we can do to mitigate the effects?

We must remember that the climate is constantly changing. A number of hurricane seasons have come and gone without a single storm threatening our state. Yet years with multiple landfalls are not uncommon. Over the past century, Louisiana has suffered immeasurable losses from other memorable hurricanes like Audrey, Betsy, Camille and Andrew. But the flurry of tropical activity in recent years somehow seems different.

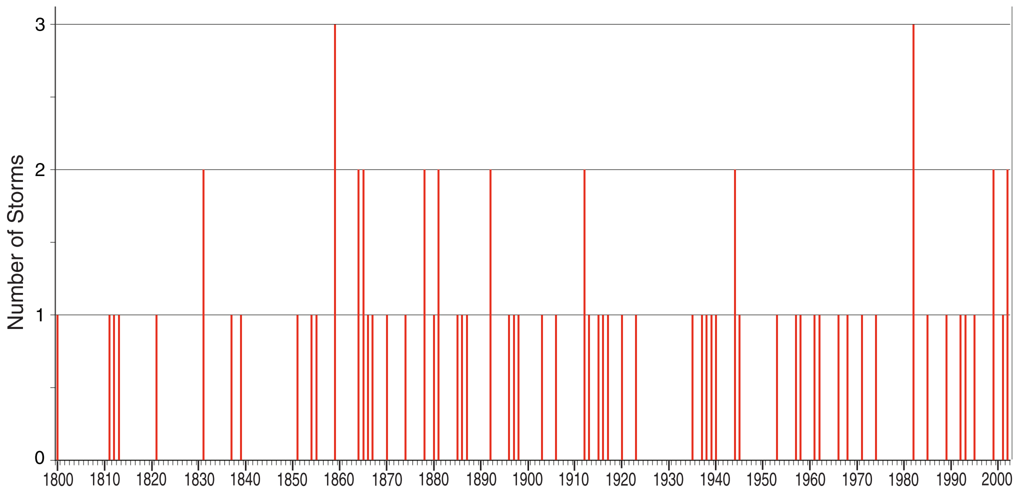
If we examine Louisiana landfalls from August to October over the past 200 years, for example, we can discount any obvious long-term trends (Figure 1). But the last five years have been extra busy for the Louisiana coastal zone (Figure 2).

Increased Hurricane Activity

It is clear that hurricane activity in the Atlantic Basin is way up in recent years. Ten of the past 11 years have seen storm counts rise above the 100-year average. Major hurricane (Category 3 or stronger) numbers appear to be on the rise. And the 2005 season was the first on record with four confirmed Category 5 storms: Emily, Katrina, Rita and Wilma (three were Gulf of Mexico storms). Indeed, the hyper-active 2005 Atlantic hur-

Jay Grymes, Climatologist, and David Greenland, Professor, Department of Biological & Agricultural Engineering, LSU AgCenter, Baton Rouge, La.

Figure 1. Hurricanes and tropical storms making landfall in Louisiana in August, September and October since 1800.



ricane season – with 28 tropical systems – required hurricane forecasters to use the Greek alphabet for storm names for the first time ever.

Without doubt, the loss of life associated with Katrina stands out as the most devastating in recent memory. But also noteworthy are the eye-opening economics associated with recent tropical weather. Preliminary data suggest that seven of the 10 most costly U.S. hurricanes occurred during the 2004 and 2005 seasons.

Scientists are searching for explanations for the apparent changing frequencies in the Atlantic tropical weather. But such investigations are complicated by improved observation and reporting practices over the past 150 years. These new methods include aircraft reconnaissance, which began in the late 1940s, and satellite technology.

For example, there are suggestions of a cycle in Atlantic hurricane activity – a periodic flip-flop between prolonged periods of increased activity to little activity and then back to higher tropical cyclone counts. The cycle, which takes about 50 to 70 years, is thought to correspond with changes in Atlantic Ocean temperatures. But the reliable time series of Atlantic storms only extends back 100 to 150 years, and statisticians warn that a longer period of data is needed to confidently declare the cyclic-activity hypothesis as valid.

Then, too, is the issue of this potential cyclic activity and what it means in terms of landfall frequencies. Recent work at LSU shows little in the way of a compelling association between U.S. landfalls and this proposed hurricane cycle. If a strong relationship does exist, investigations by state climatologist Barry Keim and colleagues indicate that the linkage is most likely along the Florida and Carolina coasts.

Louisiana Hurricane History

Although records of early Louisiana hurricanes are limited, some aspects of Louisiana hurricane history are worth mentioning. For example, the first notation of tropical weather affecting Louisiana dates back almost 500 years. In 1527, while exploring along the central Gulf Coast, Panifo de Narvaez of Spain reported that his fleet was caught in a violent storm off the mouth of the Mississippi, and ships were lost. Over the next centuries, reports of tropical weather can be found throughout diaries and letters and from the logs of those that established the first settlements in and around New Orleans.

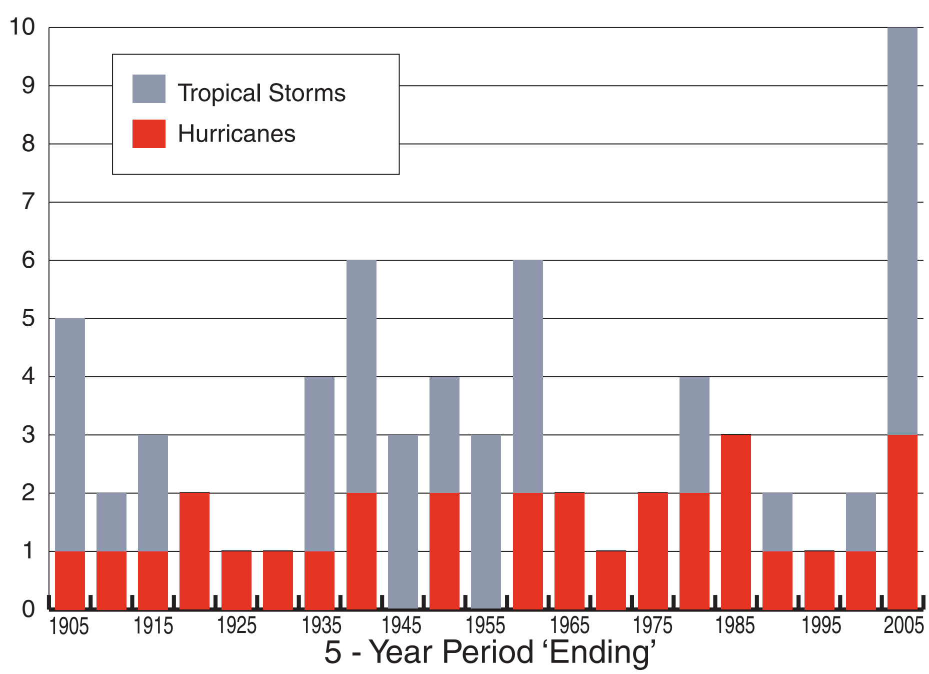
1860 was a noteworthy year for South Louisiana agriculture. A mid-August storm made landfall in southeastern Louisiana and ruined sugarcane, rice and corn crops. A month later, a mid-September storm made landfall at the mouth of the Mississippi, followed by an early October storm passing over New Orleans and Baton Rouge and adding to the losses. The 1860 triple-strike proved a devastating blow to the sugarcane industry that year.

Global Warming

The threat of annual tropical storms remains part of life for the Bayou State. And recently, an apparent increase in major storm frequency has been linked by some researchers as a result of continued global warming. So what does all this mean for Louisiana and its agriculture and forestry sectors? Obviously, a debate on the role of global warming on hurricane activity – and indeed, the debate on the global warming issue in general – is sure to continue. And don't look for a consensus from climatologists any time soon.

Still, Louisiana communities and industries need to critically evaluate the

Figure 2. Louisiana: 1901 - 2005 Hurricane/Tropical Storm Landfalls. Storms landfalling along or near the Louisiana coast.



effects of the recent decade of tropical weather and examine opportunities to implement strategies to mitigate at least some of the destruction. Whether the recent run of elevated hurricane activity reflects the onset of a multi-decade run of increased storm threats or whether this is simply an unusual and unexpected short-term trend, Louisiana will always be a frequent landfall target.

Getting Prepared

More needs to be done to analyze the effects of hurricanes on specific Louisiana crops and agricultural commodities. This is not an easy task because of changing agricultural practices and differing crop varieties. Furthermore, different crops are affected differently.

Take sugarcane, for example. Between 1963 and 2002, the mean statewide yield for the period was 27.2 tons per acre. However, yield was reduced by an average of 1.1 tons per acre during years when hurricanes passed over the state in late summer and fall. Some might consider that a relatively small reduction given the potential damage that hurricanes can inflict, particularly at or near harvest time. We hypothesize that the reason the apparent hurricane effect is not greater is that it is rare for a hurricane to affect the entire southern part of the state. Even in those years where Louisiana has suffered multiple hits, the geographic effects were somewhat contained.

Another lesson can be learned from the 2005 storm catastrophes. Each of the two storms was a record-setter in its own right, and the occurrence of intense storms like Katrina in the southeast and Rita in the southwest within a one-month period was unprecedented. Yet their effects on South Louisiana mainstay crops were not as devastating as they might have been had they each arrived at different times of the season. With Katrina's August landfall, much of the southeast and south central Louisiana sugarcane crop was able to recover before the peak harvest period. And one month later, the effect of Rita on the 2005 southwestern Louisiana rice crop was lessened by the fact that the storm occurred after the main crop had been harvested.

Such assessments are only the starting point for detailed, comprehensive studies of the large-scale, long-term implications of tropical weather on Louisiana agriculture, but they demonstrate that there is some potential for fruitful studies. And given the ever-increasing complexity of the international marketplace and Louisiana's niche in world agribusiness, we believe it is vital that firmer understandings be pursued with regard to the relationships between Louisiana agriculture and forestry and future tropical threats.

A new norm? The jury's still out. Perhaps the answer is not all that important. Whether we are experiencing a new climate regime or simply a temporary run of enhanced tropical activity, we should position ourselves to take advantage of the research opportunities available. In that way, Louisiana agriculture can be better prepared to deal with our ever-changing climate. ■

Photo by Bruce Schultz

Rice farmer David Lacour shows the level the storm surge reached on his rice storage bin. This photo was taken shortly after Hurricane Rita hit Southwest Louisiana on Sept. 24, 2005.

Red-banded Stink Bugs TROUBLE LOUISIANA

Matthew Baur and Jack Baldwin

Early soybean planting has become common practice in Louisiana. Early maturing soybeans – maturity groups III to V – are planted in early spring, shifting the focus of insect control efforts to an earlier part of the season. Thus, stink bugs have become increasingly significant, especially the red-banded stink bug, also known as the red-shouldered, red-striped or Cajun red-shouldered stink bug.

The geographic range of the red-banded stink bug, which was first described in 1837, extends from the southern United States to Argentina. Red-banded stink bugs have been reported as the principal stink bug pest of soybeans in Brazil since 1970. Within the United States, the range extends from New Mexico to South Carolina and Florida, and north to Georgia and Arkansas. The red-banded stink bug was reported in North Florida in 1983, and in Georgia from 1987-1991. Red-banded stink bugs were first reported in South Louisiana in 2000 and have reached significant numbers since 2002.

Red-banded stink bugs feed on cultivated and uncultivated plants including pigweed, poison ivy, catalpa, cactus, sunflower, castor bean, wheat, cotton, pokeweed, strawberry, fennel, violets, many types of clover, alfalfa, vetch and many cultivated beans, including lentil and kidney bean. In Louisiana, the insect has been found in significant numbers on soybean and black medic and in smaller numbers on dock and hairy vetch. The geographic range information and host-plant list suggests red-banded stink bugs are not new to the United States nor is their geographic range being extended. Rather, populations of this pest appear to rise and fall to local extinction because of environmental or other causes.

Brazil Studies Bug

Unfortunately, few studies have been conducted on the red-banded stink bug in the United States. Studies in Brazil indicate red-banded stink bugs caused damage in 2002, and yield loss caused by red-banded stink bug adults is equivalent to or higher than yield losses associated with southern green and brown stink bugs. The researchers in Brazil caged red-banded stink bug adults on soybean plants for 15 days at four adults per 3 feet of row during pod fill. Red-banded stink bugs damaged about 19 percent of the seeds, and southern green stink bug damaged less than 4 percent of the seeds. Plots infested with either the red-banded stink bug or southern green stink bug yielded about 10 percent to 11 percent less than control plots.

In a greenhouse experiment where two adults were infested on caged plants for 15 days during the pod-filling period, the number of fully filled pods dropped by 40 percent on plants infested with the red-banded stink bug compared to a 20 percent drop on plants infested with the southern green stink bug. The economic threshold (the level of infestation at which a control decision must be taken) used in Brazil for the red-banded stink bug ranges from two adults per 3 feet of row (about half the current threshold used for the southern green stink bug in Louisiana, Texas and Georgia) to four adults per 3 feet of row (roughly equivalent to the southern green stink bug threshold).

LSU AgCenter researchers are conducting studies of the impact of red-banded stink bugs. These are field-cage studies in which stink bug adults are collected in the field and caged on plants for three weeks during the reproductive growth stages of the plants. Red-banded stink bugs were caged at four levels – zero, one, two and three bugs per 3 feet of row – where two bugs per 3 feet of row is equivalent to the current economic threshold for the red-banded stink bug and three bugs per 3 feet of row is equiv-

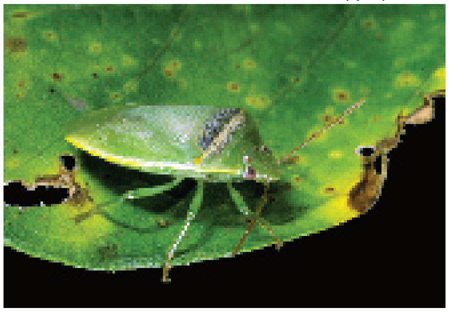
Matthew Baur, Assistant Professor, and Jack Baldwin, Professor, Department of Entomology, LSU AgCenter, Baton Rouge, La.

Table 1. Yield results from field cage studies in which red-banded stink bugs were infested on plants for three weeks during the reproductive growth stages. Bugs were infested at four levels: 3 bugs/3 ft of row (equivalent to the current economic threshold used for southern green, green and brown stink bugs), 2 bugs/3 ft of row (equivalent to the current threshold used for red-banded stink bug), 1 bug/3 ft of row and plants left uninfested. The weight of 100 seeds, yield (bu/ac) and percent yield loss are shown. Significant differences among treatments are shown by different letters.

Soybean stage infested	Infestation level (# per 3 ft of row)	100 seed count weight	Yield (bu/ac) (and % yield loss)
Pod set	0 (Control)	15.5	60.0 (0%) A
Pod set	1	15.7	58.0 (3%) A
Pod set	2	16.3	49.9 (17%) A
Pod set	3	18.3	34.9 (42%) B
Seed set	0 (Control)	15.5	58.5 (0%) A
Seed set	1	15.2	32.1 (45%) B
Seed set	2	14.3	36.5 (38%) B
Seed set	3	15.7	28.7 (51%) B
Seed fill	0 (Control)	15.5	59.0 (0%) A
Seed fill	1	15.2	43.5 (26%) B
Seed fill	2	15.0	45.6 (22%) B
Seed fill	3	15.2	48.0 (18%) B

Figure 1. Adult red-banded stink bugs are 0.4 to 0.5 inch long and brilliant green. As they get older, they may appear more yellow. Adults normally have two stripes across the back of the thorax, one yellow and one dark red to purple or even black. This stink bug is much small than either southern green or green stink bugs.

Photo by Jerry Lenhard



alent to the threshold for southern green and brown stink bugs. Cages measured 6 feet square and covered 12 row feet of soybean plants.

Substantial Yield Loss

When stink bugs were on plants at any population density for three weeks during seed set or seed fill, substantial yield losses of 18 percent to 51 percent were observed (Table 1). During pod set, only at the highest density – three bugs per 3 feet of row – was a significant yield loss of 42 percent observed. During pod set, the weight of 100 seeds increased as infestation levels increased. This may indicate that while adult red-banded stink bugs damaged developing pods and reduced the total number of pods and seeds, the plants made up for fewer pods by shunting more nutrients to the remaining seeds, thereby increasing the weight of harvested seeds

In Brazil, all classes of insecticides – organochlorines, organophosphates, carbamates and pyrethroids – control the red-banded stink bug. In Louisiana, pyrethroids have been ineffective at current rates recommended for control of the southern green stink bug. The control measures that have been the most effective include 3/4 pound of acephate (81 percent control), 1/3 pound of acephate combined with 2 ounces of Baythroid (95 percent control) and 9 ounces of Furadan (79 percent control).

LSU AgCenter researchers were concerned that control failures might have been caused by the movement of the adult red-banded stink bugs and the distribution of red-banded stink bug nymphs in the plant canopy. They added salt at 0.5 percent to insecticide treatments because work in Brazil shows that ordinary table salt in a 0.5 percent solution applied to plants arrests the behavior of stink bugs. The addition of salt did not increase the efficacy of pyrethroid applications, suggesting that adult movement away from treated areas does not explain control failures. They also attempted to increase coverage in the plant canopy by using different spray nozzles. None of them increased the level of control, suggesting that better coverage through the canopy may not explain control failures.

Smaller than the other green stink bug species (Figure 1), red-banded stink bugs always lay their eggs in two rows (Figure 2) on the upper surfaces of leaves and pods. None of the other stink bug species lays its eggs in two rows, and this difference allows for easy identification of egg masses.

Nymphs also are easily distinguished from other green stink bug nymphs (Figure 3). Red-banded stink bugs require at least 30 days at 80 degrees F to develop from egg to adult, and the females only begin laying eggs 20 days after they have emerged as adults. Adults live up to 40 days in the laboratory.

In Louisiana, two to three distinct population peaks are evident in soybeans: the first in June, the second in July and a third, much-broader peak in August and September. Broadly overlapping generations of all life stages – eggs, nymphs and adults present simultaneously – were observed only in the third peak. The long development time, long fertility period of females and the extended adult longevity cause the overlapping of generations during the final peak of the season. In addition, the presence of all life stages simultaneously may contribute to apparent control failures. Research is continuing. ■

Figure 2. Red-banded stink bug egg masses are easy to distinguish from southern green stink bug and brown stink bug egg masses because the red-banded stink bug always lays eggs in two rows totaling 10 to 15 eggs per egg mass. Southern green stink bug egg masses are almost always laid in rows forming a hexagon, and brown stink bug egg masses are disorganized.

Photo by Blaine Viator

Figure 3. Last instar red-banded stink bug nymph. The red-banded stink bug has five instars (or life stages). The second instar is up to 0.12 inches in length and mostly red and indistinguishable from most other early instar stink bug nymphs. The third through the fifth instars are 0.16 to 0.32 inches in length, mostly green with red and black markings along the side and top of the abdomen.

Photo by Jerry Lenhard

Photo by Bruce Schultz

Gary Breitenbeck, at left, interviews Bubba Leonards in 2005 to obtain information about a disorder affecting rice fields, originally known as mystery malady and now called localized decline.

Unraveling Mystery Malady in South Louisiana Rice

Gary Breitenbeck, Johnny Saichuk and Joseph Kraska

For more than 10 years, rice producers in southwestern Louisiana have occasionally encountered a mysterious disorder in their crops. It usually appears early in the season when young rice plants fail to tiller – or send out shoots. In some fields, the affliction is confined to a small area; in others, the symptoms can rapidly spread unless the field is drained. While drainage can often arrest the spread of this disorder, afflicted crops usually do not recover and produce grain.

This localized decline in early-season rice has baffled producers, consultants, agents and scientists. As a result, this disorder is commonly called the "mystery disease" or "mystery malady," though few believe it is caused by a pathogenic agent. While the rapid spread of the disorder suggests the action of a pathogen or other pest, inspection of afflicted areas usually shows no evidence of any organisms. Many believe the disorder is occurring more frequently and that it afflicts a greater acreage each year. In 2005, a systematic study was initiated to identify the cause of this mystery malady.

The LSU AgCenter researchers embarking on this study did not get a consensus from growers, agents and others regarding the specific symptoms of this disorder other than general

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agreement that it caused stunting and a failure of young plants to tiller. Therefore, a primary goal of this initial study was to determine whether a specific set of symptoms was associated with this disorder or whether it was the result of a complex of causes that contributed to poor stands.

The general suspicion that this disorder was becoming more widespread caused speculation that recent changes in production practices were responsible. Some associated the disorder with crawfish production, while others suspected that it was the result of subsoil exposure caused by precision land-leveling. Some speculated that it was caused by conservation management practices such as no-till planting or stale seed beds. Still others suspected that this disorder was related to the widespread use of the NewPath (Imazethapyr)/Clearfield production system to control red rice.

Identifying the Cause

To investigate the causes and contributors to the mystery malady, parish extension agents conducted inspections of all fields reported to have the disorder. If the cause of the symptoms was not apparent, a research team was sent to the site to collect samples of above- and below-ground plant tissue, soils from zero to 6 inches deep and irrigation water. A 5-square-foot area was harvested to determine the volume of vegetation and the numbers of stems and tillers. For comparison, a similar set of samples was collected from a nearby area under similar management where no symptoms were evident. To identify possible relationships between production practices and the disorder, growers were asked to complete a detailed survey documenting current and previous production practices.

More than 50 sites were reported during the 2005 growing season, and 29 of these sites were extensively sampled. Some sites were not sampled because heavy insect infestations or other factors were clearly contributing to the decline of the rice plants. The 29 sites sampled all contained silt loam soils.

Photo by Gary Breitenbeck

Roots of affected rice plants often are coated with an orange colored plaque of soluble iron in contrast to normally white roots.

Table 1. Percentage of afflicted and healthy sites containing more than 500, 1000 and 5000 milligrams of iron per kilogram in aboveground tissue. Though less than 500 milligrams per kilogram is often used as the toxic level, the tolerance of rice plants varies greatly among cultivars.

Site	>500 mg/kg	>1000 mg/kg	>5000 mg/kg
Afflicted	86%	48%	21%
Healthy	31%	11%	0%

Symptoms

Despite initial ambiguity, it soon became apparent that a specific set of symptoms could be associated with the mystery malady. The most definitive of these symptoms was the presence of reddish-brown spots on the lowest erect leaf. Examination of these spots with a hand lens showed that they were unlike the lesions typical of disease but were caused by discoloration within the interior of the leaf – a symptom more commonly associated with metabolic dysfunction.

Roots were partially coated with reddish-brown iron plaques, but the blackened roots associated with high sulfide concentrations were generally not present. Afflicted crops were stunted, and their root systems and stands severely reduced. In afflicted areas, plant height averaged 64 percent, root mass averaged 35 percent, and stand weight averaged 18 percent of corresponding healthy areas. Most of the stand reduction was due to reduced tillering, though death of seedlings was also observed at a number of sites. In fields where the disorder had spread rapidly over a large area, rice plants displayed a reddish-brown hue. The onset of this problem was not reported after flowering began, indicating an early-season disorder.

Iron Toxicity

The symptoms are consistent with a nutrient toxicity, especially the reddish-brown spots on the lower leaves and the bronze color displayed when large areas are afflicted. Analysis of above-ground tissue supports this possibility. Afflicted plants accumulated iron at levels far in excess of the tissue concentration considered toxic to rice. A number of healthy plants also contained high levels of iron, but apparently these accumulations did not cross the toxic threshold (Table 1). Rice plants, especially in afflicted areas, also accumulated high amounts of aluminum, but the characteristic symptoms of aluminum toxicity were evident at only a few sites.

Iron toxicity is a common problem in many parts of the world, but it has not been identified as a concern in Louisiana. Many popular rice varieties grown in Louisiana are more tolerant of iron than those grown in other rice-growing areas. Even so, the high levels of iron uptake observed in this study suggest that some conditions lead to iron uptake that exceeds the tolerance of the popular varieties.

Most of the soils used for rice production in southwestern Louisiana contain high levels of iron, but this iron is usually present as insoluble iron oxides that pose no threat to plants. When soil pH falls below 5.6 or when soils are flooded, iron is reduced to a soluble form that can be readily taken up. Rice plants have the ability to regulate iron uptake by transferring oxygen from their leaves to their roots, causing soluble iron to precipitate as a reddish-brown coating on root surfaces. Where the amount of soluble iron exceeds this ability, iron toxicity can occur. When fields are drained, microorganisms rapidly oxidize soluble iron and reduce its availability. This process apparently accounts for the success of timely draining in arresting the spread of the disorder in susceptible fields.

Tissue analyses also suggest that zinc (Zn), potassium (K) and nitrogen (N) deficiencies may have contributed to the onset of this disorder. Excessive iron uptake causes a number of adverse effects, including a reduced ability of the plant to take up and utilize zinc. Table 2 shows the percentages of plants with zinc tissue concentrations below the deficiency level established for rice. Three-fourths of the afflicted plants were below this level, whereas only 20 percent of the healthy plants may have been zinc-deficient. Average potassium levels in afflicted plants were also less than those in healthy plants and were frequently below the deficient level. This may have been because of reduced root development, since many of the soils in afflicted areas contained adequate potassium. Nitrogen uptake was low in all plants and may have contributed to the onset of this disorder by retarding early-season growth and the ability of the crop to adequately oxidize its root zone.

Steve Thevis of G&H Seed Co., left, and Joe Kraska sample soil and tissue in a field affected with "localized decline" in Acadia Parish in 2005.

Table 2. Percentage of afflicted and healthy sites containing less than 10, 15 and 20 milligrams of zinc per kilogram in aboveground tissue.

Site	<10mg/kg	<15 mg/kg	<20 mg/kg
Afflicted	5%	45%	75%
Healthy	0%	0%	20%

The mystery malady appears to be caused by excessive iron uptake, possibly augmented by excessive uptake of aluminum and deficient levels of zinc and potassium.

Effects of Management

No consistent pattern emerged regarding management practices that rendered fields more susceptible to this disorder. It is noteworthy that in nearly half the fields, the disorder originated near a riser where water flowed into the field. While irrigation water invariably contained significant concentrations of iron, the same water was applied to nearby healthy fields displaying no symptoms. It is possible that cool water temperatures or a slight increase in water depth, rather than the composition of the water, was responsible. In several fields, the disorder originated away from the riser in depressions only a few inches lower than the surrounding area.

Most fields investigated were irrigated with well water, but the disorder was also observed in several fields irrigated with surface water. Symptoms occurred with no-till, conventional till and stale seedbed management. They occurred after drilled, water-seeded and broadcast planting. Symptoms occurred in fields previously used for soybeans, crawfish or rice. Several fields had been in fallow, some for several years.

No clear relationship was found between varieties and the frequency of the disorder. It was most frequently observed in the varieties Clearfield 161, Cocodrie and Chenier, but that was likely because most of the acreage in the study area was planted with these varieties. The disorder also occurred in two fields planted with Wells, an Arkansas variety only distantly related to the popular Louisiana varieties. The disorder occurred in a number of fields treated with the NewPath system but also occurred in fields with no history of this herbicide. There was little likelihood that herbicide drift was responsible for the disorder in any of the fields examined.

The mystery malady appears to be caused by excessive iron uptake, possibly augmented by excessive uptake of aluminum and deficient levels of zinc and potassium. Draining fields as soon as symptoms appear is often effective in preventing spread of the disorder throughout the entire field. In fields with a history of the disorder, growers should consider delaying the flood as long as practical to allow sufficient growth to adequately oxidize the root environment. Ongoing research is focused on developing a soil test to identify susceptible fields and to develop management practices that prevent the onset of this disorder. We are also seeking treatments to arrest or offset the symptoms once they occur, though preliminary work suggests achieving this goal will be particularly challenging. ■

Versatility of Valor Herbicide in Cotton and Soybeans

Derek M. Scroggs and P. Roy Vidrine

With weeds being a major pest in production agriculture, most growers have come to rely on herbicides to prevent negative effects on yield. Producers may choose from many herbicides, depending on the crop they are growing and the weed species affecting the crop. Valor (flumioxazin) is a broad-spectrum herbicide that controls most broadleaf weeds while offering suppression of some annual grasses. Valor is in the N-phenyl-phtalimide herbicide family, and is a lethal inhibitor of the enzyme protoporphyrinogen oxidase (PPO), which is in the pigment synthesis pathway. This PPO inhibition starts a reaction in the cell that ultimately causes cell membrane disruption and results in plant death.

Valor has a unique use in cotton and soybean weed control. In cotton, Valor can be applied 30 days before planting or directed beneath the crop before the canopy closes. In soybeans, Valor can be used as a pre-plant burndown with no time restrictions, as a pre-emergence application or directed beneath the crop. Because Valor is less effective when controlling grass species, total weed control can be achieved by including the herbicide glyphosate in the spray mixture or in a sequential application. The use of Valor in Southern row crops has increased in recent years, and this addition has added an important weed control measure for many Louisiana growers.

Photo by Derek M. Scroggs

Valor applied at planting followed by Roundup.

Derek M. Scroggs, Research Associate, and P. Roy Vidrine, Professor, Dean Lee Research Station, Alexandria, La.

Valor as a Burndown Herbicide

Research was conducted in 2003 at the Dean Lee Research Station near Alexandria, La., using Valor as a pre-plant burndown treatment either alone or tank-mixed with glyphosate as Roundup Weathermax before planting cotton. Visual weed control assessments were made 32 days after treatment and revealed an increase in weed control from the addition of Valor to Roundup Weathermax. Treatments with Roundup Weathermax at 22 ounces per acre controlled pitted morningglory 67 percent, palmer amaranth 75 percent, smellmellon 67 percent, hemp sesbania 70 percent and hophornbeam copperleaf 70 percent (Figure 1). Control of these weeds increased approximately 21 percent to 29 percent, depending on the weed species evaluated, with the addition of Valor at 2.0 ounces per acre. Cotton was planted after this evaluation, and no injury was seen from treatments containing Valor.

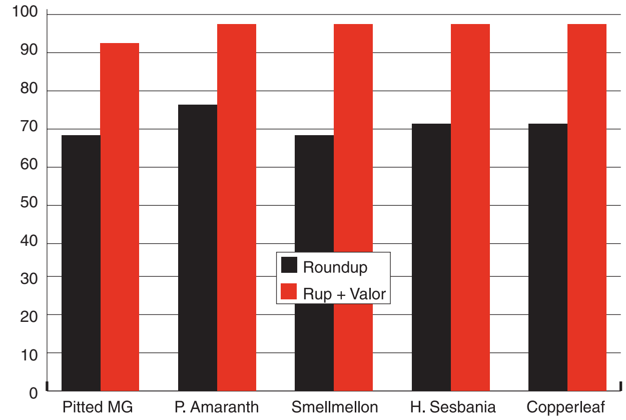
Photo by Derek M. Scroggs

Roundup Weathermax alone in a soybean field.

Photo by Mark Claesgens

P. Roy Vidrine addressing participants at the annual field day at the Northeast Research Station near St. Joseph, which was held June 15, 2006.

Figure 1. Visual weed control from Valor used in a pre-plant burndown in combination with Roundup Weathermax 32 days after treatment. (Rup = Roundup)



Valor Pre-emergence in Soybean

Studies conducted in 2003 focused on the use of Valor pre-application followed by a post-emergence treatment with Roundup Weathermax in comparison with sequential post-emergence applications of Roundup Weathermax in Roundup Ready soybean. Results indicated excellent control of pitted morningglory (96 percent), smellmellon (96 percent), hophornbeam copperleaf (96 percent), browntop millet (95 percent), barnyardgrass (95 percent) and spotted spurge (96 percent) with the Valor/Roundup Weathermax treatment when visual weed control was evaluated 51 days after treatment (Figure 2). With two applications of Roundup Weathermax control was less – pitted morningglory (77 percent), smellmellon (67 percent), hophornbeam copperleaf (83 percent), browntop millet

Figure 2. Visual weed control from Valor used as a pre-application followed by (fb) a post-application of Roundup Weathermax 51 days after treatment. (Rup = Roundup)

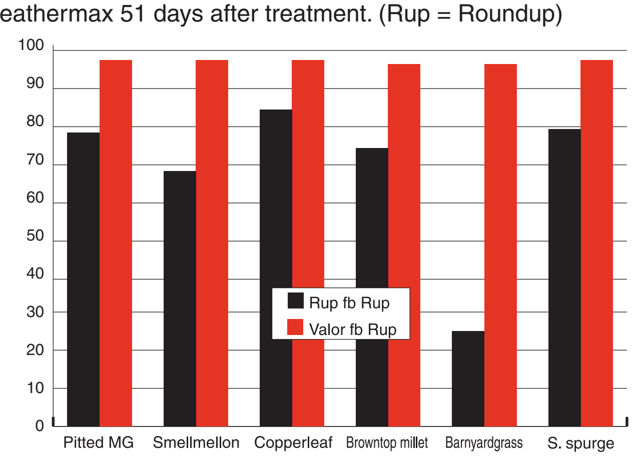
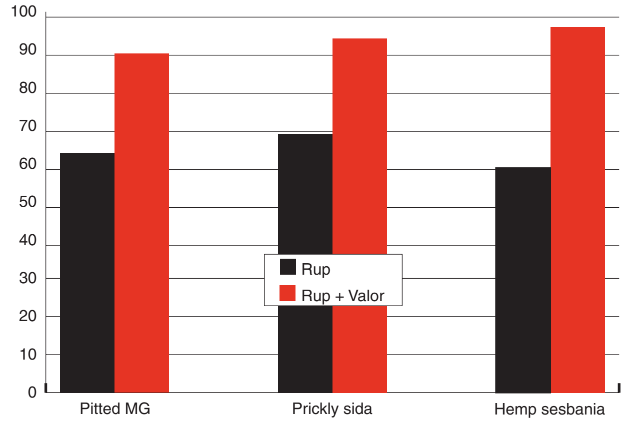


Photo by Derek M. Scroggs

Valor plus Roundup layby in cotton.

Figure 3. Visual weed control from the addition of Valor to Roundup Weathermax in a layby application in cotton 15 days after treatment. (Rup = Roundup)



(73 percent), barnyardgrass (25 percent) and spotted spurge (78 percent). In 2004, studies conducted with the same Valor/Roundup Weathermax treatment resulted in excellent control of pitted morningglory, smellmellon, hophornbeam copperleaf, spurred anoda, barnyardgrass and browntop millet, with control averaging approximately 96 percent 70 days after treatment. In both studies, no soybean injury was observed and optimum yield was achieved.

Valor Layby in Cotton

Valor has recently been given a 2 (ee) label for application to 16-inch cotton and a minimum of 2 inches of bark visible on the lower stem of the plant. Also, with the currently available Roundup Ready cotton varieties, glyphosate must be directed beneath the crop after the fifth-true-leaf stage, and contact to stem or foliage must be avoided or yield loss may result. Research in 2003 evaluated the co-application of Valor and Roundup Weathermax at standard layby application timing. At 15 days after treatment, this co-application demonstrated adequate control of pitted morningglory (89 percent), prickly sida (93 percent) and hemp sesbania (96 percent). This was higher than control exhibited by Roundup Weathermax alone, which controlled pitted morningglory at 63 percent, prickly sida at 68 percent and hemp sesbania at 59 percent (Figure 3). An additional study in 2003 evaluated the combination of Valor and MSMA (monosodium acid methanearsonate) at the same application timing as above. At 16 days after treatment, results indicated 96 percent control of pitted morningglory; 98 percent control of palmer amaranth, hophornbeam copperleaf and smellmellon; and 96 percent control of browntop millet and barnyardgrass. A more-recent study conducted in 2004 also demonstrated similar results with combinations of Valor and Roundup Weathermax or MSMA as a layby treatment, further indicating the importance of Valor in cotton weed control systems. From these studies, no crop injury was observed and no negative effects on cotton yield were noticed.

When used according to herbicide labeling, Valor has been shown to be a beneficial tool growers can use to effectively control weeds. If used as a pre-plant burndown application, Valor can help achieve a clean seed bed at planting and can also minimize early-season weed competition. When used in a pre-emergence application in soybean, Valor can add a residual weed control component and be an effective initial treatment that can help delay or decrease post-emergence applications of glyphosate in Roundup Ready soybean. As a layby treatment in cotton, Valor can aid not only as a contact herbicide but also as a residual component in late-season weed control and can act as a good tank-mix partner with glyphosate in order to maintain a clean crop until harvest. Valor has demonstrated excellent versatility in multiple situations and if implemented in an appropriate manner can be effectively used to increase overall weed control in Louisiana crops. ■

Sweet potato, IP experts added to staff

During this time of financial emergency for the LSU AgCenter, it has been difficult to add new staff. But, fortunately, two key positions were filled that have major implications for Louisiana's economic development. Tara Smith has been named the state sweet potato specialist, and Wade Baumgartner has been appointed as a licensing associate with the Office of Intellectual Property.

Smith, who completed her Ph.D. in May under the guidance of Abner Hammond of the Department of Entomology, assumed her new duties in June. She replaces Mike Cannon, who had been the sweet potato specialist before his retirement in January 2006.

Smith has a bachelor's degree in biology from the University of Louisiana at Monroe and a master's degree in biology from Louisiana Tech at Ruston. She will work out of the Sweet Potato Research Station at Chase.

Baumgartner, who has a Ph.D. in reproductive endocrinology and a J.D., both from the University of Illinois, evaluates the research conducted at the AgCenter with respect to patent protection and works to obtain patents for AgCenter inventions. One of his goals is to move those inventions into the marketplace. He also began his duties in June. His other degrees are also from the University of Illinois – an M.S. in molecular genetics and a B.S. in animal sciences. ■ **Linda Foster Benedict and Rick Bogren**

New Weed Control Technology for Cotton

Donnie K. Miller, Alexander M. "Sandy" Stewart and Steven T. Kelly

Since the release of the first generation of Roundup Ready cotton in 1995, U.S. cotton producers have shown a willingness to adopt this new technology. Benefits to this Roundup Ready technology in cotton include the potential to reduce or eliminate chemical applications and tillage operations, control of a broad spectrum of both grass and broadleaf weeds, and rotational flexibility to plant other crops because of lack of residual soil activity with glyphosate. The primary drawback to this technology was the label restriction for over-the-top application of glyphosate to occur before the fifth-leaf stage of development. Over-the-top application of glyphosate to Roundup Ready cotton beyond this restriction has the potential to result in misshapen and sterile pollen and no or poor fruit set, which can lead to maturity delays or yield loss. Subsequent glyphosate applications beyond the label restriction must be directed underneath the crop, minimizing herbicide-to-plant contact.

In 2006, the second generation of Roundup Ready cotton, termed Roundup Ready Flex cotton, was made commercially available. This new version allows cotton producers to make glyphosate applications over-the-top regardless of crop growth stage. This places less reliance on specialized spray equipment intended to reduce herbicide-plant contact and allows the use of larger, faster-moving equipment. In addition, this affords the ability to reduce the number of application trips through the field by co-applying insecticides, plant growth regulators or micronutrient fertilizers with glyphosate in over-the-top applications.

Research conducted with Roundup Ready Flex cotton by LSU AgCenter weed scientists has focused on weed efficacy, crop tolerance and co-application effects. Efficacy trials indicate that excellent control of a number of grass and broadleaf weeds in cotton can be achieved season-long with glyphosate applications to small (1-3 inches tall) weed infestations. Glyphosate applications should be made as early as possible once weeds emerge to eliminate weed competition. Delaying initial glyphosate application from the two-leaf cotton growth stage to the five-leaf stage has resulted in a 20 percent yield reduction, even though excellent weed control was observed with glyphosate applied at this timing, indicating the effect of early-season weed competition. In addition, no visual injury or negative growth effects with over-the-top glyphosate applications beyond the current restriction on Roundup Ready cotton indicate excellent tolerance to glyphosate in Roundup Ready Flex cotton.

Research has also shown that including additional herbicides with residual soil activity at planting can buy producers time in making the initial glyphosate application. This would limit weed competition that can occur when the initial glyphosate application is delayed because of environmental conditions and weeds become larger. Co-applying herbicides with residual soil activity with glyphosate over-the-top can prevent weeds from emerging later in the season and negatively affecting the crop.

Perhaps the main benefit to including other herbicides with glyphosate in Roundup Ready Flex cotton is to introduce different modes of action to prevent weed resistance associated with the continuous use of glyphosate. The need for additional herbicides in the Flex system will be a decision made by the individual producer. Decisions will depend on the ability of a producer to cover his acreage in a timely fashion to eliminate early season weed competition, environmental factors that affect timeliness of application, and increased technology costs associated with the new technology and the cost efficiency of using additional inputs.

Research was conducted on the effects of glyphosate co-applied with most insecticides commonly used in cotton production and a commonly used plant growth regulator. It indicated that no negative effects were observed on control of most of the common weed problems in cotton in Louisiana. In addition, negative effects of these co-applications to cotton at the pinhead-square or first-bloom growth stages were limited to minor, temporary leaf burn lasting no longer than 14 days with no reduction in crop maturity or yield. When applied according to the herbicide labeling on Roundup Ready Flex cotton, glyphosate co-applications can offer producers the ability to integrate pest and crop management strategies and reduce application costs with minimal effect on the crop.

Although increased costs will be associated with this new technology, it offers the potential to reduce costs and time associated with applications over-the-top throughout the growing season. Producers may be able to use larger, faster-moving equipment and to reduce the number of application trips through the field by co-applying insecticides and plant growth regulators with glyphosate. A careful evaluation of the cotton varieties in which Roundup Ready Flex will be available will be critical to the system's profitability. Early research with Roundup Ready Flex varieties in Louisiana has indicated that their yield may not always be competitive with the best currently available varieties. With new variety development taking place each year, this situation could change. Roundup Ready Flex varieties will require yields that are competitive with existing varieties to offset the increase in technology fees and contribute to overall profitability. ■

Donnie K. Miller, Associate Professor, Northeast Research Station, St. Joseph, La.; Alexander M. "Sandy" Stewart, Assistant Professor, Dean Lee Research Station, Alexandria, La.; and Steven T. Kelly, Associate Professor, Scott Extension Education & Research Center, Winnsboro, La.

Crawfish Burrows

Ray McClain

Sealed entrance of a crawfish burrow, showing the typical "chimney" and dirt plug.

Crawfish extraction from burrows begins with slow, careful excavation. John Sonnier, research farm specialist, is doing the extraction.

Burrow excavations are difficult and time consuming, but necessary to obtain data critical to the understanding of burrow ecology of crawfish in aquaculture.

Industrywide, crawfish yields for the 2005-06 production season were abnormally low. This is especially true for those using the production strategy of culturing crawfish following rice in a field rotation. This strategy, used on most crawfish production acreage in Louisiana, is most susceptible to crawfish population adversities because population densities are typically lower than in ponds permanently dedicated to crawfish production. When crawfish are not cultured in the same field (pond) during consecutive production seasons, there is little opportunity for populations to build up and develop a wide range of reproduction cycles – both aspects that tend to mitigate adverse effects on populations. Therefore, unfavorable weather patterns or other environmental conditions that affect crawfish broodstock survival and reproduction generally have a greater effect on crawfish production systems that employ field rotation. By all perspectives, the 2006 drought in Louisiana began during the summer of 2005 and persisted through the fall, with the exception of some short-lived rains associated with one or both hurricanes.

Prolonged summer drought when crawfish are confined to burrows, where they reproduce, can hamper reproduction if residual water within the burrows is lacking. If the drought is severe enough and burrows completely dry out, massive broodstock mortality can result. Drought during the fall, at a time when crawfish are emerging from burrows with young, can also hamper production by preventing or delaying emergence from burrows. Crawfish remain trapped in burrows until the hardened dirt plug at the entrance of the burrow is sufficiently softened by pond flooding or rainfall. For crawfish burrowed in the levees above the normal waterline of the flooded pond, timely rainfall is critical for the crawfish's emergence, and limited rainfall amounts are often not enough to adequately soften the hardened plug.

Soil type, burrow depth, burrow location and amount of water inside the burrow at the time of initial burrowing may play a role in how crawfish respond to prolonged drought conditions. Because little research exists regarding the burrow ecology of crawfish, especially as it relates to crawfish aquaculture, research at the LSU AgCenter is being focused in this area. One such project examined crawfish burrows in 2005

Ray McClain, Professor, Rice Research Station, LSU AgCenter, Crowley, La.

Table 1. Aspects of burrow ecology relating to crawfish extracted from burrows following pond draining in experimental crawfish production ponds. Information is organized by crawfish burrow occupancy number and survival status.

Burrows	No.	Average Depth of Burrows (and Range)	Range of Water Volume (ml)	% of Burrows without Water
With Remnants of Dead	113	20.8 (4-48)	0 – 1,500	90.3
Single Occupancy[1] – Live	87	24.2 (9-45)	0 – 2,820	42.5
Single Occupancy[2] – Dead	1	34	0	–
Double Occupancy[3] – Both Alive	55	28.8 (8-55)	0 – 2,000	30.9
Double Occupancy[3] – Both Dead	2	39.5 (29-50)	0	100
Double Occupancy[3] – One Alive	2	34.5 (27-42)	0 – 600	50

[1]11 of the 87 burrows contained male crawfish.
[2]Consisted of a male crawfish.
[3]All burrows containing 2 crawfish consisted of 1 male and 1 female.

and DROUGHT

Live crawfish were mostly associated with burrows containing free water.

at the Rice Research Station in Crowley, approximately one month after pond draining. Two hundred sixty burrows were excavated, and crawfish were retrieved, water volumes and burrow depths were recorded, and locations of the burrow entrances were noted.

Average burrow depths and water volumes, by crawfish survival and number of burrow occupants, are presented in Table 1. Burrows containing only female crawfish are further organized according to burrow location and depth in Table 2. It was surprising to observe that 45 percent of the burrows contained no living crawfish after such a short time following pond draining. Dead crawfish were generally associated with burrows containing no measurable water, and a strong positive relationship exists between the amount of water present and burrow depth. There was also a marked difference in average water volume, the percentage of burrows with no measurable water and crawfish survival between burrows initiated at or above the pond's water line (likely pre-drain burrows) and those made on the pond bottom (post-drain burrows). Though the average burrow depths were similar, burrows found on the pond bottoms (often near the base of the levees) generally contained much greater volumes of water, had fewer burrows without free water and contained more living crawfish than burrows found at or above the waterline on levees.

Though the implication of these findings with regard to burrow location is unclear, in the Crowley silt loam soil, burrow depth and water volume appear to be highly correlated; and the volume of water found in burrows soon after burrowing may play a significant role in the ultimate survival of reproductive female crawfish within the burrow. These findings strongly implicate summer drought as a significant factor in negatively affecting crawfish reproduction and subsequent yield, at least on silt-loam soils, and may help to explain the reduced yields reported following the unusually dry conditions during 2005 in Louisiana. ■

Photos by Ray McClain

Table 2. Observations obtained from burrows with female crawfish only, segregated by location of burrow and burrow depth.

Depth Group (inches)	(N)	(N) as % of Total	Avg. Depth (inches)	% Live Crawfish	Avg. Water Volume (ml)	% of Burrows with No Water
Burrows Constructed at Water Line or Above						
4 – 10	4	2.2	6.3	0	0	100
11 – 20	65	35.3	16.5	18.5	2.1	93.8
21 – 30	67	36.4	25.4	45.5	44.5	83.6
31 – 40	34	18.5	35.4	64.7	184.6	55.9
41 – 55	14	7.6	46.2	75.0	351.1	28.6
Average[1] (or Total)	184		25.3	40.8	77.7	78.3
Burrows Constructed on Pond Bottom						
4 – 10	9	14.1	8.3	44.4	22.2	55.6
11 – 20	24	37.5	16.2	95.8	238.3	20.8
21 – 30	24	37.5	25.0	100	579.3	4.2
31 – 40	6	9.4	35.5	100	1236.7	0
41 – 55	1	1.6	42.0	100	1200.0	0
Average[1] (or Total)	64		20.6	90.6	448.1	17.2

[1]Averages are weighted averages and not simply grand means from each depth category.

A burrow after crawfish extraction showing the simple, nearly vertical tunnel and slightly enlarged terminal chamber. Note that no water was present in this burrow at the time of excavation. Cracks observed in the upper portion of this burrow may have compromised the integrity of the burrow allowing water, which normally is trapped inside, to evaporate, compromising the survival and reproduction of the occupant crawfish.

Photo by John Wozniak

Effect of Herbicide Regimes on Weed Density and Yield in Sweet Potato

Tara P. Smith, Donnie K. Miller, Steven T. Kelly and Abner M. Hammond

In 2005, Louisiana producers harvested more than 16,000 acres of sweet potatoes with a total value exceeding $90 million. Weeds can affect agricultural production systems in many ways. In vegetable crop production, weeds can cause significant yield reductions by competing with crops for nutrients, light and water. Beauregard, the predominant sweet potato cultivar grown in Louisiana, is a high-yielding variety but is not as tolerant to weed interference as some of the older, lower-yielding varieties. Research suggests that the majority of yield loss in Beauregard is caused by weed interference during the first two to eight weeks after transplant.

Sweet potato producers deal with a complex of weed species, and recently, the primary problem weeds affecting sweet potato production in Louisiana are hophornbeam copperleaf, spiny amaranth (pigweed), smellmelon, and yellow and purple nutsedge. Carpetweed is also widespread but is not considered a problem. Currently, the herbicides labeled for use on sweet potato are Command (clomazone), labeled to control grasses, and Valor (flumioxazin), labeled to control broadleaf weeds. In 2004 and 2005, Sandea (halosulfuron) received emergency labeling under Section 18 of the Federal Insecticide, Fungicide and Rodenticide Act to control purple nutsedge in Louisiana sweet potato production. Since the registration of Command herbicide in sweet potato, the populations of morningglories, cocklebur and grasses have been drastically reduced, but other weeds that clomazone does not control continue as pests. Valor and Sandea have been evaluated previously, with neither having known adverse effects on growth or yield of sweet potatoes when applied as recommended.

A study conducted in 2005 investigated the effect of different herbicide regimes on weed density and yield in sweet potato. Transplants 12 inches long were cut the day of transplanting and spaced one foot apart. All herbicide treatments were applied immediately before or following transplant to weed-free beds. Treatments included Valor at 2 ounces per acre plus Sandea at 2/3 ounce per acre, Command at 2.5 pints per acre plus Sandea at 2/3 ounce per acre, Command at 2.5 pints per acre plus Valor at 2 ounces per acre, Valor at 2 ounces per acre plus Command at 2.5 pints per acre plus Sandea at 2/3 ounce per acre, and an untreated control. All Sandea applications were made according to label directions at 28 days after transplanting.

The Valor-plus-Sandea combination targeted broadleaf weeds and annual sedges, whereas Command-plus-Sandea targeted annual grasses and sedges. The combination of Valor plus Sandea plus Command targeted broadleaf weeds, grasses and sedges. The goal of the treatment regime that included all three herbicides was to establish weed-free plots with little competition.

Three random weed counts were taken 70 days following transplant in one square foot of each plot. At 115 days after transplant, two rows of each plot were harvested using a mechanical digger. Roots were graded according to U.S. Department of Agriculture standards and separated into three grade classes – U.S. No. 1 and 2, Canners and Jumbos.

Overall, yields in the study were low because of minimal rainfall in research plots in 2005. U.S. No. 1 and 2 yield – the premium yield grade of sweet potato in the United States – was significantly increased in all herbicide treated plots (up to 75 percent) compared to untreated controls. The treatment regime which included Valor and Command had the highest yield of all herbicide combinations evaluated. The majority of weed species present in the current study were broadleaf weeds, specifically spiny amaranth and carpetweed, although minimal crabgrass was also present. Differences in grass control were not detected in herbicide-treated and untreated plots in the study. All herbicide treatments reduced the number of spiny amaranth plants, and all regimes except Command-plus-Sandea – the only treatment regime without Valor – significantly reduced carpetweed numbers.

The increase of U.S. No. 1 and 2 yield in the herbicide-treated plots compared to untreated controls demonstrates the importance of practicing integrated weed management in sweet potato. Treatment regimes that included Valor and Command (currently recommended for use on sweet potato in Louisiana), provided good control of spiny amaranth and carpetweed, two predominate weed species in Louisiana sweet potato production. These data indicate that greater yields may be achieved in sweet potato if herbicides are integrated into an overall pest management program. ■

Tara P. Smith, Assistant Professor, Sweet Potato Research Station, Chase, La.; Donnie K. Miller, Associate Professor, Northeast Research Station, St. Joseph, La.; Steven T. Kelly, Associate Professor, Scott Extension Education & Research Center, Winnsboro, La.; and Abner M. Hammond, Professor, Department of Entomology, LSU AgCenter, Baton Rouge, La.

Cotton weeds were planted approximately 2 inches beside soybeans at the Northeast Research Station in St. Joseph.

Photo by Mark Claesgens

Competitive Potential of Volunteer Roundup Ready Cotton and Soybean

Donna R. Lee, Donnie K. Miller, Steven T. Kelly, David Y. Lanclos and Alexander M. "Sandy" Stewart

Roundup Ready cropping systems, which feature plant varieties genetically enhanced to withstand application of glyphosate herbicide with minimal to no adverse effect on the crop, have proven to be effective and cost efficient for managing weeds in cotton and soybean. Increasing percentages of acreage devoted to Roundup Ready cotton and soybean increase the likelihood of "volunteer" Roundup Ready crop plants that germinate from a previous crop or remain after a crop failure. If left uncontrolled, these volunteer plants can compete with a subsequent crop in the same way traditional weeds do.

In field studies conducted under weed-free conditions in 2005 at the Northeast Research Station in St. Joseph, La., LSU AgCenter researchers identified the competitive potential of volunteer Roundup Ready cotton and soybean as "weeds."

Density Studies

In density studies, soybean weeds were planted approximately 2 inches beside a cotton crop, and cotton weeds were planted approximately 2 inches beside a soybean crop. All weeds were thinned after emergence to densities of zero, 0.05, 0.1, 0.2, 0.4, 0.8 and 1.6 plants per foot of row and allowed to compete season-long.

Donna R. Lee, Assistant County Agent, East Carroll Parish, Lake Providence, La.; Donnie K. Miller, Associate Professor, Northeast Research Station, St. Joseph, La.; Steven T. Kelly, Associate Professor, Scott Research & Extension Education Center, Winnsboro, La.; David Y. Lanclos, Assistant Professor, and Alexander M. "Sandy" Stewart, Assistant Professor, Dean Lee Research Station, Alexandria, La.

Significant soybean competition with the cotton crop occurred at low densities. Yield was reduced by 7.6 percent at 0.1 plant per foot of row and 14.6 percent at 0.2 plant per foot of row. Higher densities increased competitiveness of soybean as cotton had yield losses of 44.8 percent at 0.8 plant per foot of row and 53.8 percent at 1.6 plants per foot of row. Analysis indicated an expected cotton yield loss of 32.2 percent at 0.5 plant per foot of row and 50.4 percent at 1 plant per foot of row, if soybeans are allowed to compete with cotton season-long.

Low cotton densities resulted in minimal competition with the soybean crop. Soybean yield was reduced by only 0.6 percent at 0.1 cotton plant per foot of row and 3.7 percent at 0.4 cotton plant per foot of row. Higher densities increased competitiveness of cotton. Soybean yield loss was 10.7 percent at 0.8 cotton plant per foot of row and 34.9 percent at 1.6 cotton plants per foot of row. Analysis indicated an expected soybean yield loss of 5.1 percent at a cotton density of 0.5 plant per row and 15.5 percent at 1 plant per foot of row if cotton plants are allowed to compete with soybean season-long.

Interference Studies

In interference period/removal timing studies, soybean weeds were planted approximately 2 inches beside a cotton crop and cotton weeds were planted approximately 2 inches beside a soybean crop. The weeds were thinned to a density of 1.6 plants per foot of row after emergence. Soybean and cotton weeds were allowed to compete for zero, 1, 2, 3, 4, 5, 6, 7 or 8 weeks and season-long. The weeds were manually removed at appropriate intervals.

Soybean interference with cotton resulted in yield losses of 7.2 percent after 1 week and 10.9 percent after two weeks following emergence. Other yield losses were 18.2 percent after four weeks, 32.7 percent after eight weeks and 61.9 percent for the entire season.

Cotton interference with soybeans for periods of 1 to 5 weeks after emergence resulted in yield losses ranging from 4.5 percent to 5.5 percent. Allowing cotton to compete with soybean for eight weeks after emergence resulted in a yield loss of 10.5 percent, and season-long competition reduced soybean yield by 43.3 percent.

Based on these results, Roundup Ready soybean appears to be a strong competitor with Roundup Ready cotton, necessitating an aggressive and effective management program for this "weed" either before the cotton crop is planted or during the growing season. Roundup Ready cotton does not appear to be a strong competitor with Roundup Ready soybean, indicating a less-aggressive management program may be implemented. Although competitiveness of Roundup Ready cotton as a weed in soybean may be severely reduced or eliminated with minimal management, cotton plants left in a soybean field may provide reproductive sites for boll weevil and negatively affect eradication efforts for this pest. Further research is needed to address the impact of volunteer Roundup Ready cotton and soybean as weeds in other matters, including effects on harvest efficiency, cotton grades, soybean grades and insect and disease infestations. ■

Acknowledgment

Marcie Mathews, research associate at the Northeast Research Station, and Louisiana Soybean and Feedgrain Research and Promotion Board for funding

Hammond Research Station Shows Off Latest in Landscaping

Photos by Johnny Morgan

The Hammond Research Station, just outside Hammond, La., has been undergoing a transformation to provide more research and education for the green service industry. To help the public understand some of the change, the station hosted its first landscape and horticulture field day on June 29. At left, Yan Chen, an assistant professor at the station, talks about her research into insect pests of ornamental plants. New equipment was demonstrated including the Allen Hover Mower being demonstrated by Elton Granger, research farm assistant. The hover mower is used in place of weed trimmers along pond edges, lake embankments and on golf courses. According to Roger Rosendale, research associate, the mower cuts a 22-inch path and sells for about $800. ■ **Johnny Morgan**

L 99-226

Two New Sugarcane Varieties for Louisiana's Sugar Industry

L 99-233

Kenneth Gravois, Keith Bischoff, T. Eugene Reagan, Jeff Hoy and Collins Kimbeng

More sugarcane varieties. That's good news for the Louisiana sugar industry. On April 25, 2006, the LSU AgCenter released two new sugarcane varieties, L 99-226 and L 99-233, in cooperation with the U.S. Department of Agriculture's Agriculture Research Service Sugarcane Research Laboratory in Houma and the American Sugar Cane League.

The Louisiana sugar industry has battled through some hard times in its long history, and 2005 proved no exception. After a promising start to the crop, rust disease and drought began to take their toll by mid summer. The planting season was well under way when the devastating blow of Hurricane Katrina was felt on Aug. 29, 2005. The central and eastern portions of the sugarcane growing region in Louisiana were severely damaged by hurricane and tropical storm force winds, but the far western portions of the belt were spared. Hurricane Rita changed that on Sept. 24, 2005. Wind damage and extensive flooding dealt a harsh blow to many sugarcane growers and processors.

The harvest that followed resulted in low yields. This, along with a stagnant price, cast a pall over the Louisiana sugar

Kenneth Gravois, Professor and Resident Coordinator, and Keith Bischoff, Associate Professor, Sugar Research Station, St. Gabriel, La.; T. Eugene Reagan, Professor, Department of Entomology; Jeff Hoy, Professor, Department of Plant Pathology & Crop Physiology; Collins Kimbeng, Assistant Professor, Department of Agronomy & Environmental Management, LSU AgCenter, Baton Rouge, La.

Photo by John Wozniak

Kenneth Gravois (in photo) and Keith Bischoff led the effort to develop L 99-226 at the LSU AgCenter's Sugar Research Station at St. Gabriel.

industry as 2005 wrapped up. But some bits of good news were on the horizon. The performance of three previously released sugarcane varieties – HoCP96-540, L 97-128 and Ho 95-988 – showed signs of promise as potential replacements for LCP 85-384. Yields of LCP 85-384 have been declining in the past few years, primarily as a result of sugarcane rust disease. Another bit of good news was the performance of L 99-226 and L 99-233.

The crosses for the two new varieties were made at the crossing facilities of the Sugar Research Station in September 1994. Photoperiod facilities were used to induce flowering in the parental clones. The parents used for the cross of L 99-226 were HoCP 89-846 and LCP 81-30. The parents of L 99-233 were CP 79-348 and HoCP 91-552. Seedlings from these crosses were planted in the field in April 1995. Early stage selection culminated in the assignment of permanent varietal designations. For these varieties, the "L" indicates that both the cross and early-stage selection occurred at the LSU AgCenter's Sugar Research Station, the "99" indicates the year (1999) of assignment; and the numbers – 226 and 233 – are from a consecutive set of numbers between 1 and 499 used by the AgCenter's sugarcane breeding program for unique variety identification.

L 99-226 and L 99-233 should pay big dividends in the future for Louisiana's growers and processors.

The next stages of the sugarcane breeding program are variety testing. These stages include on-station nurseries, off-station nurseries and infield variety trials, and the final stage, referred to as outfield variety trials. Data from variety testing include measures of sugar yield (pounds of sugar produced per acre of land), cane yield (tons of sugarcane produced per acre of land) and sucrose content (the pounds of sugar produced per ton of sugarcane). At the same time experimental clones are introduced to the outfield variety trials, they are provided to the American Sugar Cane League for "seed" increase. This isn't actual seed but whole stalks because sugarcane isn't grown from seed. Stalks from a plant are cut and planted, and the buds along the stalks germinate and grow to produce new plants. This increase through cutting and planting of stalks, or "seedcane," is a process known as vegetative propagation. The American Sugar Cane League provides seed to any sugarcane grower requesting an allotment. For L 99-226 and L 99-233, seed will be made available to growers in late summer of 2006.

New sugarcane varieties are eagerly anticipated to replace LCP 85-384, which in 2005, was planted on 89 percent of the Louisiana's sugarcane acreage. New varieties with comparable yield potential are important to avoid risks associated with monocultures – growing extensive acreage of a single variety. L 99-226 and L 99-233 should provide growers with viable choices when selecting alternative varieties to plant.

The main criterion that growers use when selecting varieties to plant is yield. To the sugarcane grower, sugar yield, cane yield and sugar per ton of cane are the main traits of interest. Information from the outfield variety trials is reported in Table 1. Information is provided for plant-cane, first stubble (ratoon) and second stubble crops.

L 99-226 had the highest sugar yield and sugar per ton of cane of any variety reported. This new variety also had the highest cane yield in the plant-cane and first stubble crops. The variety is charac-

Table 1. Summary of Outfield Variety Trials conducted across South Louisiana comparing L 99-226 and L 99-233 with other commercial sugarcane varieties in 50 combine-harvested, replicated trials on light- and heavy-textured soils from 2003 to 2005.

Variety	Sugar per Acre (lbs/A)	Cane Yield (tons/A)	Sugar per Ton (lbs/ton)	Stalk Weight (lbs)	Stalk Number (stalks/A)
Plant-cane Crop: 2003-2005 (26)[1]					
LCP85-384	7320	26.9	272	1.88	29385
HoCP91-555	8171+	29.1+	280+	1.99+	30067
HoCP96-540	8855+	31.7+	279+	2.41+	27281-
L97-128	8209+	29.4+	280+	2.35+	25138-
L99-226	9493+	32.1+	295+	2.76+	24004-
L99-233	8652+	31.7+	273	1.89	34569+
First Stubble Crop: 2004-2005 (17)[1]					
LCP85-384	6736	24.8	273	1.52	33100
HoCP91-555	7823+	27.3+	285+	1.72+	32034
HoCP96-540	7951+	28.3+	281+	1.93+	29739-
L97-128	7588+	27.0+	282+	1.97+	27585-
L99-226	8676+	29.1+	299+	2.27+	25882-
L99-233	7833+	28.3+	278	1.59	36268+
Second Stubble Crop: 2005 (7)[1]					
LCP85-384	6067	22.3	272	1.38	32493
HoCP85-845	6203	23.1	265	1.53	29301
HoCP91-555	5970	21.8	273	1.38	30974
HoCP96-540	6614	24.4	271	1.69+	28695
L97-128	6893+	25.3+	271	1.68+	29811
L99-226	7976+	26.2+	301+	1.98+	26646-
L99-233	7441+	27.8+	265	1.39	39774+

[1] Number in parentheses represents the total number of trials.
Varieties that are significantly higher or lower than LCP85-384 are denoted by a plus (+) or minus (-), respectively, next to the value for each trait.

terized as having a moderate population of large-diameter stalks.

L 99-233 produced significantly higher sugar and cane yields than LCP 85-384. Its sugar per ton of cane is similar to LCP 85-384. This new variety is characterized as having a high population of small diameter stalks. L 99-233's high cane yield in second stubble is an indication that the variety is an excellent stubbling variety.

Harvesting characteristics are important for sugarcane varieties. Both new varieties tend to lodge (or fall over), with L 99-233 lodging more severely than L 99-226. Because of their propensity to lodge and their high cane yield, these varieties are better suited to combine harvesting systems, which more easily pick up leaning plants.

Disease resistance is another important component of variety selection. L 99-226 and L 99-233 are moderately resistant to smut, moderately resistant to brown rust and moderately resistant to leaf scald under natural field infection. Both varieties are also moderately resistant to *Sorghum mosaic virus*. The effect of yellow leaf disease on the yield of both L 99-226 and L 99-233 is unknown. These new varieties may sustain significant yield loss in stubble crops from ratoon stunting disease. To realize the maximum yield potential of these varieties, healthy seed cane, free of ratoon stunting disease, must be planted.

Resistance to the sugarcane borer is a key aspect necessary for reducing the number of insecticide applications. L 99-226 is resistant to the sugarcane borer. A new sugarcane variety with resistance to the sugarcane borer is badly needed in the Louisiana sugar industry. Growers have limited options. The majority of acreage in Louisiana is planted to susceptible varieties. L 99-226 is a good choice for planting in areas near neighborhoods, schools and hospitals where insecticides should not be used for control of the sugarcane borer. L 99-233 is susceptible to the sugarcane borer and should be scouted for timely insecticide applications.

Louisiana's sugar industry has continually looked toward the public sector for the development of new varieties. The arrival of new sugarcane varieties is a highly anticipated event. L 99-226 and L 99-233 should pay big dividends in the future for Louisiana's growers and processors. ■

Crop Research Featured
at Northeast Field Day

Nearly 200 farmers and other agricultural industry representatives attended the annual field day at the Northeast Research Station in St. Joseph, La., on June 14. The half-day program featured stops at 10 field locations where LSU AgCenter scientists explained their research with row crops.

One topic that has generated interest is the growing resistance of weeds to glyphosate, a popular nonselective herbicide that can kill any plant it contacts. Farmers are finding plants in their fields that have survived glyphosate treatment. When they come across these plants, LSU AgCenter researcher Donnie Miller collects the seeds from the plants and grows them to see if they produce plants resistant to the herbicide.

Along those same lines, researchers are evaluating Roundup Ready volunteer cotton and soybeans, which are plants that grew from seeds left in the field following the previous year's harvest. These seeds are from plants that have been developed to be resistant to glyphosate so that herbicide could be used to control weeds in those crops.

Researchers consider soybean plants in cotton fields and cotton plants in soybean fields as weeds. Because both kinds of plants are broadleaf, most herbicides that would kill the "weed" also kill would the crop plant. But because these descendants of Roundup Ready plants also would be resistant to glyphosate, another tactic has to be used to manage the "weed."

Farmers have to control these glyphosate-resistant plants early, Miller said.

"They can be a tough weed once they get going," he said.

Volunteer cotton also can be a host to boll weevils, and volunteer soybeans can harbor Asian soybean rust – if those plants are not eliminated.

While the boll weevil eradication program has been making progress in eliminating the insect pest from Louisiana cotton fields, Asian soybean rust is a disease that's a looming threat to Louisiana soybean fields.

Photo by Mark Claesgens

Ken Damann, a professor in the Department of Plant Pathology & Crop Physiology, discusses the latest research on aflatoxin and corn at the Northeast Field Day on June 14.

Although the fungus that causes the rust has been identified in limited areas of Louisiana the past two falls, it hasn't appeared in commercial fields early enough in a season to cause crop damage.

Also at the field day, LSU AgCenter entomologist Ralph Bagwell talked about tarnished plant bug and aphid control in cotton.

He said the tarnished plant bug is the No. 1 insect problem in cotton in Louisiana. He recommended alternating insecticides, using higher volumes of water in insecticide applications and selecting sprayer tips that provide extensive coverage of the material on plant leaves. ■ **Rick Bogren**

Long-term Management of Perennial Weeds Starts in the Fall

Bill Williams and Steven T. Kelly

Perennial weeds such as alligatorweed and redvine are becoming more difficult to control as producers adopt conservation tillage practices. These weeds begin spring growth before crops are planted and are difficult to manage even with multiple herbicide applications. Fall applications of the herbicide glyphosate for johnsongrass and dicamba (Banvel, Clarity) for redvine have long been recommended for managing these weeds. A standard recommendation for alligatorweed has not been established.

Many producers complain of inconsistent results from fall herbicide applications and the high cost of dicamba for redvine control. Most fall applications have been made in late October to early November. One of the main reasons for this is because those are the earliest dates possible following many cotton crops. Another important reason is that it is commonly believed that the best time for fall applications is within a couple of weeks of the first frost.

In recent years the best johnsongrass control following corn harvest has been observed in September. The increased use of a cotton-corn rotation provides an opportunity for producers to make earlier fall applications. Glyphosate prices have dropped dramatically in recent years, which may make high rates of glyphosate more economical. The objective of this research was to evaluate fall herbicide programs for managing alligatorweed and redvine.

Photo by Mark Claesgens

Scientists study control of redvine.

Research Approach

Studies were established in the fall of 2003 near Monroe, La., to evaluate fall applications of herbicides for alligatorweed control. The field was planted to rice in 2002 and 2004 and fallowed in 2003 and 2005. During the fallow years the field was disked 2 to 3 times and leveled. The field was not tilled during the cropping years. In the first study, several phenoxy herbicides (Tordon, Banvel, 2,4-D and Grandstand) and glyphosate were applied on Sept. 15, 2003. Alligatorweed control was evaluated monthly from March to October in 2004 and in April and September of 2005. A second study evaluated the effect of application timing on alligatorweed control with glyphosate, glyphosate plus 2,4-D and glyphosate plus triclopyr (Grandstand).

In the fall of 2002, a study was established near Crowville, La., to evaluate fall applications of herbicides for redvine control. The field was planted to cotton in 2001 and 2003 and planted to corn in 2002 and 2004. The field was prepared for planting in the fall by clipping stalks and re-hipping (or re-shaping the planting beds) within two weeks of harvest. Cotton was harvested early in 2003. As a result, the field was prepared for planting by early September, presenting an opportunity to investigate sequential fall programs. The plots from 2002 (12, 40-inch rows) were reduced to 4-row plots and treated with dicamba (Banvel) or glyphosate in late September, 2003, or not treated at all. A second study was established in the fall of 2004 to evaluate the effect of glyphosate application timing and rate on redvine control. Two replications were near Crowville, La., and two replications were near Saint Joseph, La.

Results

Picloram (Tordon) at 0.5 pound per acre and glyphosate a 1.0 pound per acre resulted in the best alligatorweed control. Dicamba, 2,4-D, triclopyr and picloram at 0.25 pound per acre resulted in 70 percent or lower alligatorweed control. Synergistic responses were not identified when glyphosate was tank mixed with dicamba, 2,4-D, triclopyr or picloram. Glyphosate applied alone resulted in excellent alligatorweed control for as much as two years after application (Figure 1). Control was best from mid-September to early-October and

Bill Williams, Associate Professor, Northeast Research Station, St. Joseph, La.; and Steven T. Kelly, Associate Professor, Scott Research & Extension Education Center, Winnsboro, La.

Figure 1. Effect of fall application timing on alligatorweed control approximately 2 years (early October) from 1 lb ai/A glyphosate, glyphosate plus 1 lb ai/A 24-D and glyphosate plus 0.8 lb ai/A triclopyr.

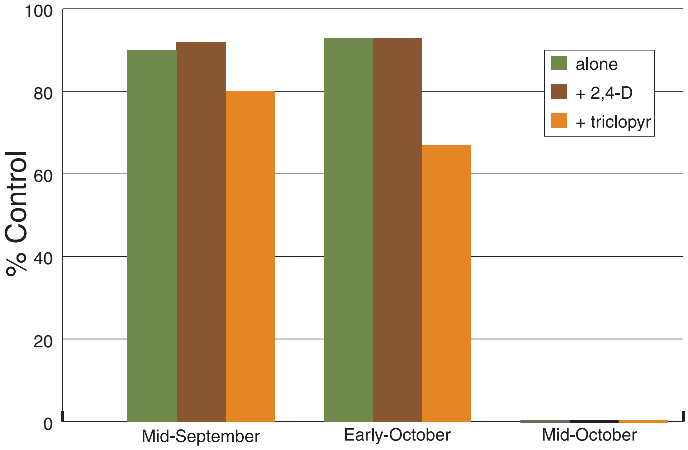
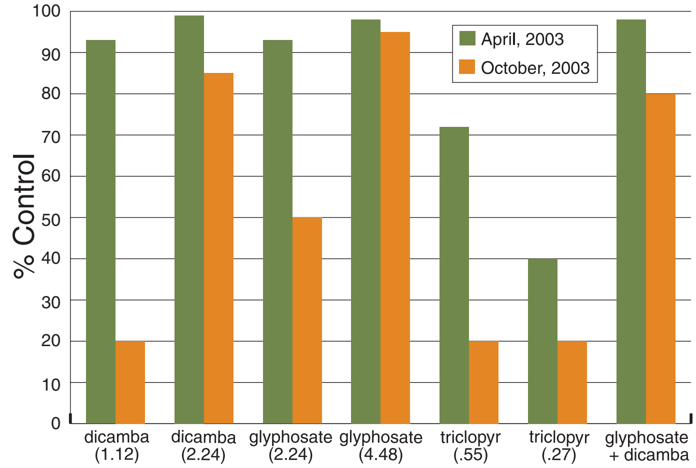


Figure 2. Redvine control in 2003 follosing fall applications of dicamba, glyphosate and triclopyr made on September 22, 2002. Rates listed in parenthesis are lb ai/A. The rates for the glyphosate plus dicamba combination were 2 and 1 lb ai/A, respectively.



was considerably lower with mid-October applications. Tank mixing glyphosate with either 2,4-D or triclopyr did not improve alligatorweed control. In many cases, especially with a mid-October application, alligatorweed control was reduced when glyphosate was mixed with 2,4-D or triclopyr compared to glyphosate alone.

After 6 months, redvine control was similar for glyphosate at 2 and 4 pounds per acre and for dicamba at 2 pounds per acre (Figure 2). Triclopyr resulted in the lowest redvine control. One year after application, glyphosate at 4 pounds per acre controlled redvine 95 percent, dicamba at 2 pounds per acre controlled redvine 85 percent and glyphosate at 2 pounds per acre plus dicamba at 1 pound per acre controlled redvine 80 percent. The remaining treatments resulted in 50 percent or lower redvine control.

Glyphosate at 2 pounds per acre applied in late September of 2002 and 2003 resulted in redvine control in 2004 equal to or better than single or multiple applications of 2 pounds per acre dicamba or 4 pounds per acre glyphosate.

Glyphosate applied at 2, 3 and 4 pounds per acre on Sept. 15, 2004, resulted in similar levels of redvine control in observations made in April 2005. The best control from 2 pounds of glyphosate per acre was observed from mid-September to mid-October. Timing had little effect on redvine control with glyphosate at 4 pounds per acre. By September, treatments began to differentiate, demonstrating the need for at least 3 pounds of glyphosate per acre. These results show that glyphosate at higher rates controls redvine as well as dicamba. Glyphosate at 4 pounds per acre resulted in the most-consistent redvine control from single applications. However, 2 pounds of glyphosate per acre applied two years in a row appears to be the best approach.

Overall, fall applications of glyphosate can help manage alligatorweed and redvine. This research indicates that glyphosate applications at 1 pound per acre for alligatorweed or 2 to 3 pounds per acre for redvine should be made between September 15 and October 15 when conditions are favorable for rapid weed growth. ■

Acknowledgments
Todd Bridges, Darrell Vandeven and Rocky Williams for their help in conducting this research and to the Louisiana Rice Research Board and the Louisiana Soybean & Grain Research & Promotion Board

Photo by Mark Claesgens

Bill Williams holds a sample of alligatorweed at the Northeast Research Station at St. Joseph.

What's New?

What's New?

13 Farmers Attain Elite 'Master' Status

Photo by Michael Danna

Left to right are Bill Richardson, LSU AgCenter chancellor; Don Gohmert, NRCS director; Scott Wiggers of Winnsboro, one of 13 farmers who have attained master farmer status; Ronnie Anderson, Farm Bureau president; and Bob Odom, LDAF commissioner.

Thirteen of Louisiana's finest farmers have completed the rigorous requirements to become a Master Farmer – a title that means they have not only learned the latest in scientifically based conservation techniques but they are voluntarily implementing them on their farms.

"They are an elite group," said Carrie Castille Mendoza, who directs the Master Farmer program for the LSU AgCenter. "These farmers had to successfully complete the three phases of the program. And some of these conservation practices, such as precision land-leveling, can cost thousands of dollars."

Two of the 13 have been in the program for nearly five years, having enrolled in the first Master Farmer class offered back in 2001 in Vermilion Parish – Ernest Girouard and Craig Adam, both of Kaplan.

"Farming is big business. And with any good business, you have to have continuing education," Girouard said.

The other 11 are Thomas M. Batchelor of Ringgold, Johnny Boudreaux of Abbeville, Jess E. Crosier of Cade, Harvey Gonsoulin of Loreauville, George Hains of Rayne, Howard Hardie of Jonesville, Kenneth LaHaye of Ville Platte, Hank Schumacher of Husser, Robert Thevis of Simmesport, and Russell (Rusty) and Scott M. Wiggers Jr., who together have the Wiggers Farm Partnership in Winnsboro.

Nearly 2,300 Louisiana farmers have completed Phase 1 of the program, which involves eight hours of classroom instruction. Instructors from the LSU AgCenter, the Natural Resources Conservation Service (NRCS) and the Louisiana Department of Agriculture and Forestry (LDAF) teach best management practices related to environmental stewardship and water quality regulations.

Of that number, 575 have gone on to finish the second phase, which means they have participated in a tour of a farm selected because of its exemplary use of conservation practices.

The third and final phase is the most difficult, Mendoza said. The farmers have to arrange for a visit from an NRCS agent and devise a conservation plan specific to their farming operation.

Then the farmer has to put this plan into practice, which can involve such things as installing fences to contain cattle or pumps in fields to recycle water. Some of the Master Farmers use GPS equipment to conserve the amounts of fertilizer and pesticides they apply and to improve the drainage on fields through precision land-leveling.

But that's not all. The NRCS agent has to make a return visit and verify that the conservation prescription is being carried out. Then, and only then, can the farmer apply for certification from LDAF.

"It's a slow, arduous process. But we expect to have many more certified Master Farmers by this time next year," Mendoza said. ■ **Linda Foster Benedict**

Inside:

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